Umicore CSM NA Site
Arab, Alabama
ADEM VCP Site #: 461-095-039

Fact Sheet

A Voluntary Cleanup Program (VCP) Cleanup Plan has been approved by the Alabama Department of Environmental Management for the Umicore CSM NA site. Umicore CSM NA, a Division of Umicore USA Inc., currently owns the facility located in Arab, Alabama. This fact sheet has been prepared to briefly advise the public of the principal legal and policy issues of the VCP.

I. VCP PROCESS

The VCP provides a mechanism for the implementation of a cleanup program that encourages applicants to voluntarily assess, remediate, and reuse rural and urban areas of actual or perceived contamination. The program does not relieve any "responsible person" for the liability for administrative, civil, or criminal fines or penalties which are otherwise authorized by law and imposed as a result of the illegal or unpermitted disposal of solid waste, hazardous waste, hazardous constituents, hazardous substances, petroleum products, and/or pollutants to the land, air, or waters of the State on an identified property. The program is designed to expedite the voluntary cleanup process and has been designed for entry at any stage of the cleanup process as long as all applicable criteria have been met up to the point of entry.

II. PROCEDURES FOR REACHING A FINAL DECISION

The Alabama Department of Environmental Management (ADEM) is proposing to issue Umicore CSM NA a final decision for the site remediation.

ADEM Admin Code R. 335-15-6-.02 requires that the public be given a 30-day comment period from the date of the notice. The comment period will begin on September 21, 2016 which is the date of publication of the public notice in major local newspaper(s) of general circulation and will end on October 20, 2016.

All persons wishing to comment on any of the conditions of the VCP Remediation should submit their comments in writing to the Alabama Department of Environmental Management, Permits and Services Division, 1400 Coliseum Blvd. (Zip 36110). P.O. Box 301463 (Zip 36130-1463) Montgomery, Alabama, ATTENTION: Mr. Russell Kelly. Written comments on the VCP activities should be submitted to the Alabama Department of Environmental Management and be received by 5:00 p.m. on October 20, 2016.

ADEM will consider all written comments received during the comment period while making a final decision on this issue. When the Department makes its final

decision, notice will be given to the applicant and each person who has submitted written comments or requested notice of the final decision.

III. FACILITY DESIGN

Hart and Hickman, PC has completed Site Investigation activities under the VCP at the Umicore CSM NA facility located at 1951 Guntersville Road Arab, Marshall County, Alabama. From approximately 1967, the site has been zoned general industrial by the City of Arab. The property has been previously used for metal reclamation and/or metal salts manufacturing by Hall Chemical Company. The current use of the property, owned and operated by Umicore CSM NA, is for the operation of a chemical processing and recycling facility for the manufacture of metal salts and recovery of metals from fly ash. The site currently contains 18 buildings including a recently constructed warehouse building addition. Other property features include a closed former wastewater lagoon, several above ground storage tank (AST) areas, a bone yard, a wastewater treatment plant, a sediment basin, and asphalt and/or concrete paved loading/unloading areas. Extensive soil and groundwater sampling, and remedial activities have been or will be conducted at the site prior to redevelopment. Institutional and engineering controls will be used to eliminate or minimize potential exposures associated with future use and/or development.

IV. TECHNICAL CONTACT

Haley L. Kelley, Project Manager
Redevelopment Section
Environmental Services Branch
Land Division
Alabama Department of Environmental Management
1400 Coliseum Boulevard (Zip 36110)
P.O. Box 301463 (Zip 36130-1463)
Montgomery, Alabama
(334) 271-7848

Via Email and Federal Express (Standard Overnight)

March 24, 2016

Alabama Department of Environmental Management
Assessment Section, Environmental Services Branch
Land Division
1400 Coliseum Boulevard
Montgomery, AL 36130-1463

Attn: Mr. Kenneth L. Prestridge, ESS

Re: Property Assessment Report and Cleanup Plan
Umicore CSM NA
1951 Guntersville Road
Arab, Alabama
VCP Site No. 461-095-039
H&H Job No. UMI-001

Dear Mr. Prestridge:

On behalf of Umicore Cobalt Specialty Materials (CSM) North America (NA), Hart & Hickman, PC (H&H) is sending via email a downloadable digital copy of the Property Assessment Report and Cleanup Plan for the above referenced site. One bound hard copy and one electronic copy on CD is also being sent to you via Federal Express.

If you have any questions or require additional information, please do not hesitate to contact us at (704) 586-0007.

Very Truly Yours,

Hart & Hickman, PC

Shannon Cottrill
Project Manager

Steven C. Hart, PG
Principal Hydrogeologist

Attachment

cc: Mr. Theron Grim, Umicore – (Via Email)

Property Assessment Report and Cleanup Plan

Umicore CSM NA
1951GuntersvilleRoad
Arab, Alabama

umicore

VCP Site No. 461-095-039
H&H Job No. UMI-001
March 24, 2016

Steven C. Hart
Lic 435
ALABAMA LICENSED PROFESSIONAL GEOLOGIST
3/24/16

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Property Assessment Report and Cleanup Plan
Umicore CSM NA
Arab, Alabama
VCP Site No. 461-095-039
H&H Job No. UMI-001

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Property Assessment Report
and Work Plan Addendum
Umicore CSM NA
Arab, Alabama
VCP Site No. 461-095-039
H&H Job No. UMI-001

1.0 Introduction

On behalf of Umicore Cobalt Specialty Materials (CSM) North America (NA) (Umicore), Hart & Hickman, PC (H&H) is pleased to present this Property Assessment Report and Cleanup Plan for the Umicore facility in Arab, Marshall County, Alabama (hereafter referred to as the Site). This report presents a summary of previous assessment activities at the Site, the methods and results of additional soil and groundwater assessment activities performed in 2014 and 2015, a characterization of the magnitude and extent of soil and groundwater impacts at the Site, a Site-specific exposure assessment, and a plan for Site cleanup based upon the characterization and exposure assessment. A brief summary of background information is provided below.

Based upon the results of previous sampling conducted in March 2012 by others, Umicore submitted an application to participate in the Voluntary Cleanup Program (VCP) to the Alabama Department of Environmental Management (ADEM) on May 18, 2012 to address metals detected in soil in stormwater channels at the Site. The VCP application was accepted by ADEM in a letter dated May 31, 2012. Assessment and remedial actions related to the metals are being conducted through ADEM's VCP. The primary metals of concern are cobalt, manganese, cadmium, and nickel.

In accordance with VCP Guidance, a Property Assessment Plan entitled *Site Assessment Work Plan, Revision 1* was prepared and submitted to ADEM on May 9, 2013. The plan included a summary of Site history, previous assessment activities conducted at the Site, and detailed methods to more fully assess potential impacts to soil at the Site. ADEM approved the Property Assessment Plan on May 23, 2013. H&H completed the proposed assessment activities, including additional soil sampling proposed in the area of a planned warehouse expansion project for Building 16, between May 28 and June 7, 2013. Subsequent to the field sampling

activities, soil sampling was also conducted on September 16, 2013 in a stormwater channel in the eastern portion of the Site adjacent to a planned plant expansion area.

After the soil sampling, an interim soil removal action and post-excavation soil sampling associated with the Building 16 warehouse expansion project were completed between September 17 and September 20, 2013. Soil stockpile removal activities related to the Building 16 interim soil removal action were completed between March 31 and April 2, 2014. A summary of the 2013 additional assessment activities, Building 16 soil removal activities, and proposed additional Site assessment based upon the results of the 2013 assessment activities were detailed in H&H's *Property Assessment Report and Work Plan Addendum* which was submitted to ADEM on July 15, 2014.

The July 15, 2014 Work Plan Addendum described additional assessment activities to be conducted at the Site to 1) further refine the extent of soil metal impacts detected above screening levels in soil in stormwater channels at the Site, and 2) investigate surface water, sediment, and groundwater conditions associated with the identified soil metals impacts. The Work Plan Addendum also detailed information to be collected to support a preliminary risk assessment.

ADEM approved the Work Plan Addendum on November 12, 2014, and H&H conducted the additional soil and groundwater assessment activities at the Site in November and December 2014. Because the results of groundwater sampling conducted in December 2014 indicated that concentrations of manganese and cadmium were detected above screening levels in groundwater in the eastern portion of the Site and the extent of potential groundwater impacts was not defined by the existing well network, H&H proposed additional groundwater assessment activities. Prior to conducting the additional groundwater assessment activities, H&H received concurrence from ADEM to proceed with additional monitoring well installations and sampling activities. H&H completed the groundwater assessment activities in June 2015. Prior to groundwater sampling activities, H&H also conducted additional soil sampling in May 2015 to further evaluate the extent of soil impacts near the wastewater treatment plant where a small quantity release of untreated wastewater was released onto the ground surface in mid-March 2015.

This Property Assessment Report and Cleanup Plan is organized into sections to include the following:

- Background Information (Section 2.0);
- Environmental Setting (Section 3.0);
- Previous Assessments and Remedial Activities (Section 4.0);
- 2014 and 2015 Additional Assessment Activities (Section 5.0);
- Soil Characterization (Section 6.0);
- Groundwater Characterization (Section 7.0);
- Surface Water and Sediment Characterization (Section 8.0);
- Conceptual Site Model Development (Section 9.0);
- Exposure Assessments (Section 10.0);
- Proposed Remedial Action (Section 11.0); and
- Schedule (Section 12.0).

2.0 Site Background Information

2.1 Site Location

The Umicore CSM NA facility is located at 1951 Guntersville Road in Arab, Marshall County, Alabama. Arab is located in the northeastern portion of Alabama approximately 4.5 miles west of Guntersville Lake. The Site is located approximately 2.5 miles northeast of Arab. The location of the Site is shown on the United States Geologic Survey (USGS) 7.5 Minute topographic map of Arab, Alabama dated 1973 which is included as Figure 1. The approximate coordinates of the Site are: latitude 34° 20' 38.79"; longitude 86° 27' 21.55."

A Site survey prepared by Morell Engineering, a registered land surveyor, is included in Appendix A. The Site survey includes building locations, pavement, property boundaries, monitoring well locations, stormwater discharge points, drainage features, and the location of soil borings advanced during H&H's assessment. As a supplement to the Site survey and for ease of reference, the general layout of the Site including buildings, pavement, drainage features, vegetation, and estimated stormwater piping is illustrated on Figure 2.

2.2 Site Ownership

The Site buildings and property were purchased by Umicore CSM NA, a Division of Umicore USA Inc., from Hall Chemical Company on December 17, 2001. Umicore CSM NA currently operates a chemical processing and recycling facility on the property for the manufacture of metal salts and recovery of metals from fly ash. On March 7, 2013, Umicore CSM NA purchased an adjacent tract of land to the east of the Site from Majestic Farms Land & Cattle Company, Inc. (labeled on the Site survey as the George H. & Kathleen A. Miller property).

2.3 Site Description and Improvements

The Umicore CSM NA facility property is approximately 44 acres in size. The property consists of two parcels. The main parcel is approximately 42 acres in area and contains the Site

improvements and buildings. The second parcel is approximately 2 acres in area and includes the recently purchased adjacent tract of land to the east of the main parcel. Shoal Creek borders the Site to the east, enters the Site approximately 300 ft northeast of the facility operational areas, and traverses the northeastern portion of the Site.

The Site is currently developed with 18 buildings totaling approximately 102,000 square feet in area, including a recently constructed warehouse building addition along the southern side of Building 16 (Trimellitic Anhydride (TMA) Building) which was completed in March 2014. In January 2014, Umicore began construction of an approximate 3,000 square ft Cobalt Manganese Bromide (CMB) Building in the eastern portion of the Site north of the employee parking lot. Construction of the CMB Building was completed in June 2014. The Site buildings are situated on an approximate 7-acre portion of the Site. A Site layout map of the facility is provided as Figure 2, and a summary of Site buildings is provided in the table below.

Building ID.	Operations	Construction Date
1	Manganese acetate and manganese-nitrate manufacturing.	1961
2	Cobalt acetate, nickel acetate, nickel phosphate, nickel nitrate, and cobalt nitrate manufacturing.	1962
3	Cobalt acetate, manganese acetate, and nickel acetate production activities; historical cobalt sulfate operations until 1986.	1967
4	Raw Materials Warehouse; historical maintenance shop.	Between 1967 and 1977
5	Wastewater and Sludge Treatment Building; historical cadmium operations and zinc nitrate productions.	Between 1967 and 1977
6	Warehouse for finished goods; extension constructed in 2005.	Approximately 1977
7	Packaging warehouse	Approximately 1977
8	Fly ash processing and cobalt manganese acetate manufacturing facilities. Historical laboratory operations prior to 1988, and chromium nitrate, iron nitrate, and zirconium acetate solution production from 1990 to 1993.	1980s

Building ID.	Operations	Construction Date
9	Boiler room	1980s
10	Fly ash warehouse	1980s
11	Fly ash filter processing	1980s
12	Maintenance Building; historical pilot plant operations prior to 1988.	1980s
16	Trimellitic Anhydride (TMA) Building	2005
TMA Warehouse	Fly ash storage	2014
20	Office building and extension	1961 – 2008
IX	Ion Exchange Building (Bromide removal)	2008
Warehouse	Warehouse extension	2005
FRIT	Fly ash blending	2008
CMB Building	Cobalt manganese bromide manufacturing facilities	2014

Other property features include a closed former wastewater lagoon, several above ground storage tank (AST) areas, a bone yard, a wastewater treatment plant, a sediment basin, and asphalt and/or concrete paved loading/unloading areas. A covered and concrete paved ash handling area is located in the west central portion of the facility. The Site features are depicted on Figure 2.

Asphalt paved parking areas are located in the southeastern portion of the Site and west of the office building/extension in the southern portion of the Site. An asphalt paved drive and a connecting gravel driveway are located in the southern portion of the Site along Old Guntersville Highway. The central portion of the operational area of the facility is asphalt or concrete paved. Other operational areas of Site that are not paved are primarily grass covered. A chain link security fence encircles the plant buildings and operational areas, and limits access to the property (see Figure 2).

A former agricultural hay field is located in the western and northwestern portions of the Site. The remaining portions of the Site property are primarily wooded (Figure 2).

2.4 Land Usage and Zoning

The subject property was previously used by Hall Chemical Company for metal reclamation and/or metal salts manufacturing from approximately 1967 to 2001. Since 2001, Umicore CSM NA has operated the facility as a chemical processing and recycling facility for the manufacture of metal salts and the recovery of metals from fly ash. The subject Site is zoned general industrial (M-2) by the City of Arab.

The surrounding properties are primarily residential, business, and industrial in use. The Site is bordered to the northwest, north, and northeast by Guntersville Road (Alabama Highway 69). Across Guntersville Road to the northwest and north are two commercial properties including Laysan Bio, Inc. (biotechnology drug delivery company) and a commercial business which is currently under construction. Both of these properties are zoned general industrial (M-2) by the City of Arab. Across Guntersville Road to the northeast is an undeveloped wooded tract of land. The undeveloped wooded tract of land is located outside of the City of Arab zoning jurisdiction, and no zoning currently exists for Marshall County.

Shoal Creek borders the Site to the east and then crosses the subject property boundary approximately 300 ft northeast of the manufacturing area. Across Shoal Creek to the northeast and east of the Site is an undeveloped wooded tract of land and the Brookwood Cemetery, respectively. These properties are located outside of the City of Arab zoning jurisdiction and are not zoned by Marshall County. The Site is bordered to the southeast, south, and southwest by Old Guntersville Highway. Across Old Guntersville Highway to the southeast, south, and southeast are rural residences, agricultural, and undeveloped wooded land. These properties are zoned low density residential (R-1) and agricultural (A-1) by the City of Arab. The Site is bordered to the west by undeveloped land zoned by the City of Arab as general business district (B-2).

A Site and surrounding area map is provided as Figure 3.

2.5 Brief Site Operational History

Hall Chemical Company purchased the property in 1961 for development of a facility designed to reclaim metals. Prior to 1961, the subject property was residential, agricultural, and undeveloped wooded land. Four buildings, including the office building and Buildings 1, 2, and 3, were constructed at the Site between approximately 1961 and 1967, when operations were initiated. Since 1967, the subject property has been operated as a metal reclamation and/or metal salts manufacturing facility. Fifteen additional buildings were constructed after 1967. The facility was operated by Hall Chemical Company until December 2001, when Umicore purchased the Site, and continued facility operations as Umicore CSM NA.

Initial operations at the Site conducted by Hall Chemical Company included reclaiming nickel and cobalt from scrap military parts. Hall Chemical Company subsequently expanded operations to include the manufacture of metal salts, such as cobalt manganese acetate, nickel nitrate, nickel acetate, nickel phosphate, manganese nitrate, cadmium nitrate, cobalt sulfate, manganese acetate, and cobalt hydroxide. Cobalt sulfate operations ceased in September 1986, and the manganese acetate and cobalt hydroxide operations ceased between 1988 and 1990, respectively. Manganese acetate operations resumed in approximately 2002. Cadmium nitrate operations were also terminated prior to 2001, although the timing is not clear. Hall Chemical Company began metal recovery from fly ash in 1980.

Umicore CSM NA currently manufactures metal salts including cobalt and manganese acetate, cobalt and nickel nitrate, nickel acetate, nickel phosphate, and manganese nitrate. In addition, Umicore produces cobalt manganese acetate from fly ash.

2.6 Release History

According to documents reviewed in ADEM's Land Division files, groundwater monitoring wells were previously installed at the Site as part of an investigation of a 1976 cadmium release to a former wastewater lagoon, which was investigated and subsequently closed out by ADEM in 1999. As part of the initial spill response, cadmium-impacted soils were excavated from the lagoon and placed in the northeastern portion of the operational area of the Site. These soils were subsequently capped with concrete, and Buildings 6 and 7 were constructed over portions of the cap.

The former wastewater lagoon was closed in 1998 following excavation and off-Site disposal of impacted sediment and placement of a clay cap. In March 1999, ADEM indicated that further groundwater monitoring was not required and issued a "No Further Remedial Action Planned" (NFRAP) letter stating that the terms of the Settlement Agreement related to investigation and closure of the lagoon had been completed.

3.0 Environmental Setting

3.1 Site Topography

The subject Site is located in the Cumberland Plateau Physiographic Province of Alabama which is in the southern part of the Appalachian Plateau Physiographic Province. The Cumberland Plateau is located in the northeastern portion of Alabama and is a deeply dissected mountainous area of numerous steep mountain ridges, intermontane basins, and trench valleys that give the area its rugged mountain character. The land surface of the Cumberland Plateau generally consists of flat-topped high-elevation plateaus separated by deep, steep-sided valleys. The plateaus in the Site area generally slope from northeast to the southwest. The subject Site is located along the southern portion of the Cumberland Plateau and its topographic setting is best characterized as a mountain plateau.

The Site is located at an approximate elevation of 1,020 ft above mean sea level (ft msl). Total topographic relief across the Site is approximately 40 to 45 ft; the highest topographic elevations are located in the southwestern portion of the Site, and the lowest topographic elevations are located in the northeast portion of the Site. A copy of the area USGS topographic map is provided as Figure 1.

3.2 Surface Water Hydrology

The subject Site generally slopes to the northeast and east toward Shoal Creek. Shoal Creek borders the property to the east, enters the property approximately 300 ft northeast of the manufacturing area, and traverses the northeastern portion of the Site. A series of intermittent drainages which flow into Shoal Creek are located north of the paved operational areas of the facility.

Shoal Creek is approximately 10 miles in length and ultimately discharges into Lake Wheeler (Tennessee River) approximately 6.8 miles north-northeast of the Site. Shoal Creek has a use classification of Fish and Wildlife and is considered a Tier 2 waterbody. Tier 2 waterbodies are

waters whose quality exceeds the levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water.

Fish and Wildlife streams are protected for fishing, propagation of fish, aquatic life, wildlife, and any other usage except swimming and water-contact sports or as a source of water supply for drinking or food-processing. ADEM has restrictions on watershed development and the types of discharges for Tier 2 waters, and requires applicants to new or expanded discharges to Tier 2 waters to demonstrate that the proposed discharge is necessary for important economic or social development.

In the surrounding Site area, Clemons Branch and Hamby Branch (tributaries of Shoal Creek) are located approximately 500 ft southeast and 1,300 ft northwest of the Site property, respectively. In addition, two ponds and an unnamed tributary of Shoal Creek are located approximately 1,500 and 1,800 ft east-southeast and 1,500 ft southeast of the facility, respectively. An unnamed tributary of Shoal Creek is located approximately 2,800 ft northeast of the property. In addition, several small ponds were identified in the Site area at distances ranging between approximately 1,300 ft and 2,400 ft of the facility. These small ponds ultimately discharge to Shoal Creek in the Site area.

3.3 Stormwater Drainage

Stormwater from the Site sheet flows into grass areas along the perimeter of the Site, flows into drains which direct stormwater to the wastewater reclaim system located east-northeast of Building 5, flows into drains or sumps which discharge to drains north and northwest of the paved manufacturing area, or flows into a newly constructed sediment basin located in the eastern portion of the Site (Figure 2). As part of this property assessment, H&H reviewed available drawings of the Site depicting subsurface utilities, stormwater conveyances, and/or structures. In addition, H&H conducted a subsurface utility tracer study to evaluate the subsurface stormwater flow pathways at the Site. The tracer study was conducted using ground penetrating radar and electromagnetic equipment to trace subsurface stormwater conveyance pipes. In locations where discharge pipes daylighted, a metal wire rod was inserted in subgrade

piping to facilitate the tracing activities.

The results of the drawing review and tracer study indicate that there are 18 stormwater discharge points at the Site including two permitted National Pollutant Discharge Elimination System (NPDES) outfalls (labeled DSN003 and DSN004). Outfall DSN003 is located in the northern portion of the Site near the northeast corner of the warehouse. Outfall DSN003 discharges stormwater runoff from roof drains in the central and northern portions of the facility, the raw products storage area which includes acetic and nitric acid storage tanks, and the finished goods storage area which includes cobalt acetate, manganese acetate, and various other specialty chemicals contained in bulk storage tanks. Outfall DSN004 is located south of the wastewater treatment plant in the eastern portion of the Site, and receives stormwater runoff from roof drains in the eastern half of the facility, the tanker truck parking area, and wastewater pretreatment area. Of the remaining discharge points, twelve discharge points are for stormwater only and four other discharge points are apparently inactive based on blockage observed in the subgrade piping during the tracer study (Figure 2).

Open trench drains for the collection of stormwater are present in the western and central portions of the manufacturing area. The open trench drain in the western portion of the manufacturing area discharges stormwater at a point west of the paved manufacturing area, and the open trench drains in the central portion of the manufacturing area discharge stormwater via multiple points north of the paved manufacturing area. Several stormwater discharge points are located along the northern portion of the paved manufacturing area, including one discharge point that receives water from a stormwater drain located south of the ash handling area and a sump located north of the ash handling area. The stormwater which discharges along the northern portion of the paved manufacturing area flows into a series of intermittent drainages that ultimately connect to Shoal Creek near the eastern property boundary of the Site. An open trench drain located west of Building 5 and drains located in AST containment areas direct stormwater to the wastewater reclaim system which is located east-northeast of Building 5. The wastewater reclaim system discharges to the Arab POTW.

3.4 Regional Geology and Hydrogeology

According to the *Groundwater Hydrogeology, Recharge, and Water Availability in the Tennessee River Watershed of Alabama* (Cook et al., 2009), the Site is located in the Warrior Basin of the Cumberland Plateau Physiographic Province. [1] The Warrior Basin consists of a synclinal dissected sandstone and shale plateau of moderate relief. This area is characterized by narrow valleys underlain by limestone and narrow high relief ridges of limestone that are capped by sandstone. According to the Alabama Geological Survey *Geologic Map of Alabama* (Alabama Geological Survey, 2006), underlying bedrock in the Site area consists of the lower part of the Pottsville Formation. [2] The Pottsville Formation is Pennsylvanian in age and consists of light-gray, thick-bedded to massive pebbly quartzose sandstone containing varying amounts of interbedded shale, siltstone, and discontinuous coal.

The Site is located in the Tennessee River watershed which comprises the northern part of Alabama. Groundwater within this region generally occurs at relatively shallow depths and readily interacts with the land surface through hydrologic processes related to recharge and baseflow. Groundwater in the Tennessee River watershed occurs in semi-confined or unconfined aquifers that generally consist of relatively shallow, fractured, Paleozoic clastic and carbonate aquifers with karst development in carbonate rocks. Groundwater movement is from topographic highs to topographic lows where groundwater discharges to springs or other surface water bodies. The geometry and connectivity of the fracture systems in the aquifers affects the direction and velocity at which groundwater flows. According to Cook, et al. (2009), groundwater production in the area of the Site is generally low-yield in clastic rocks with higher yield in areas with fractures.

[1] Cook, M.R., Moss, N. E., and Jennings, S.P. 2009. Groundwater Hydrogeology, Recharge, and Water Availability in the Tennessee River Watershed of Alabama. Geological Survey of Alabama Open File Report 0910.

[2] Geological Survey of Alabama, 2006, Geologic map of Alabama, digital version 1.0: Alabama Geological Survey Special Map 220A [adapted from Szaba, M. W., Osborne, W. E., Copeland, C. W., Jr. and Neathery, T. L., 1988, Geologic map of Alabama (1:250,000): Alabama Geological Survey Special Map 220].

3.5 Water Supply

As part of the assessment activities, H&H conducted a water supply well supply survey for the area within a one mile radius of the Site. In addition, H&H contacted the Arab Water Works (AWW) Board to determine the availability and use of municipal water in the Site area and restrictions on use of water supply wells in areas with municipal water. The results of the survey are provided below.

3.5.1 Municipal Water Availability

On June 7, 2013, H&H visited the AWW Board office in Arab, Alabama and interviewed AWW personnel regarding the source and availability of municipal water in the Site area. According to AWW records, municipal water is provided to the Site and is available to properties within a one mile radius of the Site. In addition, H&H observed evidence of municipal water availability (i.e., water meters and fire hydrants) in the survey area. According to AWW personnel, the sources of municipal water include both surface water and groundwater. The source of surface water is from Brown's Creek Embayment (Guntersville Lake) located approximately one mile west of Guntersville on Highway 69. The surface water intake is located in Lake Guntersville approximately 65 ft south of the Highway 69 causeway. The intake is approximately 7.2 miles east-northeast of the Site. The groundwater source is a municipal well located at the filtration plant at 66 Waterworks Road in Warrenton, Alabama. The well is approximately 6 miles east-northeast of the Site. According to AWW personnel, surface water and groundwater are treated at the filtration plant in Warrenton and then pumped to Arab municipal water tanks via a series of pumping stations.

H&H also contacted the City Planning and Zoning Department in Arab to determine if there are policies which would prevent the use of water supply wells in the Site area. According to Arab Planning personnel, there are no restrictions that would prohibit the use of water supply wells in the Site area.

3.5.2 Water Supply Wells

On June 7, 2013, H&H conducted a water supply well survey for the area within a one mile radius of the Site. The survey included an area reconnaissance and visual observation for municipal water connections and/or evidence of water supply wells. Additionally, H&H conducted an extended survey of the properties located within 1,500 ft of the Site. The extended survey for these properties included contacting current property owners to inquire about the presence of water supply wells on their property.

The results of the well survey indicate that there is one inactive water supply well located approximately 800 ft southeast of the Site at 2070 Guntersville Road. According to the property tenants, the water supply well was previously used for irrigation purposes but has not been used for more than 2 years. The property tenants reported that the pump and well are out-of-service, and the residence is connected to the municipal supply. The location of the inactive water supply well is depicted on Figure 3.

Additionally, the property tenants of 2070 Guntersville Road reported that two water supply wells are located approximately 675 ft southeast of the Site at 2058 Guntersville Road. H&H contacted Mr. Dorron K. Mitchell, the property owner of 2058 Guntersville Road property, who reported that he was not aware of any water supply wells on his property and confirmed that the residence is connected to the municipal supply. H&H observed a municipal water meter associated with the 2058 Guntersville Road residence. H&H did not observe evidence of water supply wells on this property.

A review of EPA's Safe Drinking Water Information System (DWIS) website indicates that no records of non-transient non-community or transient non-community water systems in Marshall County.

3.6 Environmentally Sensitive Areas

3.6.1 Wetlands

As part of the property assessment activities, H&H reviewed the U.S. Fish and Wildlife Service (USFWS) online Wetlands Mapper to identify potential wetlands at the Site and nearby areas. Based upon information obtained from the online Wetlands Mapper, a potential wetlands area is located in the northeastern portion of the Site along the Shoal Creek stream channel and another potential wetlands area is located approximately 600 ft southeast of the Site along the Shoal Creek stream channel. [3] Based upon the online Wetlands Mapper, the two potential wetlands area are characterized as "freshwater emergent" wetlands with a classification code of PFO1A. The "P" in the description code of PFO1A indicates that the potential wetlands areas are Palustrine Systems which includes all nontidal wetlands dominated by trees, shrubs, emergent, mosses or lichens. The "FO" in the description code of PFO1A indicates that the Class of the potential wetlands is forested and is characterized by woody vegetation that is 6 meters tall or taller. The "1" in the description code of PFO1A indicates that the Subclass of the potential wetlands are Broad-Leaved Deciduous and consist of woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season. The "A" modifier in the description code of PFO1A indicates the water regime for these potential wetlands areas is characterized as being "temporary flooded." Temporary flooded indicates surface water is present for brief periods during the growing season, but the water table usually lies well below the soil surface for most of the growing season.

According to the Wetlands Mapper, the potential wetlands area located in the northeastern portion of the Site covers approximately 2 acres of the Site and begins at a location approximately 550 ft north-northeast of the manufacturing area of the Site. This potential wetland area extends in a northerly direction off-Site along the Shoal Creek stream channel for a distance of approximately 0.5 mile. The potential wetlands area located approximately 600 ft southeast of the Site extends approximately 0.4 mile upgradient of the Site. The locations of the

[3] U.S. Fish and Wildlife Service. 1981. National Wetlands Inventory Website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. http://www.fws.gov/wetlands/

potential wetlands areas are depicted on Figure 3.

3.6.2 Critical Habitats

As part of the property assessment activities, H&H also reviewed the USFWS online Critical Habitat Map to identify potential environmentally sensitive areas at the Site and nearby areas. Based upon information obtained from the online Critical Habitat Map, no critical habitats were identified on or near the Site. [4] The closest critical habitat(s) identified in the Site area are the Federally-listed linear Endangered Critical Habitat of the *Pleuronaia dolabelloides* (Slabside Pearlymussel) and the Federally-listed linear Threatened Critical Habitat of the *Quadrula cylindrical* (Rabbitsfoot) located approximately 11.3 miles north-northeast of the Site on the Paint Rock River. [5, 6]

[4] U.S. Fish and Wildlife Service. 2016. Critical Habitat Website. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. http://www.arcgis.com/

[5] 80 FR 24691 - 24774. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Neosho Mucket and Rabbitsfoot: Final Rule. April 30, 2015.

[6] 78 FR 59555 - 59620. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Fluted Kineyshell and Slabside Pearlymussel: Final Rule. September 26, 2013.

4.0 Previous Assessment and Remedial Activities

Previous assessments and remedial activities have been conducted at the Site on behalf of Umicore to address metals detected in soil in stormwater channels at the Site. The results of these activities were previously included in the *Property Assessment Report and Work Plan Addendum* dated July 15, 2014. A brief summary of these previous assessment activities is provided below.

4.1 2012 Preliminary Surface and Subsurface Soil Sampling

In March 2012, ENVIRON International Corporation (ENVIRON) conducted preliminary assessment activities at the Site to investigate areas of dark soil located near two stormwater discharge pipes on the north side of the manufacturing area and from other identified stormwater channels receiving stormwater runoff. The assessment activities included the collection of 28 surface (0-2 inches) soil samples near identified stormwater discharge points and in the ravine and intermittent drainage to the north of the manufacturing area. In addition, 13 shallow subsurface (12-15 inches) soil samples were collected at corresponding surface soil sampling locations in the two areas where staining was observed at stormwater discharge pipes nearest the ash handling area.

The results of the 2012 preliminary assessment activities indicated that the primary compounds of concern at the Site were cobalt, manganese, nickel, cadmium, and arsenic. Chromium was also identified as a potential compound of concern, but based on the chromium speciation analyses of soil samples collected in 2013 as discussed in Section 4.2 below, chromium was eliminated as a primary compound of concern.

The results of the 2012 preliminary assessment also indicated concentrations of metals generally decreased rapidly with distance from the stormwater discharge points, and that stormwater is the primary mechanism of metals transport at the Site. The results of the 2012 preliminary assessment also indicated that concentrations of metals generally decrease significantly with depth at the co-located surface and shallow surface soil sample locations. H&H conducted

additional soil sampling in 2013 to further evaluate the horizontal and vertical extent of metals in soil.

4.2 2013 Additional Assessment Activities

During the 2013 assessment activities, soil sampling was conducted to establish Site-specific background metal concentrations, and evaluate the vertical and horizontal extent of the previously identified soil impacts. In addition, soil sampling was conducted in a stormwater channel adjacent to Building 16 and along the southern side of Building 16 in the location of a planned warehouse construction project where previous soil samples had not been collected. Additionally, soil sampling was conducted in a drainage channel in the eastern portion of the Site adjacent to a planned plant expansion area where previous sampling had not been conducted.

During the 2013 soil assessment, H&H advanced a total of 111 borings and submitted 269 samples for laboratory analysis. The 2013 soil sample locations included background locations, previously sampled locations, primary additional sample locations, and provisional locations. Samples were collected from surface and subsurface locations for horizontal and vertical delineation of soil impacts as discussed below. In accordance with our phased approach for analyses, not all of the soil samples collected were analyzed by the laboratory. The soil boring depths, sample intervals, and analyses are summarized on Table 1.

<u>Background Samples</u>

In May 2013, five background borings (BG-1 through BG-5) were advanced to evaluate naturally occurring concentrations of metals in soil. The results of analysis of the background samples indicated the metals arsenic, chromium, copper, nickel, lead, cobalt, zinc, and manganese were detected in at least one background sample. The metals antimony, beryllium, cadmium, selenium, silver, thallium, and mercury were not detected in any of the collected background samples. Metal concentrations in potential areas of concern were considered to be above background levels if they exceeded the range of the background soil sample concentrations and/or two times the mean of the metal in accordance with ADEM guidance. In calculating the mean concentration for a particular metal, non-detect values were taken at one-

half the detection limit. Based upon the background sampling and additional analyses of soil as part of the 2013 assessment, several metals (including antimony, arsenic, beryllium, copper, lead, mercury, silver, thallium, and zinc) were eliminated as compounds of concern at the Site. The results of chromium speciation of soil samples indicated that chromium was also eliminated as a compound of concern.

Based upon the 2013 background data and chromium speciation, the compounds of concern at the Site were determined to be cobalt, manganese, nickel, and cadmium.

2013 Soil Assessment Summary

The results of the 2013 assessment activities indicated that the highest concentrations of the metals of concern were detected in soil samples collected near the fly ash area stormwater discharge in the central portion of the Site and at samples closest to other stormwater discharge points. Concentrations of metals in surface soils collected in 2013 were generally much lower than previous samples collected in March 2012. This is most likely due to the difference in sample intervals between the sampling events. The 2012 assessment used a 0-2 inch interval, and the 2013 assessment used a 0-1 ft surface sample interval in accordance with ADEM guidance. As noted in the 2013 assessment report and work plan, H&H believes that the 0-1 ft interval is more representative for potential exposure and protection of groundwater evaluations.

Based upon the presence of elevated metals concentrations observed at multiple discharge points and locations downgradient of these discharge points, H&H concluded that stormwater is the primary mechanism of metals transport at the Site and that soil metal impacts are generally confined to the intermittent channels with the exception of several locations where surface topography is relatively flat beneath the stormwater discharge points (i.e., fly ash area stormwater discharge location).

The results of the additional analyses of deeper soil samples collected in 2013 indicated that metal concentrations generally gradually decrease with depth to concentrations below background and/or screening levels. Based on the presence of metals above Site-specific protection of groundwater screening levels, groundwater sampling was conducted in December

2014 to evaluate the potential for groundwater impacts as discussed in Section 5.2.2.

Synthetic Precipitation Leaching Procedure (SPLP) Analysis

Following completion of the 2013 soil sampling, H&H evaluated the soil data and selected 42 soil samples for SPLP analysis to represent a range of sample depths and concentrations of each metal detected above the generic protection of groundwater screening levels. Then, Site-specific protection of groundwater screening levels for soil were determined by regression analyses of total metal concentrations versus Synthetic Precipitate Leaching Procedure (SPLP) leachate concentrations for each of the four metals of concern (cobalt, manganese, nickel, and cadmium).

Based upon the regression analyses, site-specific protection of groundwater screening levels were determined for cobalt (250 mg/kg) and manganese (2,570 mg/kg). The regression analyses for nickel and cadmium did not indicate good correlation due to a limited number of samples for SPLP analysis. However, because the empirical leaching data for these compounds were relatively consistent with the generic screening levels, the generic protection of groundwater EPA Regional Screening Levels (RSLs) for nickel (520 mg/kg) and cadmium (7.6 mg/kg) were used as the screening levels for Site soil data.

2013 Building 16 Soil Assessment and Remediation

As mentioned previously, a warehouse expansion construction project was planned for the area south of Building 16. This area was previously used for the exterior storage of super sacks that contained fly ash on a concrete apron. As part of the 2013 assessments, H&H collected soil samples to evaluate metal concentrations in soil prior to the construction of the proposed building. The area assessed included the area south of Building 16 and a stormwater channel located adjacent to the building.

During the 2013 assessment, a total of 16 surface and 15 subsurface soil samples were submitted for laboratory analysis from the Building 16 area (Table 1). To expedite the planned Building 16 warehouse construction project, interim soil removal activities were conducted at the Site in September 2013 to address elevated levels of cobalt (up to 288 mg/kg) which were detected above background and generic screening levels in surface and shallow subsurface soil samples

collected from the stormwater channel located adjacent to the TMA building and from the area south of the TMA building. The interim removal activities also included the removal, sampling, and disposal of the existing concrete apron along the southern side of the TMA building, and excavation of shallow stained soils beneath the western portion of the concrete apron. The cobalt-impacted soil in the stormwater channel and area south of the TMA building was likely related to rain water contact with the exterior storage of super sacks that contained fly ash on the concrete apron along the southern and western sides of the TMA building. The expanded warehouse building is used for interior storage of fly ash which precludes the potential for rain water contact with the super sacks.

H&H contracted with A&D Environmental Services, LLC (A&D) of Buford, Georgia to perform the soil removal activities between September 16 and 19, 2013. Approximately 923 tons of non-hazardous cobalt-impacted soil and concrete debris were shipped off-Site for proper disposal at the Advanced Cedar Hill Landfill in Ragland, Alabama.

Following excavation activities and in accordance with ADEM's request, H&H collected post-excavation confirmation soil samples from the base of the excavation area using a decontaminated stainless steel hand spade or stainless steel hand auger. Twenty-four post-excavation confirmation samples were collected from the base of the excavation between September 17 and 19, 2013. Based on the results of post-excavation soil sampling, cobalt was not detected above the generic industrial RSL of 350 mg/kg, the generic protection of groundwater RSL of 5.4 mg/kg (using a dilution attenuation factor of 20), or the Site-specific protection of groundwater screening level of 250 mg/kg in any of the post-excavation samples.

2013 Monitoring Well Assessment

As discussed in the *Property Assessment Report and Work Plan Addendum* dated July 15, 2014, groundwater monitoring wells were previously installed at the Site as part of an investigation of a 1976 cadmium release to a former wastewater lagoon, which was investigated and subsequently closed out in 1999. The locations of the existing monitoring wells are shown on Figure 2. Because the existing monitoring wells had not been inspected at the Site for several years, H&H conducted a visual inspection of the condition of the wells to determine their

suitability for potential future use as monitoring locations and to determine their suitability for collection of groundwater level measurements to evaluate shallow and deeper groundwater flow direction at the Site.

The results of our visual inspection of the monitoring wells indicated that several monitoring needed to be repaired or replaced and several previous monitoring wells could not be located. A discussion of additional monitoring wells installed at the Site and sampling of the wells in 2014 and 2015 is provided in Section 5.2.2 below.

5.0 2014 and 2015 Additional Assessment Activities

5.1 Assessment Objectives

Based upon the results of the 2013 assessment activities, H&H performed additional soil assessment and groundwater, surface water, and sediment assessment at the Site in 2014. The purpose of the 2014 additional assessment activities was to 1) further refine the extent of soil metal impacts detected above screening levels in stormwater channels at the Site in 2012 and 2013, 2) investigate surface water, sediment, and groundwater conditions associated with the identified soil metal impacts, and 3) obtain additional Site information to support a preliminary risk assessment.

A brief description of the 2014 and 2015 assessment activities is provided below in this section. The results of the 2014 and 2015 assessment activities are discussed together with the previous data (as applicable) in the soil, groundwater, sediment, and surface water data characterization summaries in Sections 6.0, 7.0, and 8.0.

5.2 Methodology

The 2014 and 2015 assessment activities were conducted in accordance with the *Property Assessment Report and Work Plan Addendum* dated July 15, 2014. The assessment activities and methods were developed to comply with the *Alabama Environmental Investigation and Remediation Guidance* document dated March 2002 (revised September 2005), the *Alabama Risk-Based Corrective Action (ARBCA) Guidance Manual* dated April 2008 (Revision 2), and the USEPA Region 4 Science and Ecosystem Support Division's (SESD) Quality System and Technical Procedures document (most recent version).

During the 2014 assessment activities, soil sampling was conducted to further evaluate the vertical and horizontal extent of the previously identified soil impacts. In addition, surface water and sediment sampling was conducted to evaluate these potential exposure pathways. As part of the 2014 assessment, H&H installed additional monitoring wells and sampled existing and newly

installed monitoring wells to evaluate groundwater flow and groundwater conditions associated with the identified soil metals impacts. In addition, stream gauges were installed in Shoal Creek to evaluate surface water/groundwater interactions, and aquifer testing was conducted on shallow and bedrock monitoring wells to evaluate aquifer hydraulic conductivity.

Because the results of the groundwater sampling conducted in December 2014 indicated that concentrations of manganese and cadmium were detected in groundwater above screening levels in the eastern portion of the Site, additional groundwater assessment activities were conducted in 2015. Soil sampling was also conducted in May 2015 to evaluate the extent of soil metal impacts near the wastewater treatment plant in the eastern portion of the Site where a small quantity release of untreated wastewater was released onto the ground surface in mid-March 2015.

A summary of the 2014 and 2015 assessment activities by media is provided below.

5.2.1 2014/2015 Soil Assessment

In November 2014, H&H collected 341 soil samples from 119 soil borings locations to further evaluate the extent of soil metal impacts in soil in stormwater channels at the Site (note that not all collected samples were analyzed as described below). To evaluate the extent of soil impacts related to the small quantity release of untreated wastewater near the wastewater treatment plant and to further evaluate soils in the eastern portion of the Site where cadmium is present in groundwater, H&H collected 115 soil samples from 51 additional soil boring locations in May 2015. Soil samples were collected and analyzed from surface and subsurface locations for horizontal and vertical delineation of soil impacts as described below. Please note that not all of the soil samples collected were analyzed by the laboratory in accordance with our phased approach for analyses as described below.

Surface Soil Sampling

Surface soil sample analyses were conducted in a phased approach. All of the samples identified on Table 1 were collected but the analysis of the samples was dependent upon whether the sample was from a primary or provisional boring. Samples from primary borings were shipped to the laboratory for immediate analysis. Surface soil samples collected from provisional borings were placed on hold at the laboratory pending the results of analysis of samples from the primary locations. If the concentrations of one or more metals at a primary sample location exceeded the direct contact or Site-specific protection of groundwater screening criteria (see Section 6.0 for a discussion of soil screening levels), surface soil samples collected at nearby provisional sample locations were analyzed. Depending upon the location and results of the previous sampling, the metals analyses included cobalt, manganese, nickel, and/or cadmium by EPA Method 6010. The metal analyses performed on each sample are indicated on Table 1.

Subsurface Soil Sampling

At each of the primary surface soil sample locations described above, subsurface soil samples were also collected at deeper depth intervals of 1-2 ft and 2-3 ft below ground surface (bgs), and the samples were placed on hold pending the result of the surface soil samples from that boring. If the concentrations of metals in the surface soil exceeded the screening levels, the next deeper soil sample (1-2 ft bgs) from that location was analyzed. If the results of analysis of the sample collected at 1-2 ft bgs exceeded one or more screening criteria, the next deeper sample (i.e., 2-3 ft bgs) was analyzed.

At provisional boring locations, subsurface soil samples were collected at a depth of 1-2 ft bgs. Subsurface soil samples collected at provisional sample locations were placed on hold pending the results of the correlating surface soil sample analyses. If surface soil sample locations contained metal concentrations that exceeded screening criteria, the correlating subsurface provisional sample was analyzed. Depending upon the location and results of previous sampling, the metal analyses included cobalt, manganese, nickel, and/or cadmium by EPA Method 6010. The metal analyses performed on each sample are indicated in Table 1.

Based upon the staged approach described above, a total of 117 surface samples and 60

subsurface samples were analyzed by the laboratory in November 2014 and May 2015 (Table 1). A summary of the soil samples collected, sample identifiers, number of samples submitted for laboratory analysis, and analyses performed on each sample is provide as Table 1.

5.2.2 2014/2015 Groundwater Assessment

To evaluate groundwater conditions, H&H conducted groundwater assessment activities at the Site in December 2014 and June 2015. A number of existing monitoring wells were located at the Site from prior assessment and remedial activities. The December 2014 groundwater assessment included the installation and sampling of four additional shallow monitoring wells (MW-5R, MW-7R, MW-8, and MW-9) and two additional deeper bedrock wells (MW-8D and MW-9D). The December 2014 groundwater assessment activities also included the abandonment of one existing monitoring well (MW-7) due to well integrity issues and the sampling of eight existing Site monitoring wells (including MW-2, MW-2D, MW-3D, MW-4, MW-5D, MW-6, MW-6D, and MW-7D). Because damage to the above ground protectors was noted during the 2013 assessment, the above ground protectors for existing monitoring wells MW-2 and MW-4 were replaced, and MW-6D, which is located in a high traffic area of Building 6 warehouse, was converted into a flush mount well in December 2014.

To further evaluate groundwater conditions, four additional shallow monitoring wells (MW-1, MW-3R, MW-10, and MW-11) and four additional deeper bedrock monitoring wells (MW-1D, MW-3DR, MW-10D, and MW-11D) were installed and sampled at the Site in June 2015. Because existing well MW-3 was determined to be in poor condition and MW-3D was determined to be screened across multiple aquifer zones during the December 2014 groundwater assessment, MW-3 and MW-3D were abandoned in June 2015. The well installation and abandonment activities are detailed below.

<u>Monitoring Well Installations</u>

To evaluate groundwater conditions associated with the identified soil impacts, additional shallow monitoring wells were installed to evaluate the shallow groundwater conditions and deeper bedrock wells were installed to evaluate deeper groundwater conditions. The locations of

the monitoring wells are shown on Figure 2. Monitoring well construction and groundwater elevation data are presented in Table 5, and boring logs and well diagrams are provided in Appendix C.

The rationale for the well locations installed in December 2014 is as follows:

- MW-5R – Shallow well to replace previous well MW-5 adjacent to bedrock well MW-5D which could not be located during the 2013 well investigation activities, but was subsequently found and abandoned during the CMB Building construction activities in June 2014.
- MW-7R – Shallow well to replace existing well MW-7 which was abandoned in December 2014 due to potential integrity issues.
- MW-8/MW-8D - Shallow and bedrock well cluster to evaluate groundwater in the northern portion of the Site in the vicinity of metal impacted soil.
- MW-9/MW-9D - Shallow and bedrock well cluster to evaluate groundwater downgradient of the northeastern portion of the Site.

The rationale for the well locations installed in June 2015 is as follows:

- MW-1/MW-1D – Shallow and bedrock well cluster to evaluate site-specific background metal concentrations in Site groundwater.
- MW-3R and MW-3DR – Shallow and bedrock well cluster to replace existing well MW-3 and MW-3D which were abandoned in June 2015 due to potential integrity and/or preferential pathway issues.
- MW-10/MW-10 – Shallow and bedrock well cluster to evaluate groundwater in the eastern portion of the Site downgradient of groundwater concentrations detected in samples collected from MW-5R/MW-5D.
- MW-11/MW-11D – Shallow and bedrock well cluster to evaluate groundwater in the southeastern portion of the Site downgradient of groundwater metal concentrations detected in a sample collected from MW-4.

The shallow monitoring wells (MW-1, MW-3R, MW-5R, MW-7R, MW-8, MW-9, MW-10, and MW-11) were installed utilizing a track mounted direct push technology (DPT) rig capable of hollow stem auger and air drilling capabilities. The shallow monitor wells were constructed of 2-inch diameter PVC casing and screen. The shallow wells were installed to total depths ranging between 13 to 40.5 ft bgs using 5 to 15-foot sections of pre-packed well screens. The pre-packed well screens were used to minimize well development and sample turbidity. Because sufficient groundwater was not encountered in the boreholes until penetration of the underlying sandstone bedrock unit, the shallow monitoring wells were installed in water-bearing units in shallow bedrock (see following section). The monitor wells were constructed in accordance with the Alabama well construction regulations and were completed at the ground surface with steel aboveground protectors.

Bedrock monitor wells MW-1D, MW-3DR, MW-8D, MW-9D, MW-10D, and MW-11D were constructed as EPA Type III wells. At each bedrock well, surface casing was installed into the top of rock to minimize the potential for interconnecting shallow groundwater with the bedrock aquifer. The wells were installed and screened below the surface casing. The bedrock wells were drilled using HSA and air rotary drilling techniques to advance the borehole to depths ranging between 31 to 40 ft bgs and 6-inch diameter PVC surface casings were installed in the borehole and grouted in place. After allowing the surface casing grout to cure, the surface casing was re-entered and the well was drilled to a total depth using air hammer drilling techniques.

The bedrock wells were constructed of 2-inch diameter PVC casing and screen. A bottom section of 2-inch diameter PVC well screen (ranging in length between 4 to 12 ft) was used each at each well location. The monitor wells were constructed in accordance with the Alabama well construction regulations and were completed at the ground surface with steel aboveground protectors. Well construction details are provided in Table 5.

Following installation, the new wells were developed in accordance with standard protocol and EPA SESD guidance.

Monitoring Well Sampling and Analysis

Groundwater samples were collected from the newly installed wells and the existing monitoring wells (except MW-3 which was not sampled due to well integrity issues and MW-7 which was abandoned) between December 8 and 11, 2014. Following installation of additional monitoring wells, H&H collected groundwater samples from the newly installed wells on June 21, 2015. The groundwater samples were analyzed for the metals cobalt, manganese, nickel, and cadmium by EPA Method 6010.

Monitoring well sampling was conducted in accordance with standard procedures as presented in ADEM Guidance and EPA Region 4 SESD Guidance. Monitoring well development, purging, and sampling were conducted with dedicated Teflon bailers and/or a peristaltic pump with new polyethylene tubing. Low-flow sampling techniques using either a peristaltic pump or bladder pump were used to minimize sample turbidity and the potential for suspended sediment to impact the metal results. As part of the sampling process, field measurements were obtained for dissolved oxygen, pH, specific conductance, temperature, and turbidity with properly calibrated field instruments. Sampling was not conducted on the monitor wells until the turbidity was less than 10 Nephelometric Turbidity Units (NTU) to minimize the potential for sample turbidity to affect the groundwater analytical results. Copies of the groundwater sampling forms are included in Appendix E.

5.2.3 2014/2015 Surface Water and Sediment Assessment

Surface water and sediment samples were collected in Shoal Creek on December 10, 2014 to evaluate the potential for impact to surface water and sediment in Shoal Creek. H&H collected one upgradient surface water and sediment sample (labeled SW-1/SED-1), one downgradient surface water and sediment sample (labeled SW-3/SED-3), and one sample surface water and sediment sample just below the confluence of the main intermittent drainage (labeled SW-2/SED-2). The locations of the surface water and sediment samples are shown on Figure 19. Surface water and sediment samples were analyzed for cobalt, manganese, nickel, and cadmium by EPA Method 6010.

Surface water and sediment samples were collected from downgradient to upgradient locations during sampling. Samples were collected during apparent base flow conditions. Surface water samples were collected by placing the sample bottles directly into the flowing stream. Sediment samples were collected with a stainless steel trowel. Sediment samples were homogenized in a decontaminated glass bowl and then sequentially placed into laboratory-supplied containers until full. Sediment samples were collected from the surface to 0.2 ft.

5.3 Investigation Derived Waste

Investigation derived waste (IDW) generated during the 2014 and 2015 assessments was containerized in labeled 55-gallon steel drums and staged on-Site on a concrete paved area. IDW was generated during the assessments in the form of soil and rock cuttings, development water, decontamination water, and plastic and personal protective equipment (PPE) debris.

During the 2014 assessment, 90 drums of IDW were generated during the assessment activities (77 drums of water, 9 drums of soil/rock cuttings, and 4 drums of plastic debris). For waste characterization purposes, H&H collected one composite water sample (labeled IDW Water-12102014) and one composite soil sample (labeled IDW Soil-12102014) from the 55-gallon drums. The composite IDW Water and IDW Soil samples were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) RCRA metals and total cobalt, manganese, and nickel by EPA Method 6010. Results of the TCLP metals and total metals analyses for the water drums indicate that a low level concentration of manganese (0.242 mg/l) was present in the water. Results of the TCLP metals and total metal analyses for the soil drums indicated low level concentrations of lead (0.0353 mg/l) in the TCLP leachate. In addition, cobalt (6.65 mg/kg), nickel (4.86 mg/kg), and manganese (165 mg/kg) were present in the composite soil sample. The results of the sample analyses indicated that the IDW was non-hazardous.

During the 2015 assessment, 67 drums of IDW were generated during the assessment activities (43 drums of water, 19 drums of soil/rock cuttings, and 5 drums of plastic debris). For waste characterization purposes, H&H collected one composite water sample (labeled IDW Water 06222015) and two composite soil samples (labeled IDW Soil 20150520 and IDW Soil

06222015) from the 55-gallon drums. The composite IDW Water and IDW Soil samples collected on June 22, 2015 were analyzed for TCLP metals and total cadmium, cobalt, manganese, and nickel by EPA Method 6010. The composite IDW Soil sample collected on May 20, 2015 was analyzed for TCLP metals and total cadmium, cobalt, manganese, and nickel by EPA Method 6010. Results of the TCLP metals and total metals analyses for the water drums indicated that low level concentrations of cadmium (0.00170 mg/l), cobalt (0.0602 mg/l), manganese (3.21 mg/l), and nickel (0.166 mg/l) were present in the water. Results of the TCLP metals and total metal analyses for the soil drums indicated that low level concentrations of cadmium (up to 0.325 mg/l) were detected in the TCLP leachate. In addition, cobalt (up to 180 mg/kg), manganese (up to 244 mg/kg), and nickel (up to 210 mg/kg) were present in the soil. The laboratory analytical data and chain-of-custody record for the IDW samples are provided in Appendix B.

Based upon the results of the composite water samples, IDW water was placed in the on-Site wastewater treatment plant. Based upon the composite soil samples analytical results and the results of analysis of the Site soil samples, the IDW soil was removed from the Site on January 6 and 7, 2016 and disposed at the Advanced Cedar Hill Landfill in Ragland, Alabama as non-hazardous waste.

5.4 Laboratory Analytical and Quality Assurance/Quality Control (QA/QC) Samples

TestAmerica, Inc. of Nashville, Tennessee conducted the laboratory analyses during the additional assessment activities. The samples were shipped via courier to the laboratories under chain of custody documentation. Samples were received in good condition, and met holding times and preservation requirements. The laboratory data are provided in data package formats consistent with Level II QA/QC documentation in accordance with the approved Property Assessment Plan. The laboratory data sheets are provided in Appendix B.

In accordance with the approved *Property Assessment Report and Work Plan Addendum*, the following field quality assurance samples were collected during the field activities:

- One equipment rinseate blank (rinse blank) was collected each week for each sampling or sample mixing device.

- A minimum of one duplicate soil or groundwater sample was collected per 20 samples submitted for laboratory analysis. At least one duplicate soil sample was collected from each of the primary depth intervals.

- Matrix spike/matrix spike duplicate (MS/MSD) soil and groundwater samples were submitted as a further QA/QC check. The matrix spike samples were collected from areas of suspected low compound concentrations. Typically, one MS/MSD sample was submitted for every 20 (or fewer) samples.

The equipment rinse blanks were collected by pouring laboratory provided deionized water over sampling equipment after decontamination but before use of the equipment. Duplicate and matrix spike soil samples were homogenized prior to placement into sample containers. Homogenization was performed by mixing the soil sample in a decontaminated glass bowl (Pyrex) and then sequentially placing aliquots of the mixed sample into each set of containers until full.

Laboratory QA/QC was conducted in accordance with analytical method prescribed protocols.

<u>Rinseate Blank Sampling and Results</u>

Four rinseate blanks (labeled Rinse Blank -12022014, Rinse Blank – 12092014, Sed-Rinse Blank, and GW-Train Rinse Blank) were collected for laboratory analyses during the 2014 assessment activities. The rinseate samples were as follows:

- Rinse Blank – 12022014 was collected through a decontaminated stainless steel hand auger bucket.
- Rinse Blank - 12092014 was collected through a decontaminated stainless steel hand auger bucket.

- Sed-Rinse Blank was collected through a decontaminated glass (Pyrex bowl).
- GW Train-Rinse Blank was collected through new silicone and polyethylene sampling tubing.

In addition, three rinseate blanks (labeled Rinse Blank, Rinse Tubing 06222015, and Rinse Bladder 06222015) were collected for laboratory analyses during the 2015 assessment activities. The rinseate samples were as follows:

- Rinse Blank (05202015) was collected through a decontaminated glass (Pyrex bowl).
- Rinse Tubing 06222015 was collected through new silicone and polyethylene sampling tubing.
- Rinse Bladder 06222015 was collected through a new dedicated polyethylene sampling bladder.

The rinseate blanks collected in 2014 and 2015 were analyzed for cadmium, cobalt, manganese, and nickel using EPA Method 6010. No analyzed metals were detected above laboratory method detection limits in any of the collected rinseate samples. The results of the rinseate blanks are provided in Appendix B.

Duplicate Samples

A minimum of one duplicate soil and one groundwater sample were collected per 20 samples. The duplicate data are identified in the data summary tables and the compound distribution figures. In general, blind duplicate sample results were acceptable and indicated good laboratory repeatability with the exception of several metal concentrations reported in three blind duplicate soil samples (DUP-14, DUP-19, and DUP-24) collected from SS-97 (0-1 ft), SS-124 (0-1 ft), and SS-118A (0-1 ft), respectively. However, both the duplicate and associated soil sample metal concentrations are considered in our evaluation of the soil data, including the exposure assessment.

Laboratory QA/QC Data

Narratives from the laboratory for each sample delivery group are contained with the laboratory

analytical data sheets in Appendix B. A discussion of laboratory QA/QC data, issues, and resolutions are contained in these summaries as appropriate. The laboratory has qualified the data accordingly based upon the method and laboratory protocol, and these data qualifications are contained in Appendix B and the data summary tables.

5.5 Field Notes

The activities conducted as part of the assessments were documented by field personnel in logbooks and were supplemented by photographs as appropriate. Information recorded in the logbooks included the following:

- Project name and Site location;
- Name of person keeping the log and field personnel at the Site;
- Time of arrival and departure from the Site;
- Date and time of all logbook entries;
- Daily weather conditions and observations;
- Site conditions;
- Field instrumentation calibration information;
- Location of sampling points;
- Sample collection information, including
    - Date and time of collection;
    - Sample matrix and physical description;
    - Sample identification number;
    - Method of collection;
    - Number and volume of containers collected;
    - Analyses for which sample is submitted;
    - Identity of split or duplicate samples; and
- Additional relevant field observations.

5.6 Boring Logs

During soil boring and monitoring well borehole advancement, soil lithology was logged by H&H field personnel and each soil sample was classified in general accordance with the Unified Soil Classification System (USCS) and described in accordance with *ASTM D2488: Standard Practice for Description and Identification of Soils.* Boring logs for the soil borings and monitoring wells are provided in Appendix C.

5.7 Sample Locations

All sample locations were surveyed by a registered land surveyor (Morell Engineering, Inc.). The surveyed sample locations are provided in the surveyor's maps in Appendix A. In addition, sample locations based on the surveyed locations are provided in the report figures.

5.8 Screening Levels

A summary of the soil, groundwater, surface water, and sediment characterization data is presented in the following sections. To facilitate data discussion, the results are compared to screening levels. The sources of the screening levels for each media are discussed in each section. The screening levels are intended to provide an initial screening of the data against generic and conservative levels and to provide an initial indication as to whether a metal is present in a concentration of potential concern that may warrant further assessment or evaluation. The screening levels are not intended to be final cleanup levels or an assessment of potential risks posed by the impacts. An exposure assessment and proposed remediation plan with remedial goals are presented in Sections 10.0 and 11.0.

6.0 Soil Characterization

During the 2013 to 2015 assessment activities, H&H advanced a total of 269 borings and submitted 429 samples for laboratory analysis. Please note that this does not include previous samples collected in 2012. The results of the analyses of soil samples are summarized in Table 2. In Table 2, the data are compared to screening levels based upon 1) background concentrations, 2) a health-based screening level, and 3) and leaching to groundwater. A discussion of the screening levels is provided below.

6.1 Screening Levels

Background

Background metal sampling and analyses were conducted as part of the 2013 assessment activities (Figure 4 and Table 3). Based upon the background sampling and additional analyses of soil as part of the 2013 assessment, several metals (including antimony, arsenic, beryllium, copper, lead, mercury, silver, thallium, and zinc) were eliminated as compounds of concern at the Site. Chromium was also initially identified as a potential compound of concern but, based on the chromium speciation analyses of soil during the 2013 assessment, chromium was eliminated as a compound of concern.

Based upon the background data, the compounds of concern at the Site are cobalt, manganese, nickel, and cadmium. Concentrations of these compounds which were detected above background were then screened against health-based and protection of groundwater screening levels. These screening levels are discussed below.

Health-Based Screening Levels

ADEM Guidance indicates that soil concentrations should be remediated to unrestricted use levels unless an ADEM-approved land restriction is placed on the property as part of the Cleanup Plan. Because the Site is industrial in use and the proposed remediation plan in Section 11.0 includes an industrial land use restriction, the soil sample analytical data were screened against

the generic EPA Regional Screening Levels (RSLs) for industrial soil direct contact published in EPA's RSL table dated November 2015. The RSLs for each compound are presented in Table 2.

Protection of Groundwater Screening Levels

The soil sample analyses were initially screened against the generic maximum contaminant level (MCL)-based protection of groundwater Soil Screening Levels (SSLs) from EPA's RSL table dated November 2015 using a dilution attenuation factor (DAF) of 20. In the case where a MCL-based protection of groundwater SSL was not specified for a particular compound, the analytical results for the soil samples were screened against the corresponding generic risk-based protection of groundwater SSL using a dilution-attenuation factor (DAF) of 20. The use of a DAF of 20 was approved by ADEM.

Following this initial screening, H&H developed Site-specific protection of groundwater screening levels. The Site-specific protection of groundwater screening levels for soil were determined during the 2013 assessment by regression analyses of total metal concentrations versus Synthetic Precipitate Leaching Procedure (SPLP) leachate concentrations for each of the four metals of concern (cobalt, manganese, nickel, and cadmium). Based upon the regression analyses, site-specific protection of groundwater screening levels were determined for cobalt (250 mg/kg) and manganese (2,570 mg/kg). The regression analyses for nickel and cadmium did not indicate good correlation due to a limited number of samples for SPLP analysis. However, because the empirical leaching data for these compounds were relatively consistent with the generic screening levels, the generic protection of groundwater SSLs for nickel (520 mg/kg) and cadmium (7.6 mg/kg) were used as the screening levels for Site soil data. Details concerning the derivation of the Site-specific protection of groundwater screening levels are provided in the *Property Assessment Report and Work Plan Addendum* dated July 15, 2014. The Site-specific protection of groundwater screening levels for cobalt and manganese and the generic protection of groundwater SSLs for other metals are presented in Table 2.

6.2 Soil Boring Locations

The soil boring locations are depicted on Figure 4. For ease of reference, soil boring locations and concentrations of cobalt, manganese, nickel, and cadmium are also shown on Figure sets 5 through 8, respectively. Because the sampling encompassed a large area, the maps are separated into three areas showing the western, central, and eastern portions of the facility. As such, each of these figures consists of three maps sheets labeled A, B, and C depicting the west, central, and eastern portions of the Site. Because the depicted areas are different in size (area), the figures were prepared at three different scales for illustration and readability purposes. In addition, the overall areas of soil impact above screening levels are depicted in Figure 9.

As discussed previously, the shallow soil samples collected in 2012 by others were collected from depths of 0-2 inches. As part of the 2013 assessment, H&H re-sampled many of these locations with higher metals concentrations at the 0-1 ft depth interval to evaluate the previous detections and for consistency with the ADEM Guidance. Because these sample locations were re-collected and other surface samples during our assessment were collected at the 0-1 ft interval, we have not included the 0-2 inch sample data in our discussion or evaluation below, although the data are presented in Table 2 for sake of completeness.

6.3 Soil Impacts

The estimated areas of cobalt, manganese, nickel, and cadmium above Site-specific protection of groundwater screening levels are depicted on Figure 9. Because the protection of groundwater screening level is less than the industrial RSL for the compounds of concern, the estimated extents of impacts in Figure 9 are based upon the Site-specific protection of groundwater screening levels. A discussion of the metal data by compound of concern is provided below.

<u>Cobalt</u>

As indicated on Figures 4 through 9 and Table 2, cobalt (as shown in blue shading on the figures) was detected above the Site-specific protection of groundwater screening level of 250 mg/kg and the generic industrial RSL of 350 mg/kg in soil samples collected from multiple areas

of the Site including soil samples collected near the fly ash area stormwater discharge in the central portion of the Site (near SS-75), stormwater discharge points (SS-1A, SS-21, SS-22, SS-25, SS-26, and SS-28), and in soil samples collected in the immediate vicinity of the wastewater treatment plant (SS-43, SS-44A, and SS-45) in the eastern portion of the Site.

The highest surface soil (0-1 ft) cobalt concentrations was detected in boring SS-75 (6,650 mg/kg) at the fly ash area stormwater discharge area. Cobalt is the most widespread compound of concern in soil. Based upon the results of the additional soil sampling analyses, depth to bedrock, and/or depth to groundwater, the horizontal and vertical extents of cobalt soil impacts in stormwater channels at the Site are adequately defined.

Manganese

As indicated on Figures 4 through 9 and Table 2, manganese soil impacts (as shown in orange shading on the figures) above the Site-specific protection of groundwater screening level of 2,570 mg/kg are limited to soil samples collected near the fly ash area stormwater discharge in the central portion of the Site (near SS-75) and at sample locations closest to stormwater discharge point SS-116 located east of Building 6 and the Building 6 warehouse. The highest surface soil manganese concentration of 6,990 mg/kg was detected in boring SS-75 in the fly ash area stormwater discharge. No manganese concentrations exceeded the industrial RSL of 26,000 mg/kg. Based upon the results of the additional soil sampling analyses, depth to bedrock, and/or depth to groundwater, the horizontal and vertical extents of manganese soil impacts in stormwater channels at the Site are adequately defined.

Nickel

As indicated on Figures 4 through 9 and Table 2, nickel soil impacts (as shown in purple shading in the figures) above the protection of groundwater screening level of 520 mg/kg are limited to soil samples collected near the fly ash area stormwater discharge in the central portion of the Site (near SS-75), at one sample location downgradient of the stormwater discharge northeast of the Building 6 warehouse at sample location SS-27C, and at samples closest to stormwater discharge points SS-43, SS-44A, and SS-45 in the northeast portion of the Site. The highest surface soil (0-1 ft) nickel concentration of 2,920 mg/kg was detected in sample SS-75 in the fly ash area

stormwater discharge. No nickel concentrations exceeded the industrial RSL of 22,000 mg/kg. Based upon the results of the additional soil sampling analyses, depth to bedrock, and/or depth to groundwater, the horizontal and vertical extents of nickel soil impacts in stormwater channels at the Site are adequately defined.

Cadmium

As indicated on Figures 4 through 9 and Table 2, cadmium soil impacts (as shown in green shading on the figures) above the protection of groundwater screening level of 7.6 mg/kg are limited to soil samples collected near the fly ash area stormwater discharge in the central portion of the Site (near SS-75), at samples closest to stormwater discharge point SS-01A located north of the maintenance shed in the central portion of the Site, and at multiple samples in the vicinity of the March 2015 untreated wastewater spill location near the wastewater treatment plant in the northeast portion of the Site. The highest surface soil (0-1 ft) cadmium concentration of 97 mg/kg was detected in boring SS-118C near the wastewater treatment plant. No cadmium concentrations exceeded the industrial RSL of 980 mg/kg. Based upon the results of the additional soil sampling analyses, depth to bedrock, and/or depth to groundwater, the horizontal and vertical extents of cadmium soil impacts in soil in stormwater channels at the Site are adequately defined.

7.0 Groundwater Characterization

7.1 Site Geology

Site geology was determined based upon information obtained during monitoring well and soil boring installation. The boring logs for the monitoring wells and soil borings are provided in Appendix C. A summary of the monitoring well construction and groundwater elevation data is provided in Table 5. H&H prepared cross-sections A-A', B-B', C-C', and D-D' to depict geologic and hydrogeologic conditions at the Site. The location of the monitoring wells and cross-section locations are provided on Figure 9, and the cross-sections are shown on Figures 10, 11, 12, and 13.

The Site geology consists of unconsolidated materials overlying bedrock. The unconsolidated materials are approximately 10 to 20 ft thick. The upper unconsolidated unit consists of fine to medium grained sand with varying percentages of silt. The middle unconsolidated zone consists of sandy silt with varying percentages of clay at depths, and the lower unconsolidated zone is sandy clay transitioning to a semi-consolidated weathered clayey sandstone. Sandstone (comprised of arenite with interbedded lenses of greywacke and greywacke with interbedded layers of shale) and shale bedrock are located below the unconsolidated units.

During the December 2014 and June 2015 monitoring well installation activities, sufficient groundwater was not encountered in the boreholes until penetration of the underlying sandstone and shale bedrock units. Based upon the rise in water levels after installation of the wells, the sandstone and shale units are artesian. Shallow monitoring wells were installed in water-bearing units in shallow bedrock, and the deeper monitoring wells were installed in water-bearing units encountered in deeper bedrock.

Based upon our evaluation of site geology and hydrogeology, we identified six hydrogeological zones below the Site which are described below. The hydrogeologic zones are indicated on the cross-sections in Figure 10, 11, 12, and 13.

- Zone 1 – Zone 1 consists of unconsolidated materials that are fine to medium grained sands with varying percentages of silt grading to sandy silts with varying percentages of clay at depths. Beneath the fine to medium grained sands and sandy silts in some areas of the Site, Zone 1 consists of a sandy clay layer which transitions to a semi-lithified partially weathered clayey sandstone. Groundwater was not encountered at multiple locations across the Site in Zone 1.

- Zone 2 – Zone 2 consists of thinly laminated white to light grey sandstone bedrock or arenite. Limited groundwater was encountered in secondary fractures within this zone. In some areas, Zone 2 transitions with depth to interlayered white sandstone and gray greywacke.

- Zone 3 – Zone 3 consists of thinly laminated grey to dark grey sandstone bedrock comprised of highly fractured, weathered, greywacke with interbedded lenses of shale. Abundant groundwater was encountered in primary porosity and secondary fractures within this zone.

- Zone 4 - Zone 4 consists of thinly laminated grey to dark grey sandstone bedrock consisting of arenite with interbedded lenses of greywacke. Limited groundwater was encountered within secondary fractures within this sandstone zone.

- Zone 5 – Zone 5 consists of dark grey to black shale bedrock. Abundant groundwater was encountered in primary porosity and secondary fractures within this transmissive shale bedrock zone.

- Zone 6 – Zone 6 consists of grey to dark grey sandstone bedrock comprised of greywacke and interbedded lenses of shale. Groundwater was encountered in secondary fractures within this sandstone (greywacke) bedrock zone.

During the 2014 and 2015 monitoring well installation activities, monitoring wells MW-5R and MW-10 were primarily screened in Zone 2; wells MW-1, MW-3R, MW-7R, MW-8, MW-9, and

MW-11 were screened in Zones 2 and 3; well MW-10D was screened in Zone 4; wells MW-1D, MW-8D and MW-9D were screened in Zones 4 and 5; MW-11D was screened in Zone 5; and well MW-3DR was screened in Zones 5 and 6. The primary hydrogeologic zones for each of the wells at the site are indicated in Table 5. Please note that because the construction details and boring logs for some of the previously existing wells are not known, the primary hydrogeologic zones screened for some wells are not known.

7.2 Site Hydrogeology

7.2.1 Groundwater Elevation Data

As part of the June 2015 groundwater assessment, a comprehensive round of water level measurements was obtained from the Site wells to prepare potentiometric surface maps. On June 23, 2015, H&H measured water levels in 21 monitoring wells as part of the groundwater monitoring event. Water level data were collected with an electronic depth to water probe. To evaluate surface water/groundwater interactions and confirm that Shoal Creek is a hydraulic barrier, a stream gauge was also installed in Shoal Creek in the eastern portion of the Site near the MW-11/11D well cluster. The location of this gauge, labeled "Upstream", is indicated in Figure 16. The stream gauge elevation was also surveyed by Morell Engineering, Inc. The monitor well and stream gauge water level readings are summarized in Table 5.

The water level data evaluation was broken down into two aquifer zones: shallow bedrock comprised of wells screened primarily in Zones 2 and 3, and deeper bedrock comprised of wells screened primarily in Zones 4 and 5. Based on the June 2015 dataset, potentiometric maps were developed for the shallow and deeper aquifer zones (Figures 15 and 16). Please note that well MW-3DR was not included in the water level evaluation for the deeper bedrock zone because it is screened primarily in Zone 6 and is screened within an underlying sandstone layer below a thicker sequence of shale.

As shown on Figure 15, the groundwater flow direction in the shallow bedrock zone is to the northeast toward Shoal Creek. There is also a component of shallow bedrock flow to the

northwest in the northwest portion of the Site. In the deeper bedrock zone, the groundwater flow direction is to the east-southeast in the northern portion of the Site and to the east toward Shoal Creek in the central portion of the Site (Figure 16). The hydraulic gradients are approximately 0.03 ft/ft in the shallow bedrock zone and 0.02 ft/ft in the deeper bedrock zone.

H&H evaluated vertical hydraulic gradients for the June 23, 2015 water level dataset using eleven well pairs (Table 6). Based on the June 23, 2015 data, the vertical hydraulic gradient between the shallow bedrock zone and the deeper bedrock zone wells in six well pairs (MW-1/MW-1D, MW-2/MW-2D, MW-5R/MW-5D, MW-6/MW-6D, MW-7R/MW-7D, and MW-8/MW-8D) was downward. For example, the groundwater elevation for well pair MW-5R (shallow) and MW-5D (deeper) is approximately 15 ft higher in the shallow well. In three other well pairs (MW-3R/MW-3DR, MW-9/MW-9D, and MW-11/MW-11D, the vertical gradient between the shallow bedrock zone and the deeper bedrock aquifer zone wells is upward. In one well pair (MW-10/MW-10D), the vertical gradient between the shallow bedrock zone well and the deeper bedrock zone well is neutral. The four well pairs with upward to neutral vertical gradients are located near the creek in the eastern portion of the Site indicating that shallow and deeper groundwater likely discharge to the creek.

A comparison of the water level data in wells MW-11/MW-11D and the adjacent steam gauge indicates that the groundwater levels in each well were higher than the stream elevation in the June 2015 gauging event which provides further indication that groundwater discharges to Shoal Creek.

7.2.2 Aquifer Testing

To characterize the hydraulic properties of the aquifers beneath the Site, H&H performed slug tests on several shallow and deep bedrock aquifer zone wells in December 2014 and June 2015. The shallow aquifer wells tested were:

- MW-2 screened in Zone 1 and 2,

- MW-1, MW-5R, MW-7R, MW-8, MW-10, and MW-11 screened primarily in Zones 2 and 3.

The deep aquifer wells tested were:

- MW-1D, MW-7D, MW-8D, MW-10D, and MW-11D screened primarily in Zones 4 and 5.
- MW-3DR screened primarily in Zones 5 and 6.

The slug test consisted of removing a slug of water from each well using an 84-inch long disposable bailer, and the water level recovery in the wells was monitored over time using a pressure transducer and data logger. The slug test data are provided in Appendix D. The slug tests were analyzed with AQTESOLV utilizing the method of Bouwer and Rice.

The results of the slug test evaluation indicate that the hydraulic conductivity for the aquifer zones are as follows:

- 0.06 ft/day in the well screened in Zone 1 and 2 (one well tested)
- Geometric mean of 0.5 ft/day in shallow bedrock aquifer Zones 2 and 3 (six wells tested)
- Geometric mean of 3 ft/day in the deeper bedrock aquifer Zones 4 and 5 (five wells tested)
- 80 ft/day in the deeper bedrock aquifer Zones 5 and 6 (one well tested)

The slug test results are summarized on Table 7. As indicated in Table 7, the data for all of the wells in an aquifer zone were fairly consistent with one another except for the higher hydraulic conductivity value in MW-10D (Zone 4) which was two orders of magnitude higher than other wells in the zone. MW-10D is located near Shoal Creek and the higher hydraulic conductivity may be the result of higher fracturing and weathering in the rock in this zone near the creek.

Utilizing the mean hydraulic gradient calculated above (0.03 ft/ft), the geometric mean hydraulic conductivity for the shallow aquifer zone (0.5 ft/day), and an assumed effective porosity of 0.2,

the average groundwater flow velocity for the shallow bedrock is estimated to be approximately 0.08 ft/day (approximately 30 ft/yr). Based on the deeper bedrock aquifer zone hydraulic gradient of 0.02 ft/ft, geometric mean hydraulic conductivity of 3 ft/day, and an assumed effective porosity of 0.25 (a higher effective porosity was assumed for the bedrock zone based on field observation), the calculated groundwater velocity for deeper bedrock is estimated to be approximately 0.3 ft/day (approximately 100 ft/year).

7.2.3 Groundwater Flow Summary

Based upon our observations in the field and geologic and hydrogeologic data discussed above, it appears that groundwater flows downward in Zone 2 to Zone 3. Groundwater in Zone 3 then migrates laterally and then upward and discharges to Shoal Creek. Further groundwater flow downward from Zone 3 into Zone 4 is limited by the lower transmissivity Zone 4 and therefore there is little hydraulic communication between Zones 3 and 5. Zone 5 is also a primary zone of groundwater transport but there is limited communication between shallow aquifer zones below the Site and the lower aquifer zones. Groundwater flow in the deeper aquifer zones also appears to be lateral and then upward to Shoal Creek which is facilitated by higher fracturing and weathering (and thus hydraulic conductivity) in bedrock below the creek.

7.3 Groundwater Data Screening Levels

Screening levels used in the groundwater sample data evaluation consisted of an initial comparison of groundwater metal results to background levels at the MW-1/MW-1D well cluster and then to established Maximum Contaminant Levels (MCLs). However, only cadmium has an established MCL. Therefore, the groundwater metal results were evaluated against a calculated groundwater screening value assuming groundwater usage at the Site under a very conservative non-residential exposure scenario. The assumptions used in the calculation of the non-residential groundwater screening levels were presented in H&H's *Property Assessment Report and Work Plan Addendum* dated July 15, 2014. The results of the calculation indicated non-residential groundwater screening levels for cobalt, manganese, nickel, and cadmium of 0.153 mg/l, 1.08 mg/l, 0.996 mg/l and 0.023 mg/l, respectively.

7.4 Groundwater Analytical Results

7.4.1 Metals

A summary of the 2014 and 2015 groundwater monitoring data is provided in Table 8, and the laboratory analytical data sheets are provided in Appendix B.

Figure 17 depicts metal concentrations in shallow groundwater for the December 2014 and June 2015 sampling events. As indicated on Figure 17, cadmium was detected in shallow monitoring wells MW-4 (0.109 mg/l) and MW-5R (0.643 mg/l) above background levels, the MCL of 0.005 mg/l, and the calculated non-residential value of 0.023 mg/l. These wells are located in the eastern portion of the Site.

Potentially elevated concentrations of manganese were detected in shallow wells MW-3R (1.63 mg/l), MW-5R (7.11 mg/l), and MW-7R (1.16 mg/l) above the non-residential screening level of 1.08 mg/l. Of these detections, only the manganese detection at MW-5R appears to be significantly elevated above background levels. In addition, elevated concentrations of cobalt (0.872 mg/l) and nickel (1.16 mg/l) were detected in shallow well MW-5R above background concentrations and the non-residential screening levels of 0.153 mg/l and 0.996 mg/l, respectively.

Figure 18 depicts the metal concentrations detected in deep bedrock groundwater during the December 2014 and June 2015 sampling events. Potentially elevated concentrations of manganese were detected in deep wells MW-5D (2.11 mg/l) and MW-6D (1.25 mg/l). However, these concentrations are only slightly above the non-residential screening level of 1.08 mg/l and appear to be consistent with background levels. Cobalt, nickel, and cadmium were not detected above background concentrations, the MCL for cadmium, or their respective non-residential screening levels in the deeper bedrock wells.

Based upon 2014 and 2015 groundwater sampling data, there is a minor area of shallow groundwater impact above screening levels in the eastern portion of the Site. The horizontal and

vertical extent of elevated cadmium, manganese, cobalt, and nickel concentrations in the eastern portion of the Site is adequately defined by the existing monitoring well network.

7.4.2 Geochemical Parameters

During groundwater sampling, field measurements were collected from all sampled monitor wells during the December 2014 and June 2015 sampling events. The collected field geochemical parameters included DO, ORP, pH, temperature, and turbidity. The monitoring well geochemical parameters are summarized on Table 9. As indicated on Table 9, sampling was not conducted on the monitoring wells until the turbidity was less than 10 NTU to minimize the potential for sample turbidity to affect the groundwater analytical results.

Table 9 also indicates that the lowest pH of the samples collected from the monitoring wells (4.73) was in well MW-5R. Because low pH conditions can impact metals mobilization, it is possible that the low pH in well MW-5R is at least partly responsible for the elevated levels of metals in this well.

8.0 Surface Water and Sediment Characterization

The surface water sample analytical data is summarized in Table 10 and the sediment sample analytical data is summarized in Table 11. The laboratory analytical data are provided in Appendix B.

8.1 Screening Levels

Surface water screening levels consisted of the following:

- Background concentrations as determined from upgradient surface water sample SW-1;
- ADEM Water Quality Criteria for freshwater as published in Table 1 of the ADEM Admin. Code 335-6-10 using the "Aquatic Life Criteria" for acute and chronic toxicity; and
- USEPA Region 4 Ecological Screening Values for freshwater published in Table 1a of the USEPA Supplemental Guidance to Ecological Risk Assessment Guidance for Superfund (ERAGS): Region 4, Ecological Risk Assessment (2015).

Screening levels used in the sediment sample data evaluation consisted of the following:

- Background concentrations as determined from the upgradient sediment sample (SED-1);
- USEPA Region 4 Ecological Screening Values for sediment published in Table 2a of the USEPA Supplemental Guidance to ERAGS: Region 4, Ecological Risk Assessment (2015).

8.2 Surface Water Sampling Results

As indicated on Figure 19 and Table 10, the detected concentration of manganese (105 µg/l) at SW-3 is consistent with the concentrations of manganese detected in upgradient samples SW-1 (89.7 µg/l) and SW-2 (89.8 µg/l). Cobalt, nickel, and cadmium were not detected in the surface water samples above the laboratory method detection limits.

8.3 Sediment Sampling Results

As indicated on Figure 19 and Table 11, low concentrations of cobalt, manganese, nickel, and cadmium were detected in the sediment samples. The detections of manganese and nickel in downstream sample SED-3 were slightly elevated above the background level in SED-1; however, the sample located immediately downgradient of the facility stormwater discharges (SED-2) did not contain elevated concentrations of metals indicating that the detections in SED-3 are likely associated with natural background metal variability. None of the detected concentrations exceed the applicable US EPA Region 4 Sediment Screening Values.

Based on the 2014 sampling, it does not appear that surface water and sediment in Shoal Creek have been impacted by metals detected in soils in Site drainage channels or by metals in groundwater in the eastern portion of the Site.

9.0 Conceptual Site Model Development

The conceptual Site model (CSM) describes the relationship of likely sources, potential release mechanisms, potential exposure routes, and potential receptors at the Site. Sections 9.1 and 9.2 provide the basis for the CSM, and the CSM is presented in Section 9.3.

9.1 Potential Sources

The presence of metal compounds of concern in Site soil appears to be associated with two primary sources: stormwater discharge from the fly ash handling area and stormwater run-off near the wastewater treatment plant area (see Figure 2). Stormwater that collects in open trench drains located near the fly ash loading area and in the central portion of the plant that discharges to wooded areas located to the west and north of the facility is the most likely source for metals in soil in stormwater channels at the Site. Umicore constructed a canopy over the fly ash loading area in 2012 to prevent stormwater from contacting this area and therefore one of the primary sources for metals impact to stormwater has been eliminated. Stormwater run-off in the area near the wastewater treatment plant located in the eastern portion of the plant is a lesser source of soil impacts. The presence of elevated concentrations of cadmium, cobalt, nickel, and manganese in shallow Site groundwater in the east-central portion of the Site appears to be associated with stormwater runoff related primarily to the wastewater treatment plant area.

9.2 Exposure Pathways and Receptors

The following is an evaluation of potential exposure pathways at the Site.

<u>Direct Contact with Soil</u>

Surface and subsurface soil impacts have been detected at the Site in locations both outside and inside the fence of the operational areas primarily as a result of historical stormwater run-off. The metal soil impacts are primarily concentrated near and downgradient of stormwater outfalls outside the facility fence but have also been detected in areas inside the fence near the

wastewater treatment area. Concentrations of cobalt have been detected above generic industrial RSLs.

The locations of metal impacts are primarily in wooded areas outside the plant fence that are not frequented by facility personnel. However, plant personnel or construction workers could occasionally come into contact with these areas for maintenance or other activities. In addition, although unlikely based upon the remote nature and dense vegetation of the wooded areas, there is a potential that occasional trespassers in areas outside of the fence could come into contact with surface soil.

For areas inside the fence where soil impacts are present, Site personnel could come into contact with surface soil during routine activities. In addition, if construction were to be performed in areas of soil impact inside the fence in the future, construction workers could come into contact with surface and subsurface impacted soil.

Groundwater Use

Groundwater is not used for any purpose at the Site. As discussed in Section 3.5, the closest inactive water supply well to the Site is approximately 800 ft to the southeast of the Site on the opposite side of Shoal Creek (Figure 3). Because the metals are contained to the Site property, Shoal Creek is a hydraulic barrier, and no active water supply wells are located in the area of the Site, human exposure to impacted groundwater through consumption or direct contact is not considered a completed exposure pathway. As part of the proposed remediation plan in Section 11.0, a groundwater use restriction will be placed on the Site deed which will preclude use of groundwater at the Site.

Groundwater Migration to Surface Water

Impacted soil at the Site appears to have resulted in limited impact to shallow groundwater in the eastern portion of the Site. Metal impacts in shallow groundwater are expected to migrate in the direction of groundwater flow to the northeast toward Shoal Creek. Because Shoal Creek boarders the Site to the east there is a potential that Site groundwater impacts could discharge to Shoal Creek and impact the creek above surface water standards. Therefore, soil migration to

groundwater and then subsequent groundwater migration to surface water is considered a potential exposure pathway.

Vapor Migration

Based on the nature of the Site compounds of concern which are not volatile, generation and migration of vapors to structures is unlikely. As such, vapor intrusion from impacted soil or groundwater is not considered a completed exposure pathway.

Ecological Receptors

Based upon the industrial nature of the Site, which is not an attractive ecological habitat, ecological receptors are not considered a completed exposure pathway for soil in the operational areas of the Site inside the fenceline. However, metals have been detected in surface and subsurface soil outside of the fenceline, and ecological receptors could potentially be present in these areas.

No significant impacts to surface water or sediment have been detected based upon sampling of these media. Therefore, surface water and sediment do not represent current completed exposure pathways. As noted above, future groundwater discharge to surface water could pose a potential concern for ecological receptors in the future.

9.3 Conceptual Site Model

Based on recent assessment data collected and an evaluation of the sources and potential exposure pathways, H&H has developed the following Conceptual Site Model:

Soil and Groundwater Impacts

- The primary metals which have been detected in soil in stormwater discharge channels at the Site at levels of potential concern are cobalt, manganese, nickel, and cadmium. Cobalt and manganese soil impacts are most widespread at the Site.

- The primary mechanism for metals transport is stormwater run-off from paved surfaces in the operating areas of the facility. Stormwater that collects in open trench drains located near the fly ash loading area and in the central portion of the plant that discharges to wooded areas located to the west and north of the facility appears to have been the primary source for metal impacts to soil. Umicore constructed a canopy over the fly ash loading area in 2012 to prevent stormwater from contacting this area and therefore the primary source for metals has been eliminated.

- Stormwater run-off in areas near the wastewater treatment plant located in the eastern portion of the plant is a lesser source of soil impacts.

- Elevated concentrations of cobalt, manganese, nickel, and cadmium are present in shallow Site groundwater in a limited area in the east-central portion of Site. The source of the groundwater impacts appears to be leaching from soil in the wastewater treatment plant area.

<u>Geology and Hydrogeology</u>

- The Site hydrogeology generally consists of the following six zones:
    - Zone 1 – Zone 1 consists of unconsolidated materials that are fine to medium grained sands with varying percentages of silt grading to sandy silts with varying percentages of clay at depths. Beneath the fine to medium grained sands and sandy silts in some areas of the Site, Zone 1 consists of a sandy clay layer which transitions to a semi-lithified partially weathered clayey sandstone. Groundwater was not encountered at multiple locations across the Site in Zone 1.

    - Zone 2 – Zone 2 consists of thinly laminated white to light grey sandstone bedrock or arenite. Limited groundwater was encountered in secondary fractures within this zone. In some areas, Zone 1 transitions with depth to interlayered white sandstone and gray greywacke.

- Zone 3 – Zone 3 consists of thinly laminated grey to dark grey sandstone bedrock comprised of highly fractured, weathered, greywacke with interbedded lenses of shale. Abundant groundwater was encountered in primary porosity and secondary fractures within this zone.

- Zone 4 - Zone 4 consists of thinly laminated grey to dark grey sandstone bedrock consisting of arenite with interbedded lenses of greywacke. Limited groundwater was encountered within secondary fractures within this sandstone zone.

- Zone 5 – Zone 5 consists of dark grey to black shale bedrock. Abundant groundwater was encountered in primary porosity and secondary fractures within this transmissive shale bedrock zone.

- Zone 6 – Zone 6 consists of grey to dark grey sandstone bedrock comprised of greywacke and interbedded lenses of shale. Groundwater was encountered in secondary fractures within this sandstone (greywacke) bedrock zone.

- Metals that have been released to shallow soil in the stormwater channels migrate vertically with infiltrating rainwater to the underlying unconsolidated material and then into the underlying shallow bedrock. Because of the large thickness and low permeability of the unconsolidated materials and low mobility of metals, groundwater impacts at the Site are very limited.

- Horizontal shallow groundwater flow direction is to the northeast toward Shoal Creek. Horizontal deeper groundwater flow is to the east-southeast in the northern portion of the Site. In the central portion of the Site, the horizontal deeper groundwater flow is to the east toward Shoal Creek.

- Groundwater also flows vertically due to the presence of vertical hydraulic gradients. Vertical groundwater gradients are generally downward except in the eastern portion of

the Site near Shoal Creek where vertical hydraulic gradients are generally upward. Groundwater in the shallow and deeper aquifer zones discharges to Shoal Creek.

- Groundwater flows downward in Zone 2 to Zone 3 where groundwater is transported laterally toward Shoal Creek. Groundwater in Zone 3 then migrates upward and discharges to Shoal Creek. Further groundwater flow downward from Zone 3 into Zone 4 is limited by the lower transmissivity Zone 4 and therefore there is little hydraulic communication between Zones 3 and 5. Zone 5 is also a primary zone of groundwater transport but there is limited communication between shallow aquifer zones below the Site and the lower aquifer zones. Groundwater flow in the deeper aquifer zones also appears to be upward to Shoal Creek which is facilitated by higher fracturing and weathering (and thus hydraulic conductivity) in bedrock below the creek.

- Because groundwater discharges to Shoal Creek, groundwater impacts are limited to the Site. In addition, there is no significant impact to surface water or sediment from discharging groundwater.

- Due to the limited connectivity between Zones 3 and 5, there are no significant groundwater impacts in the deeper aquifer.

<u>Exposure Pathways</u>

- The primary potential exposure pathways for impacts at the Site are: direct contact with shallow soil by facility personnel inside or outside the fenceline during routine Site activities; direct contact with impacted soil outside the fenceline by occasional trespassers; direct contact with shallow and subsurface soil by construction workers inside the fenceline; soil leaching to groundwater and then subsequent discharge to surface water; and exposure to ecological receptors to soil outside the fenceline.

10.0 Exposure Assessments

10.1 Human Health Risk Evaluation

To evaluate potential risks to human health associated with the soil impacts identified at the Site and to develop Site-specific remedial goals, Hazardous Substance & Waste Management Research, Inc. (HSWMR) of Tallahassee, Florida conducted a human health risk evaluation. A copy of the human health risk evaluation report is included as Appendix F. A summary of the human health risk evaluation is provided below.

Identification of Constituents of Potential Concern (COPCs)

The human health risk evaluation focused on soil concentrations of cadmium, cobalt, manganese, and nickel which have been detected in Site soil during the 2013 to 2015 assessment activities above Site-specific protection of groundwater screening levels and/or generic direct contact industrial RSLs (in the case of cobalt). Because the soil samples collected by others in February 2012 from depths of 0-2 inches bgs and 12-15 inches bgs are inconsistent with ADEM guidelines for soil sample collection and subsequent sampling efforts duplicated the locations of the 2012 and included samples collected at 0-1 ft bgs as well as deeper intervals of interest, the 2012 soil sampling data were excluded from the risk evaluation.

As part of the risk evaluation, HSWMR reviewed historical and recent analytical data and Site characterization reports and prepared summary tables for use in statistical analysis and risk calculations. For exposure assessment purposes, sample results for locations that are inside the security fence were evaluated separately from sample results for locations outside the security fence. Samples from these two areas of interest were further broken down into surface and subsurface soil samples. Consistent with ADEM guidelines, the risk evaluation considered surface soil as samples collected from ground surface to a depth of 0-1 ft bgs and subsurface soil as samples collected from 1 ft bgs to the deepest sample interval collected. For subsequent exposure evaluation, HSWMR also assumed that the surface soil interval represents soil that has the reasonable likelihood of being encountered directly by various individuals on a routine basis, and subsurface soil intervals (i.e., depths greater than 1 ft bgs) as being encountered much less

frequently and only by specialized receptors such as construction and maintenance workers. Because it typically is not possible to be exposed to subsurface soil without also being exposed first to surface soil, the risk evaluation considered subsurface soil as all soil from ground surface to the deepest sample interval.

As part of the human health risk evaluation, HSWMR prepared summary tables for use in statistical analysis and risk evaluation calculations. Prior to calculating the summary statistics, testing for and removal of statistical outlier concentrations were performed using EPA's ProUCL statistical software program. Because land use restrictions will be placed on the property restricting future usage to commercial and industrial uses only, the risk evaluation used industrial RSLs as screening levels for identification of constituents of potential concern (COCP) at the Site.

The results of the statistical analysis, as shown on Tables 3 and 4 in Appendix F, indicate that cobalt in surface soil only both inside and outside of the site security fence is identified as the sole COPC based on a comparison of mean, maximum, and 95% upper confident limit (UCL) to the industrial RSL of 350 mg/kg. A summary of the mean, maximum, and 95% UCL are provided in the table on the following page.

Identification of Exposure Scenarios and Exposure Point Concentrations

Following identification of cobalt as the sole COPC, HSWMR developed appropriate exposure scenarios based upon Site-specific information. For the risk management evaluation at the Site, four potential receptor scenarios were considered:

- Adolescent trespasser outside of the fenceline;
- Adult trespasser outside of the fenceline;
- Adult maintenance worker inside and outside the fenceline; and
- Adult construction worker inside and outside the fenceline.

As noted in the risk evaluation report and the exposure and receptor pathway evaluation in Section 9.0, the adolescent and adult trespassers are only applicable to outside the Site security

fenceline because the fenced area at the Site is secured and monitored on a 24 hour, seven days per week basis.

For each exposure scenario, HSWMR developed exposure point concentrations (EPCs) for cobalt for each scenario based upon the statistical analysis. The EPC was taken as the 95% UCL of the dataset used for a particular scenario. A summary of the EPCs for the different exposure scenarios is provided in the summary table below and also in Tables 3 and 4 in Appendix F.

Development of Risk-Based Target Levels

Based upon the exposure scenarios, HSWMR developed Site-specific risk-based target levels (RBTLs) for each exposure scenario for cobalt for use in risk management and remedial action planning. The assumptions used in the development of the RBTLs are provided in the report in Appendix F and were generally based upon standard default exposure assumptions. A summary of the mean, maximum, EPC (95% UCL), and RBTL for each exposure scenario is provided below:

Exposure Scenario	Cobalt Maximum (mg/kg)	Cobalt Maximum Outlier (mg/kg)	Cobalt Mean (mg/kg)	Cobalt EPC (95% UCL) (mg/kg)	Cobalt RBTL (mg/kg)	Cobalt Default Industrial RSL (mg/kg)
Adolescent trespasser	1,750 (O)	6,650 (O)	297 (O)	422	487	NA
Adult trespasser	1,750 (O)	6,650 (O)	297 (O)	422	763	NA
Adult maintenance worker	1,750 (O) 1,740 (I)	6,650 (O)	297 (O) 394 (I)	422 (O) 844 (I)	1,014	350
Adult construction worker	1,750 (O) 1,740 (I)	6,650 (O)	297 (O) 394 (I)	422 (O) 844 (I)	538	350

(O) = Outside Fenceline
(I) = Inside Fenceline

As shown above and in Appendix F, the RBTLs for the adult trespasser (763 mg/kg) and the adolescent trespasser (487 mg/kg) scenarios do not exceed the outside the fence surface soil mean cobalt concentration of 297 mg/kg or the EPC of 422 mg/kg. The maximum concentration

of cobalt (1,750 mg/kg) exceeds the RBTLs, but routine exposure to a single elevated concentration location is unlikely under the assumed exposure scenarios and based upon Site characteristics. As such, remediation is not warranted to address the trespasser exposure scenarios.

For the inside the fence maintenance worker and construction worker scenarios, the EPC (844 mg/kg) exceeds the adult construction worker RBTL of 538 mg/kg, although the mean concentrations of 394 mg/kg is less than the RBTL. For the outside the fence maintenance worker and construction worker exposure scenarios, the EPC (422 mg/kg) and mean (297 mg/kg) do not exceed the RBTL of 538 mg/kg. The maximum concentration of cobalt inside and outside the fenceline (1,740 mg/kg and 1,750 mg/kg) exceed the RBTL but, as noted above, routine exposure to a single elevated concentration location is unlikely under the assumed exposure scenarios and based upon Site characteristics.

The results of human health exposure evaluation indicates that remediation is warranted for cobalt in surface soil inside the fenceline to address the Site maintenance worker and construction worker exposure scenarios.

Virtual Remediation Exercise

Because the inside the fence EPC for cobalt in surface soil exceeds the RBTL, HSWMR considered "hot spot" removal via a virtual remediation exercise. In the virtual remediation (VR), selected sample data (i.e., most elevated concentrations in decreasing order) are replaced iteratively in the data set with reasonable values based on an assumption of excavation followed by backfilling with clean fill. The VR also demonstrates the conservative nature of the EPCs. That is, if the receptor does not spend any time in the highest concentrations areas, the VR estimates what the true EPC may be for that receptor.

In the VR exercise for the inside the fence worker, removal of the two highest cobalt concentrations located inside the fenceline and replacement with a surrogate clean fill concentration of 5 mg/kg (consistent with background) yields a 95% UCL concentration of approximately 400 mg/kg. That value is below the construction worker RBTL of 538 mg/kg but

slightly greater than the default industrial worker RSL of 350 mg/kg. Replacement of the three highest concentration locations inside the fenceline results in a 95% UCL concentration of approximately 300 mg/kg, which does not exceed either the construction worker RBTL (538 mg/kg) or the generic industrial RSL (350 mg/kg). The three highest inside the fence concentrations are in close proximity to each other (SS-118, SS-118A, and SS-118C) in the wastewater treatment plant area. The VR exercise demonstrates that considerable concentration and risk reduction can be achieved with limited excavation of soil impacts in the SS-118 sample locations.

Uncertainty Evaluation

As part of the risk evaluation, HSWMR also performed an uncertainty evaluation for the exposure risk calculations. As noted above and in Appendix F, certain higher concentration "outlier" concentrations were removed from the dataset in accordance with EPA guidance. In the uncertainty evaluation, these outlier concentrations were included in the risk evaluation to determine if their inclusion would have a significant impact on the risk evaluation results and conclusions.

For surface soil inside the fence, inclusion of the outlier value removed in the evaluation (one sample for cadmium) does not have an impact on the conclusions of the risk evaluation. For subsurface soil inside the fence, three cobalt values were excluded as outliers in the risk evaluation. Inclusion of these values results in an EPC of 686 mg/kg which slightly exceeds the RBTL of 585 mg/kg for Site workers. However, all of the samples are surface samples in the SS-118 area (recall that subsurface soil include both surface and subsurface soil); therefore, risks associated with these samples have already been considered in the inside the fence surface soil evaluation.

For surface and subsurface soil outside the fence, inclusion of the outlier concentrations in the risk evaluation indicates that cadmium, manganese, and nickel are still not COPCs. For cobalt, inclusion of the outlier concentrations in the risk evaluation indicates that the EPC in surface soil of 647 mg/kg slightly exceeds the site worker RBTL of 585 mg/kg and the adolescent trespasser RBTL of 487 mg/kg. For subsurface soil, inclusion of the outlier concentrations in the risk

evaluation indicates that the EPC of 454 mg/kg does not exceed any of the RBTLs.

For cobalt in surface soil outside the fenceline including the outlier concentrations, HSWMR performed a VR exercise similar to that which was done for the area inside the fenceline. The results of the VR indicate that removal and replacement of the three most elevated surface soil concentrations (6,650 mg/kg at SS-75; 4,260 mg/kg at SS-58; and 3,530 mg/kg at SS-14A) will result in an EPC less than the RBTLs. Therefore, although such remediation is not warranted to meet USEPA and ADEM risk-based guidelines, significant risk and uncertainty reduction can be obtained through removal of surface soil in these areas.

Summary

Based on the soil sample results, known Site characteristics, and reasonable Site-specific exposure assumptions, the human health risk evaluation indicates that the area outside the fenceline at Site, as well as all of the subsurface soil at the Site, do not pose a significant risk to reasonably anticipated receptors. For the area inside the fenceline, the conservative exposure point concentration exceeds the cobalt Site-specific RBTLs for a long-term daily worker (default industrial worker) and a short-term construction worker. Because of the built-in protectiveness of the RBTLs, and because the receptors are unlikely to receive all of their daily soil ingestion from the impacted area, it is unlikely that the RBTL exceedance represents a significant risk. In addition, results of the uncertainty evaluation indicate that inclusion of the outlier concentrations for cobalt in surface soil results in EPCs above the RBTLs outside the fenceline. Although removal of this soil is not warranted based upon standard risk evaluation procedures, as demonstrated by the VR exercise, considerable concentration and risk reduction can be achieved through removal of surface soil in select “hot spot” areas.

10.2 Ecological Risk Assessment

To evaluate potential exposure scenarios associated with ecological receptors (i.e., soil invertebrates, mammals, and avian receptors), detections of Site metal compounds of concern were compared to USEPA ecological screening values. In addition, an evaluation was conducted to 1) confirm that concentrations of metals detected in Site soil and groundwater above screening

levels will not impact surface water in Shoal Creek above applicable surface water standards in the future, and 2) to establish Site-specific soil and groundwater screening levels protective of surface water. The results of these ecological risk management evaluations are detailed in the following sections.

10.2.1 Comparison to USEPA Ecological Screening Values

Based upon the industrial nature of the Site, ecological receptors are not considered a completed exposure pathway in the operational areas of the Site. Several metals (cadmium, cobalt, manganese, and nickel) have been detected in Site soil in stormwater channels in Shoal Creek which are situated in wooded areas outside of the operational areas of the property. Because these metals have been found in soil in the stormwater channels, there is a potential that soil impacts could impact ecological receptors in the wooded areas of the Site.

To evaluate this potential exposure scenario, detections of cadmium, cobalt, manganese, and nickel were compared to the range of USEPA Region 4 ecological screening criteria for soil invertebrates, mammals, and avian receptors. It should be noted that plant receptors were not included in this evaluation based upon the lack of similar higher-value plant species found in these wooded areas of the Site (i.e., alfalfa, barley, cotton, etc. upon which the ecological screening levels for plants are based).

The soil data evaluation for the ecological risk evaluation in soil was based upon the same statistical analysis as performed for the human health risk evaluation. A summary of the selected statistical summary and comparison of Site soil concentrations to a range of ecological screening levels for the areas outside of the operational areas of the Site is present in Table 12. H&H considered ecological screening level ranges in our evaluation because of the wide range in ecological screening values reported in literature.

As indicated in Table 12, the mean, maximum, and 95% UCL concentrations for all of the metals are within the range of ecological screening values for that metal. As such, we conclude that the impacts to soil do not pose a significant risk to potential ecological receptors at the Site.

10.2.2 Protection of Surface Water from Soil and Groundwater

At sites where surface water bodies have been identified within 500 ft of the downgradient edge of the groundwater plume, the ARBCA evaluation process includes back-calculation of allowable source soil and groundwater risk-based target levels (RBTLs) protective of surface water. The RBTLs may then be compared with representative source soil and groundwater concentrations and adopted as cleanup levels during the development and implementation of a remediation plan. As such, H&H performed a risk management (RM) evaluation to calculate Site-specific RBTLs protective of Shoal Creek for the three primary areas of impacted soil which have been identified at the Site. The locations of the primary impacted soil areas (identified as Soil Area A through C) are shown in Attachment 1 of Appendix G.

Soil Areas A and B include the maximum concentrations of the Site COCs (cadmium, cobalt, manganese, and nickel) which have been detected in Site soil. Soil Area C is a relatively large area of soil impacted above protection of groundwater screening levels which is located relatively close to Shoal Creek compared to the other impacted areas. These three areas were selected for the RM evaluation because they pose the greatest potential threat to surface water based on high soil concentrations (Soil Areas A and B) and proximity to the creek (Soil Area C).

The RM evaluation was performed using the RM-2 methods outlined in the ARBCA Guidance Manual (2008), which is based on the Domenico Model. In an RM-2 evaluation, mixing within the stream is used to calculate allowable groundwater concentrations at the point of groundwater discharge into the stream. As discussed below, these allowable concentrations are used in back-calculation of source area soil and groundwater RBTLs. Note that several calculations used in the evaluation are based on conservative assumptions (e.g., a steady-state groundwater plume, steady-state and low flow in the stream, and no reduction of contaminant concentration in groundwater and surface water due to natural attenuation processes such as adsorption to the sediments, etc.). These conservative assumptions result in RBTLs which are significantly lower than actual levels which are protective of surface water. For example, it is well documented that dissolved metals such cadmium, cobalt, and nickel in groundwater will, to varying extents, form insoluble complexes and/or adsorb to sediments and therefore become immobile in the aquifer.

A discussion of the general step-wise approach used in our evaluation is presented below. Calculation sheets for our evaluation of each soil area are included as Table 1 through 3 in Appendix G. These sheets include formulas, input parameter values and sources, output values, and assumptions, and are presented in the same step-wise manner as discussed below. Equations referenced in the discussion are from the ARBCA Guidance Manual (2008), unless indicated otherwise.

Step 1: Identify streams potentially impacted by COCs at the Site

As referenced in Section 3.2, Shoal Creek borders the property to the east, enters the property approximately 300 ft northeast of the facility, and traverses the northeastern portion of the Site. Shoal Creek is approximately 10 miles in length and ultimately discharges into Lake Wheeler (Tennessee River) approximately 6.8 miles north-northeast of the Site. Shoal Creek has a use classification of Fish and Wildlife and is considered a Tier 2 waterbody. Tier 2 waterbodies are waters whose quality exceeds the levels necessary to support propagation of fish, shellfish, wildlife, and recreation in and on the water. Based upon its proximity to Site soil and groundwater metal sources and the lack of other downgradient surface water bodies in the Site vicinity, Shoal Creek was selected as the only surface water body of concern for this evaluation.

Step 2: Identify concentration(s) upstream (C_{su}) of the groundwater discharge

In December 2014, background concentrations of cadmium, cobalt, manganese, and nickel were evaluated in Shoal Creek by collecting and analyzing an upgradient surface water sample (identified as SW-1) approximately 130 ft north of Old Guntersville Road. The results of the SW-1 sample indicated a detection of manganese at a concentration of 89.7 µg/l, and this concentration is used for the upstream manganese concentration in the evaluation. The other Site COCs (cadmium, cobalt, and nickel) were not detected above laboratory detection limits in SW-1; therefore, an upstream concentration of zero is used for these metals in the evaluation.

Step 3: Estimate the allowable concentrations of each COC in the stream (C_{sw})

Because Shoal Creek is defined as a "water of the state," target surface water concentrations are determined per the Water Quality Criteria established in ADEM Admin. Code 335-6-10.07 using the "Consumption of Fish/Water" pathway. Freshwater chronic aquatic life target surface water

concentrations for cadmium (0.094 µg/l) and nickel (16.2 µg/l) were calculated using Equations 2 and 10, respectively, as cited in the ADEM Admin. Code 335-6-10.07. These equations are hardness-dependent, and a Site-specific hardness value of 25.26 mg/l (calculated using the average hardness from three surface water samples collected from Shoal Creek in December 2014) was used in the calculations. Because no target ADEM surface water criteria are specified for cobalt and manganese, Region 4 Surface Water Screening Values for Hazardous Waste Sites chronic toxicity values of 19 and 93 µg/l were used for cobalt and manganese, respectively. [7]

Step 4: Estimate allowable COC concentrations in groundwater at the point of discharge (C_{gw})

In an RM-2 evaluation, mixing within the stream is used to calculate allowable groundwater concentrations at the point of groundwater discharge into the stream. The allowable groundwater concentrations of COPCs at the point of discharge were calculated for each of the three soil areas at the Site using the mass balance equation (Equation D-4.1 in the ARBCA Manual). The mass balance equation requires input of upstream flow rate and compound concentrations, and the discharge rate of impacted groundwater into the stream in order to calculate the allowable groundwater concentration at the point of groundwater discharge into the stream. The equation does not account for contribution of groundwater discharge to the stream from multiple potential sources (such as exist at the Site). If multiple sources were considered by the equation, calculated RBTLs would likely be lower than those calculated in our evaluation; however, this decrease in RBTL values would almost certainly be off-set by accounting for contaminant reduction by dissolution and/or adsorption to sediments in the aquifer.

For an RM-2 evaluation, ADEM indicates that the 7*Q*10 flow should be used to estimate the upstream flow used in the mass balance equation. Where gauging information is not available (such is the case for Shoal Creek), the flow rate can be estimated using the method developed by Bingham (1982) and consists of a regression equation using a base flow recession index, drainage area, and mean annual precipitation. The contributing drainage area (estimated drainage to Shoal Creek at the upstream point of groundwater discharge) was determined to be

[7] USEPA Supplemental Guidance to ERAGS: Region 4, Ecological Risk Assessment – Region 4 Surface Water Screening Values for Hazardous Waste Sites, Updated 2015. Table 1a – Freshwater Screening Values.

approximately 3.64 square miles and is shown in Attachment 2 of Appendix G. Using a stream flow recession index of 140 (obtained from Bingham), the contributing drainage area of 3.64 square miles, and a mean annual precipitation of 55 inches, the 7*Q*10 stream flow for Shoal Creek at the upstream point of groundwater discharge was estimated to be 56,268 cubic feet per day (cfd) or 0.65 cubic feet per second (cfs) using Equations D-4.9 and D-4.10 of the ARBCA Manual, respectively. Note that H&H evaluated stream flow in Shoal Creek during December 2014 and estimated a flow rate of approximately 7.7 cfs at that time. Therefore, use of the 7*Q*10 flow is very conservative. Upstream compound concentrations (Step 3) are also accounted for in the mass balance equation.

The rate of impacted groundwater discharge into the stream was calculated using a Site-specific groundwater Darcy velocity of 0.075 ft/day and the dimensions of the flux area at the point of groundwater discharge to the surface water. Site-specific hydraulic conductivity (0.5 ft/day) and gradient (0.03 ft/ft), and assumed effective porosity (0.2) were used to calculate the Darcy velocity. The dimensions of the flux area are calculated using Equations D-4.4, D-4.5, and D-4.6, and the calculations account for lateral and vertical dispersivity between the source groundwater and the point of discharge. Source soil area width (perpendicular to groundwater flow direction and assumed to be equal to the groundwater source width) and the distance from the source area to the surface water discharge point (parallel to groundwater flow direction) are used in these calculations and vary for each of the three soil areas. Dimensions used in the calculations for each soil area are shown in the calculations sheets and in Attachment 1 (Appendix G). In addition, the groundwater mixing zone thickness is used in the equations. An RM-1 default value of 200 cm was used for the groundwater mixing zone thickness in our evaluation.

<u>Step 5: Estimate the allowable concentration in groundwater at the source (C_{gws}) and sentry wells</u>

The allowable groundwater concentration at the source protective of the stream was estimated by multiplying the allowable groundwater concentrations at the point of groundwater discharge into the stream (Step 4) by a dilution attenuation factor (DAF). A DAF in the saturated zone between the stream and each soil area was calculated using the simplified version of Domenico's model

as presented in Appendix B (B-14) of the ARBCA Manual. Contaminant reduction by dissolution and/or adsorption to sediments is not accounted for in the DAF calculation. Source soil area width, the distance from the source area to the surface water discharge point, and the mixing zone thickness (discussed in Step 4) are used in the DAF calculations and vary for each of the soil areas. The DAF calculation also accounts for lateral and vertical dispersivity between the source groundwater and the point of discharge.

The target concentration in a sentry well located between the soil areas and Shoal Creek were also calculated for Soil Areas A (monitoring well MW-3R used as sentry well) and B (monitor well MW-6 used as sentry well). There is not a sentry well located between Soil Area C and the stream. The target concentrations in the sentry wells were calculated by dividing the allowable groundwater concentration at the source (see above) by the DAF calculated for the saturated zone between the source and the sentry well.

Dimensions used in the DAF calculations for each area, the calculated DAFs, and the calculated allowable COC concentrations in source groundwater and sentry wells are shown in the calculations sheets (Appendix G).

Step 6: Estimate the allowable soil source concentration (C_{soil})

The allowable soil source concentration was conservatively estimated assuming no attenuation in the unsaturated zone (i.e., the leachate concentration at the soil source is identical to the leachate concentration reaching the water table). The allowable soil concentration is calculated by dividing the allowable source groundwater concentration (Step 5) by the leaching factor. For each of the three soil source areas, we calculated a leaching factor for cadmium, cobalt, manganese, and nickel using the equation presented in Appendix B (B-15) of the ARBCA Manual. RM-1 default values for soil bulk density, soil water and air content, and mixing zone thickness, the Site-specific Darcy velocity (Step 4), and the length of the source area (parallel to groundwater flow direction) for each of the three soil areas were used in the equation. A regional infiltration rate of 14.4 cm and literature soil-water sorption coefficient values for each COPC were also used in the equation. Refer to the calculation sheets for infiltration and sorption coefficient source information.

In addition, H&H calculated site-specific leaching factors for cadmium, cobalt, and nickel using synthetic precipitation leaching procedure (SPLP) data from soil samples collected at the Site. This SPLP-based leaching factor was calculated by dividing the SPLP COPC concentration (mg/l) by the total COPC concentration (mg/kg) detected in each soil sample and averaging the results for each COPC. The units for the SPLP-based leaching factor (mg/L-H2O/mg/kg-soil) are the same as those for the leaching factor calculated using the ARBCA equation. The allowable soil source concentrations were then calculated using the SPLP-based leaching factor because use of these values result in lower, more conservative allowable soil source concentrations than the ARBCA-based leaching factors.

The calculated allowable soil source concentrations, leaching factors calculated using the ARBCA guidance method Appendix B (B-15) equation, and the SPLP-based leaching factors for each soil area are shown in the calculation sheets (Appendix G). Note that allowable soil source concentrations calculated using the ARBCA-based leaching factors are shown in the calculation sheets for reference only.

Comparison of Soil and Groundwater Data to Calculated RBTLs

The calculated allowable soil source concentrations for each evaluated soil area are summarized along the with maximum COPC detections in soil samples collected from each area in the following table.

Soil Area	Max [Cd] in Area	Cd RBTL	Max [Co] in Area	Co RBTL	Max [Mn] in Area	Mn RBTL	Max [Ni] in Area	Ni RBTL
A	**287**	18	1,740	20,163	953	13,424	579	18,103
B	**32.0**	23	6,650	25,992	6,990	24,652	2,920	23,337
C	NA	19	2,470	20,871	1,540	11,383	698	18,739

Notes: Max [X] = maximum concentration of compound which has been detected in soil area; concentrations are in mg/kg; Cd = cadmium; Co = cobalt; Mn = manganese; Ni = nickel; **bold underlined** concentration exceeds RBTL.

As shown in the table, maximum cadmium concentrations in Soil Areas A and B exceed the cadmium RBTLs calculated for these areas. Concentrations of cobalt, manganese, and nickel which have been detected in Site soil do not exceed the calculated RBTLs.

The calculated allowable source and sentry well groundwater concentrations for each evaluated soil area are summarized along the with maximum COPC detections in source/sentry wells associated with the area in the table below. Monitoring well locations are depicted in Attachment 1 (Appendix G).

Soil Area	Well ID	[Cd] in GW	Cd RBTL	[Co] in GW	Co RBTL	[Mn] in GW	Mn RBTL	[Ni] in GW	Ni RBTL
Source Groundwater									
A	MW-5R	**0.643**	0.12	0.87	23.6	**7.11**	5.6	1.16	20.2
B	No Source Well	--	0.15	--	30.5	--	10.3	--	26.0
C	MW-9	<0.005	0.12	<0.01	24.5	0.398	4.8	1.16	20.9
Sentry Well Groundwater									
A	MW-3R	<0.001	0.0096	0.0285	1.9	1.66	0.46*	0.0353	1.6
B	MW-6	<0.005	0.007	0.013	1.5	0.20	0.51	<0.005	1.3
C	No Sentry Well	--	--	--	--	--	--	--	--

Notes: [X] = concentration of compound; concentrations are in mg/L; Cd = cadmium; Co = cobalt; Mn = manganese; Ni = nickel; **bold underlined** concentration exceeds RBTL; underline concentration exceeds RBTL but is consistent with background. * RBTL is lower than background level.

As shown in the table, cadmium and manganese concentrations detected in December 2014 in monitor well MW-5R exceed the cadmium and manganese RBTLs calculated for the Soil Area A source groundwater area. Manganese was also detected above the manganese RBTL calculated for the Soil Area A sentry well. There were no other compounds detected above source groundwater or sentry well RBTLs calculated for the soil areas.

However, based on the MW-5R (source well associated with Soil Area A) and MW-3R (sentry well associated with Soil Area A), cadmium concentrations appear to be reduced by natural attenuation processes to below levels protective of surface in the aquifer between the soil area and Shoal Creek. Therefore, it does not appear that remediation of cadmium in groundwater is warranted for protection of surface water. Manganese concentrations in downgradient portions of the aquifer (between Soil Area A and Shoal Creek) also appear to be reduced by natural attenuation processes. As discussed in Section 7.4.1, the manganese concentration detected in downgradient well MW-3R (1.66 mg/l) is significantly lower than the level of manganese in source area well MW-5R (7.11 mg/l) and appears to be consistent with background. As

discussed in Section 7.4.2, the lowest pH in groundwater (4.73) was measured in well MW-5R. Because low pH conditions can impact metals mobilization, it is possible that the low pH in well MW-5R is at least partly responsible for the elevated levels of metals in this well. As groundwater migrates to areas with neutral pH, the metals likely partition into the solid phase and become immobile which further limits their migration.

Evaluation of COPC Migration with Natural Attenuation

As discussed above, the RBTL calculations above do not account for reduction of contaminant concentrations due to natural attenuation processes (e.g., adsorption to aquifer sediments) in groundwater between the soil areas and the point of discharge into surface water. Therefore, we evaluated attenuation of cadmium and manganese concentrations in groundwater between Soil Area A (where source groundwater concentrations of these metals exceeded calculated RBTLs) and Shoal Creek utilizing EPA's Biochlor modeling software. Biochlor uses the Domenico model with Martin-Hayden and Robbin (1997) improvements.

The Biochlor modeling software is typically used to determine the distance that a chlorinated solvent plume will extend over time. To do this, the model accounts for dispersion, advection, partitioning of compounds between groundwater and aquifer solids, and sequential first order decay biotransformation (i.e., compounds degrading to their daughter compounds) as the plume travels through the aquifer. However, Biochlor can be used to model compounds that do not biotransform (such as metals) and only attenuate through physical processes of dispersion and adsorption as is assumed to be the case for both cadmium and manganese in our evaluation by setting the biotransformation values to zero in the model. Partitioning of compounds between groundwater and aquifer solids retards the migration of compounds in comparison to the rate of groundwater flow.

For the evaluation, retardation factors used in the Biochlor model were calculated for cadmium and manganese using the following equation (from ARBCA guidance method Appendix B, B-16):

$$R_f = 1+[(P_{ss}*K_d)/\theta_{TS}];$$

where P_{ss} = aquifer material bulk density (RM-1 default value of 1.8 g/cm^3 used), θ_{TS} = porosity (RM-1 default value of 0.3 cm^3/cm^3-soil used), and K_d = partition coefficient. The partition coefficients were calculated using the equation presented in Appendix B (B-15) of the ARBCA Manual and setting the leaching factor in the equation (for cadmium and manganese) equal to the SPLP-based leaching factor (discussed above). Using this method, partition coefficients of 30 and 450 cm^3-H2O/g-soil were calculated for cadmium and manganese, respectively. Retardation factors (unitless) of 180 and 2,700 were then calculated for cadmium and manganese, respectively.

Two Biochlor models were run to evaluate attenuation of cadmium in groundwater between Soil Area A and the surface water discharge point (325 ft distance); one with the calculated retardation factor of 180, and a very conservative model with a retardation factor of 45 (or, one-quarter of the calculated retardation factor). Similarly, two models were run for manganese with retardation factors of 2,700 and 675. Other input parameters used in the models were generally consistent with those used in the RBTL evaluation and are shown in the Biochlor model files included in Appendix G. Note that these models are simulated over a 1,000-year period and assume that the source of groundwater impacts will be continuous during this period. Output files for the model runs are also provided in Appendix G.

As shown in the output files, each of models indicate that cadmium and manganese will attenuate significantly in the aquifer between Soil Area A and Shoal Creek. The cadmium models show that the dissolved cadmium plume (associated with Soil Area A) will discharge to Shoal Creek at concentrations of 0.0021 mg/L (retardation factor of 45) and 0.0001 (retardation factor of 180). These concentrations are below the allowable cadmium concentration in groundwater at the point of discharge into the stream (0.007 mg/L) which was calculated as part of the RBTL evaluation (Step 4). Therefore, even after an extremely long period of time, it does not appear that cadmium will pose a threat to surface water.

The manganese models for both retardation factors (2,700 and 675) show that dissolved manganese concentrations will not reach the creek, and that dissolved manganese concentrations

above the allowable manganese concentration in groundwater at the point of discharge into the stream (0.33 mg/L) will migrate less than 100 ft from Soil Area A. Therefore, it appears that manganese concentrations in downgradient portions of the aquifer are attributable at least in part to the previously-discussed natural background concentrations in the Site aquifer. In addition, manganese will not partition from groundwater to aquifer solids in low pH areas (such as near Soil Area A and have therefore likely migrated beyond the distance indicated in the model as a result of the pH conditions in this area. However, as groundwater with dissolved manganese migrates to areas with neutral pH, the manganese is expected to readily partition into the solid phase and become immobile.

11.0 Proposed Remedial Action

The ADEM ARBCA process allows the use of risk-based remediation for sites. In the ARBCA process, sites do not have to be remediated to unrestricted use levels. Instead, land use restrictions can be implemented to address contamination allowed to remain on-site in both soil and groundwater above unrestricted use levels, and the site can be remediated to site-specific remediation goals.

The Site-specific RBTLs for soil and groundwater established in the previous section were calculated with accepted scientific methods in accordance with USEPA and ADEM risk-based guidance. The results of these activities, indicate that only limited active soil remediation and groundwater monitoring activities are warranted for the Site. In addition, because impacts will be left on-site in both soil and groundwater above unrestricted use levels, land use restrictions are also proposed as part of the site remediation. In addition, because soil impacts appear to have resulted in historical stormwater discharge, the site remediation will include flushing certain stormwater drains to minimize the potential that remediated areas will be re-impacted in the future. The proposed soil remediation, drain flushing, land use restrictions, and groundwater monitoring activities are discussed in the following sections.

11.1 Proposed Soil Remediation Activities

Because detections of cobalt and cadmium in soil are present in a few locations at concentrations that either exceed their Site-specific health based soil remediation goal (cobalt only) or Site-specific protection of surface water soil remediation goals (cadmium only), limited “hot spot” soil removal activities are proposed for these areas. The areas targeted for “hot spot” soil removal activities include the following locations:

- Surface soil cobalt impacts above the human health-based RBTL of 538 mg/kg at soil sample locations SS-118, SS-118A, and SS-118C and cadmium soil impacts above the Site-specific soil protection of surface water RBTL of 18 mg/kg at soil sample locations SS-118, SS-118A, SS-118C, and 119B in the wastewater treatment plant area;

- Surface soil cobalt impacts above the RBTL of 487 mg/kg at soil sample locations SS-14A, SS-58, and SS-75 outside the fence in the fly ash handling stormwater discharge locations; and

- Surface soil cadmium impacts above the Site-specific soil protection of surface water RBTL of 23 mg/kg at soil sample locations SS-69 and SS-75 in the fly ash handling stormwater discharge locations.

The locations of the proposed surficial soil excavation areas are depicted on Figure 20. A brief discussion of the methodologies and approach for the "hot spot" soil removal activities is provided in the following sections.

11.1.1 Subsurface Utility Locating

Prior to the initiation of field activities, H&H will contact the Alabama 811 public utility service to mark public utilities at the Site. H&H will also contract with a private utility locator to confirm the one-call markings and to mark the location of potential private subsurface utilities in the area of the proposed excavations. Additionally, H&H will review available drawings of the Site depicting subsurface utilities and/or other structures.

11.1.2 Stormwater Line Cleaning

Prior to the proposed "hot spot" soil removal activities and in accordance with ADEM's prior recommendations, stormwater discharge collection piping for the 12 active stormwater discharge lines will be flushed with clean potable water to remove potential sediments that may have collected in these lines and prevent future metal migration to the discharge locations. The decontamination water generated during the stormwater line cleaning activities will be containerized in appropriately labeled poly tanks and staged on-Site at a location determined by Umicore pending subsequent disposal at a permitted facility. For characterization purposes, a composite water sample will be collected from the containerized decontamination water and

analyzed for TCLP metals and total metals cobalt, manganese, and nickel. IDW water may be placed in the on-Site wastewater treatment plant if appropriate.

11.1.3 Site Clearing

The soil sample locations in the proposed excavation areas will field staked by the professional land surveyor to assist in locating these previous sample locations. H&H anticipates that minor clearing of vegetation will be required to provide excavation equipment access to the wooded excavation areas of the Site.

11.1.4 Waste Characterization

Existing soil sampling characterization information will be submitted to the ADEM Solid Waste Section to renew an existing waste profile (#140265) and certification (SW-033116-0040) for the Site which expires on March 31, 2016 to allow the use of in-situ characterization data for the disposal of the proposed remediation waste. With this approval and certification in-place, impacted soil in the eastern portion of the facility can be excavated and directly loaded into trucks for transport to the permitted landfill facility.

11.1.5 Soil Excavation and Stockpiling Activities

Prior to initiating soil removal activities, the excavation areas will be marked where soil removal will be performed. For the proposed excavation area in the eastern portion of the property, it is anticipated that excavated soil can be directly loaded into dump trucks for off-Site transport to the permitted landfill facility. Because the remaining proposed excavation areas are situated in difficult access areas (wooded, ravine locations), a temporary stockpile area will be established in the field in the western portion of the property. The stockpile area will be constructed using erosion control fence on three sides to prevent horizontal migration of soil from the stockpile, and, if necessary, will have hay bales placed on the fourth side. The stockpile cell will be lined with 6-mil poly sheeting. Following construction of the temporary stockpile cell, impacted surficial soil from the proposed excavation areas in wooded locations will be excavated using a

trackhoe, loaded onto transport equipment, and placed in the stockpile cell pending off-Site transport to the permitted landfill facility. Following placement of the impacted soil into the stockpile, the stockpiled soil will be covered with 6-mil poly sheeting to prevent contact with rain water pending off-site transport to the permitted landfill facility.

Based upon the previous Site characterization soil data, each proposed excavation area will be initially excavated to a depth of approximately 1 to 1.5 ft bgs. Then post-excavation confirmation sampling will be conducted (as described below). If the results of post-excavation confirmation sampling indicates that concentrations are below the RBTLs, no further excavation will be conducted and the excavation will be backfill with clean import fill. If the results of post-excavation confirmation sampling indicate that impacted soil has not been adequately removed below the RBTLs, additional soil removal will be conducted until post-excavation confirmation soil sampling indicates that soil impacts above the RBTLs have been removed.

11.1.6 Post-Excavation Confirmation Soil Sampling

Following excavation activities, post-excavation confirmation soil samples will be collected from the base of the excavation area using a decontaminated stainless steel hand auger or stainless steel hand spade. The post-excavation confirmation soil samples will be collected at a frequency of one sample per approximately 225 square ft (approximate 15 ft by 15 ft area). The collected post-excavation confirmation soil samples will be analyzed for cobalt and/or cadmium, (depending upon the location) by EPA Method 6010. For QA/QC purposes, one duplicate soil sample will be collected from the excavation area per every twenty soil samples collected. MS/MSD samples will be submitted as a further QA/QC check using the same sampling frequency.

11.1.7 Investigation Derived Waste

The use of hand auger sampling or stainless steel hand spade methods for the collection of post-excavation confirmation soil samples will result in minimal quantities of IDW. Because soil cuttings will be from areas which are believed to be below RBTLs and the volume will be

minimal, soil cuttings will be placed back in the soil excavation areas. Decontamination water generated during the sampling and excavation equipment decontamination process will be containerized in appropriately labeled 55-gallon drums and staged on-Site at a location determined by Umicore pending subsequent disposal at a permitted facility. IDW water may be placed in the on-Site wastewater treatment plant if appropriate. For waste characterization and disposal purposes, one composite water sample will be collected from the IDW drums for TCLP metals and total cobalt, manganese, and nickel.

11.1.8 Surveying

Prior to excavation activities, soil sample locations will be staked or marked in the field by the registered professional land surveyor. Following the completion of excavation activities and post-excavation confirmation soil sampling, the extent of the excavation area and each post-excavation confirmation soil sample location will be surveyed by the professional land surveyor so that sample locations can be accurately identified on maps and for future reference.

11.2 Land Use Restrictions

Upon approval of the land use restrictions by ADEM, recordation of the land use restrictions will be completed.

To be protective of human health and the environment, the land use restrictions proposed for the Site include the following:

- Preclusion of the real property for all purposes other than industrial and commercial uses.
- Groundwater use restriction prohibiting the installation of water supply wells for all uses including those for non-potable purposes.

The above land use restrictions will be recorded with the Marshall County Register of Deeds.

11.3 Land Use Restriction Inspection Plan

No less than annually, the owner of the real property or one of its authorized representatives shall conduct a site inspection to ensure the recorded land use restrictions are still in effect and that the Site is not in violation of the land use restrictions. Following each site inspection, the owner of the real property or one of its authorized representatives will submit a signed and notarized statement stating that the Site is not in violation of the recorded land use restrictions. The owner of the real property or one of its authorized representatives will be responsible for enforcing the recorded land use restrictions for the property. If the owner of the real property or one of its authorized representatives discovers a violation of the land use restrictions, the owner shall take immediate action including notifying ADEM of the violation(s).

11.4 Proposed Groundwater Monitoring Activities

To verify soil removal effectiveness and confirm that groundwater impacts do not migrate above the RBTLs in the sentry wells, semi-annual groundwater monitoring activities are proposed to be conducted at the Site for a period of two years following completion of the soil removal activities. The semi-annual groundwater monitoring will consist of the following:

- Gauging depth to water in all Site monitoring wells;
- Purging and sampling of eight Site monitoring wells (MW-1, MW-1D, MW-5R, MW-5D, MW-3R, MW-3DR, MW-10, and MW-10D) for cadmium, cobalt, manganese, and nickel using EPA Method 6010;
- Submitting one trip blank, one duplicate groundwater sample, and one set of MS/MSD samples for analysis of cadmium, cobalt, manganese, and nickel by EPA Method 6010 for quality assurance purposes; and
- Containerizing and storing water from the monitoring wells for subsequent disposal at a permitted facility or in the on-Site wastewater treatment plant.

Monitoring well sampling methods will be conducted in accordance with standard procedures as presented in ADEM Guidance and EPA Region 4 SESD Guidance. Monitoring well

development, purging, and sampling will be conducted with dedicated Teflon bailers and/or a peristaltic pump or bladder pump with new polyethylene tubing. Low-flow sampling techniques using either a peristaltic pump or bladder pump will be used to minimize sample turbidity and the potential for suspended sediment to impact the metal results. As part of the sampling process, field measurements will be obtained for dissolved oxygen, pH, specific conductance, temperature, and turbidity with properly calibrated field instruments. Sampling will not be conducted until the turbidity is less than 10 NTUs.

Upon the completion of the groundwater sampling field work and within 60 days of receipt of the laboratory analytical data, Umicore will submit a Semi-Annual Groundwater Monitoring Report to ADEM. As proposed, four Semi-Annual Groundwater Monitoring Reports will be submitted following the completion of the proposed soil removal activities. The reports will include a description of groundwater sampling locations, sample methodology, groundwater sampling datasheets, laboratory analytical reports, tabular summaries of the groundwater data, and recommendations and conclusions. The reports will also include updated potentiometric and groundwater concentration maps for the Site.

12.0 Schedule

The schedule for the proposed remedial activities is dependent upon receipt of cleanup plan approval from ADEM. However, H&H anticipates that the remedial activities can be initiated within 30 days following ADEM approval of this Cleanup Plan and completion of public notice activities, and that the proposed remedial activities can be completed within a 30 to 60 day time period. Following completion of the field remedial activities and within 120 days following receipt of final analytical data, Umicore will submit a Remedial Action Report to ADEM which includes a summary of the remedial activities and data. The deliverable will include a description of the remedial activities, post-excavation confirmation soil sampling locations, sample methodologies, implementation of the land use restrictions, and conclusions. The deliverable will also include a tabular summary of post-excavation confirmation soil sampling results, laboratory analytical reports, and surveys of the excavation areas and post-excavation confirmation sampling locations as well as areas of soil and groundwater impacts which will remain at the Site above unrestricted use levels.

Table 1 (Page 1 of 9)
Summary of Soil Sampling and Analysis
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
BG-1 through BG-5	Background Location	5/29/2013	2	0-1 and 1-2	PPMs, Co, and Mn	--
SS-01A	Primary Sample Location	6/3/2013	3	0-1 and 1-2	Cd, Co, Mn, and Ni	Cd & Ni (0-1)
		6/3/2013		2-3	Co and Mn	--
SS-06	Previously Sampled Location	6/1/2013	6	0-1	Cd, Co, Mn, Ni, Se, Cr and Cr VI	--
		6/1/2013		2-3	Cd, Co, Mn, Ni, Se, and Cr	--
		6/1/2013		5-6	Co	--
SS-06A	Primary Sample Location	6/2/2013	3	0-1	Cd, Co, Mn, and Ni	Cd (0-1)
		6/2/2013		1-2	Cd, Co, and Mn	--
		6/2/2013		2-3	Co	--
SS-06B	Primary Sample Location	6/2/2013	3	0-1	Cd, Co, Mn, Ni, and Se	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-06C	Provisional Sample Location	6/2/2013	2	1-2	Cd, Co, and Mn	--
SS-11	Previously Sampled Location	6/1/2013	5	0-1	Cd, Co, Mn, Ni, Se, Cr, and Cr VI	Ni (0-1)
		6/1/2013		2-3	Cd, Co, Mn, Ni, Se, and Cr	--
		6/1/2013		4-5	Co	--
SS-11A	Primary Sample Location	6/2/2013	3	0-1	As, Cd, Co, Mn, and Ni	Mn (0-1)
		6/2/2013		1-2	As, Co, and Mn	--
		6/2/2013		2-3	Co	Co (2-3)
SS-11B	Primary Sample Location	6/4/2013	3	0-1	Co, Mn, Ni, and Se	Mn & Ni (0-1 & 1-2)
		6/4/2013		1-2 and 2-3	Co, Mn, and Ni	Co (2-3)
SS-11C	Provisional Sample Location	6/2/2013	2	1-2	Co, Mn, and Ni	--
SS-14	Previously Sampled Location	6/1/2013	7	0-1	Cd, Co, Mn, Ni, Cr, and Cr VI	Cd & Mn (0-1)
		6/1/2013		2-3	Cd, Co, Mn, Ni, and Cr	--
		6/1/2013		5-6 and 6-7	Co	--
SS-14A/18D	Primary Sample Location	6/4/2013	3	0-1	As, Cd, Co, Mn, and Ni	Cd & Co (0-1)
		6/3/2013		1-2	Cd, Co, Mn, and Ni	Co (1-2)
		6/4/2013		2-3	As, Co, and Mn	Co & Mn (2-3)
SS-14B	Primary Sample Location	6/4/2013	3	0-1 and 1-2	Cd, Co, Mn, Ni, and Se	Mn & Ni (0-1)
		6/4/2013		2-3	Co	Co (2-3)
SS-14C	Provisional Sample Location	6/2/2013	2	1-2	Co, Mn, and Ni	--
SS-14D	Provisional Sample Location	6/3/2013	2	1-2	Co, Mn, and Ni	--
SS-17	Previously Sampled Location	6/1/2013	5	0-1	As, Cd, Co, Mn, Ni, Se, Cr, and Cr VI	--
		6/1/2013		2-3	Co, Mn, Ni, and Cr	--
		6/1/2013		4-5	Co	--
SS-17A	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-17B	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-17C	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-17E	Provisional Sample Location	6/3/2013	2	1-2	Co and Mn	--
SS-18	Previously Sampled Location	6/1/2013	5	0-1	Co, Mn, Ni, Cr, and Cr VI	--
		6/1/2013		2-3	Co, Mn, Ni, and Cr	--
		6/1/2013		4-5	Co	Co (4-5)
SS-18A	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	Co (0-1)
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	Co (2-3)
SS-18B	Primary Sample Location	6/2/2013	3	0-1	Cd, Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-18C	Provisional Sample Location	6/2/2013	2	1-2	Co and Mn	--

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Summary of Soil Sampling and Analysis
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
SS-22	Previously Sampled Location	6/1/2013	4	0-1	Co, Mn, Ni, Cr, and Cr VI	--
		6/1/2013		2-3 and 3-4	Co and Mn	--
SS-22A	Primary Sample Location	6/2/2013	3	0-1 and 1-2	Co, Mn, and Ni	--
		6/2/2013		2-3	Co	Co (2-3)
SS-22B	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co and Mn	Mn (1-2 & 2-3)
SS-24	Primary Sample Location	11/22/2014	3	0-1	Co and Cd	--
		11/22/2014		1-2 and 2-3	Co	--
SS-24A	Primary Sample Location	6/1/2013	2	1-2	Co, Mn, and Ni	--
SS-24B	Primary Sample Location	6/1/2013	2	1-2	Co, Mn, and Ni	Mn (1-2)
SS-25	Previously Sampled Location	5/31/2013	7	0-1	Co, Mn, Ni, Cr, and Cr VI	--
		5/31/2013		2-3	Co, Mn, Ni, and Cr	--
		5/31/2013		5-6	Co	--
		5/31/2013		6-7	Not analyzed	--
SS-25A	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-25B	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-25C	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-25D	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-25E	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-25F	Provisional Sample Location	6/3/2013	2	1-2	Co	--
SS-25G	Provisional Sample Location	6/1/2013	2	0-1 and 1-2	Co	--
SS-26	Previously Sampled Location	5/31/2013	9	0-1	Co, Mn, Ni, Cr, and Cr VI	--
		5/31/2013		2-3	Co, Mn, Ni, and Cr	--
		5/31/2013		5-6 and 8-9	Not analyzed	--
SS-26A	Primary Sample Location	6/1/2013	3	0-1 and 1-2	Co, Mn, and Ni	Co (0-1), Mn (1-2)
		6/1/2013		2-3	Co and Mn	--
SS-26B	Primary Sample Location	5/31/2013	3	0-1	Co, Mn, and Ni	Mn (0-1)
		5/31/2013		1-2	Co and Mn	--
		5/31/2013		2-3	Co	--
SS-26C	Provisional Sample Location	6/1/2013	2	1-2	Co, Mn, and Ni	--
SS-26D	Provisional Sample Location	5/31/2013	2	0-1	Co and Mn	--
		5/31/2013		1-2	Co	--
SS-26E	Provisional Sample Location	6/3/2013	2	1-2	Co, Mn, and Ni	--
SS-26F	Provisional Sample Location	6/1/2013	2	0-1 and 1-2	Co	Co (0-1)
SS-27	Previously Sampled Location	6/1/2013	1	0-1	As, Co, Mn, Ni, Cr, and Cr VI	Mn (0-1)
SS-27A	Primary Sample Location	6/1/2013	1	0-1	As, Co, Mn, and Ni	--
SS-27B	Primary Sample Location	6/1/2013	1	0-1	As, Co, Mn, and Ni	--
SS-27C	Primary Sample Location	6/1/2013	1	0-1	As, Co, Mn, and Ni	--
SS-27D	Primary Sample Location	6/1/2013	1	0-1	As, Co, Mn, and Ni	--
SS-27E	Provisional Sample Location	6/1/2013	2	1-2	Co, Mn, and Ni	Mn (1-2)
SS-27F	Provisional Sample Location	6/4/2013	2	1-2	Co	--
SS-27G	Provisional Sample Location	6/1/2013	1	0-1	Co	--
SS-27H	Provisional Sample Location	6/1/2013	0.5	0-0.5	Co	--
SS-28	Previously Sampled Location	6/1/2013	9	0-1	Co, Mn, Ni, Cr, and Cr VI	--
		6/1/2013		2-3	Co, Mn, Ni, and Cr	--
		6/1/2013		5-6 and 8-9	Co	--
SS-28A	Primary Sample Location	6/3/2013	3	0-1	Co, Mn, and Ni	--
		6/3/2013		1-2	Co and Mn	--
		6/3/2013		2-3	Co	--
SS-28B	Primary Sample Location	6/3/2013	3	0-1	Co, Mn, and Ni	--
		6/3/2013		1-2	Co	--
		6/3/2013		2-3	Not analyzed	--
SS-28C	Provisional Sample Location	6/3/2013	2	1-2	Co and Mn	

Table 1 (Page 3 of 9)
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Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
SS-28D	Provisional Sample Location	6/3/2013	2	1-2	Co	--
SS-31	Primary Sample Location	6/3/2013	2	0-1 and 1-2	Co, Mn, and Ni	--
		6/3/2013		1-2	Co	--
SS-31A	Provisional Sample Location	6/3/2013	3	0-1	Co, Mn, and Ni	--
		6/3/2013		1-2 and 2-3	Co	--
SS-31B	Provisional Sample Location	6/21/2013	2	0-1	Co, Mn, and Ni	--
		6/21/2013		1-2	Co	--
SS-31C	Provisional Sample Location	6/4/2013	2	1-2	Co	--
SS-31D	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-31E	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-32	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-32A	Provisional Sample Location	6/2/2013	3	0-1, 1-2, and 2-3	Co	--
SS-33	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co	--
		6/2/2013		2-3	Not analyzed	--
SS-33A	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-33B	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-33C	Provisional Sample Location	6/2/2013	2	1-2	Co	--
SS-34	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-35	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-35A	Provisional Sample Location	6/2/2013	2	1-2	Co and Mn	--
SS-36	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2 and 2-3	Co	--
SS-37	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-38	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	Mn (0-1)
		6/2/2013		1-2 and 2-3	Co and Mn	Mn (1-2)
SS-39	Primary Sample Location	6/2/2013	3	0-1	Co, Mn, and Ni	--
		6/2/2013		1-2	Co and Mn	--
		6/2/2013		2-3	Co	--
SS-41	Primary Sample Location	6/1/2013	3	0-1	Co, Mn, and Ni	--
		6/1/2013		1-2 and 2-3	Co	Co (2-3)
SS-42	Primary Sample Location	5/30/2013	3	0-1	Co, Mn, and Ni	--
		5/30/2013		1-2 and 2-3	Co	--
SS-42A	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co	--
		9/16/2013		2-3	Not analyzed	--
SS-42B	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co	--
		9/16/2013		2-3	Not analyzed	--
SS-42C	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co	--
		9/16/2013		2-3	Not analyzed	--
SS-42D	Primary Sample Location	9/16/2013	3	0-1	Co, Mn, and Ni	--
		9/16/2013		1-2	Co	--
		9/16/2013		2-3	Not analyzed	--
SS-42E	Provisional Sample Location	9/16/2013	3	0-1	Co	--
		9/16/2013		1-2 and 2-3	Not analyzed	--
SS-42F	Provisional Sample Location	9/16/2013	3	0-1	Co, Mn, and Ni	--
		9/16/2013		1-2 and 2-3	Co	--
SS-43	Primary Sample Location	5/31/2013	3	0-1 and 1-2	Co, Mn, and Ni	Co (0-1)
		5/31/2013		2-3	Co	--
SS-43A	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co, Mn, and Ni	--
		9/16/2013		2-3	Co	--

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SS-43B	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co, Mn, and Ni	--
		9/16/2013		2-3	Not analyzed	--
SS-43C	Primary Sample Location	9/16/2013	3	0-1 and 1-2	Co, Mn, and Ni	--
		9/16/2013		2-3	Not analyzed	--
SS-43D	Primary Sample Location	9/16/2013	3	0-1	Co, Mn, and Ni	--
		9/16/2013		1-2	Co	--
		9/16/2013		2-3	Not analyzed	--
SS-44	Primary Sample Location	5/31/2013	3	0-1 and 1-2	Co, Mn, and Ni	Co (1-2)
		5/31/2013		2-3	Co	--
SS-44A	Primary Sample Location	5/31/2013	3	0-1 and 1-2	Co, Mn, and Ni	Ni (0-1)
		5/31/2013		2-3	Co	--
SS-44B	Provisional Sample Location	11/23/2014	3	0-1	Co and NI	--
		11/23/2014		1-2	Co	--
		11/23/2014		2-3	Not analyzed	--
SS-44C	Provisional Sample Location	11/23/2014	3	0-1	Co and Ni	--
		11/23/2014		1-2	Co	--
		11/23/2014		2-3	Not analyzed	--
SS-44D	Provisional Sample Location	11/23/2014	3	0-1	Co and Ni	--
		11/23/2014		1-2	Co	--
		11/23/2014		2-3	Co and Ni	--
SS-44E	Provisional Sample Location	11/23/2014	3	0-1	Co	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-44F	Provisional Sample Location	11/23/2014	3	0-1	Co	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-44G	Provisional Sample Location	11/23/2014	3	0-1	Co	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-45	Primary Sample Location	5/31/2013	3	0-1 and 1-2	Co, Mn, and Ni	--
		5/31/2013		2-3	Not analyzed	--
SS-45A	Provisional Sample Location	11/23/2014	3	0-1	Co and NI	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-45B	Provisional Sample Location	11/23/2014	3	0-1	Co and Ni	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-45C	Provisional Sample Location	11/23/2014	3	0-1	Co and Ni	--
		11/23/2014		1-2	Co and Ni	--
		11/23/2014		2-3	Not analyzed	--
SS-45D	Provisional Sample Location	11/23/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-45E	Provisional Sample Location	11/23/2014	3	0-1	Co and Ni	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-46	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	--
SS-47	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	--
SS-48	Building 16 - Primary Sample Location	5/31/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	Co (1-2)
SS-49	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	Co (1-2)
SS-50	Building 16 - Primary Sample Location	5/31/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/30/2013		1-2	Co	--
SS-51	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	--
SS-52	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Co	--
SS-52A	Building 16 - Primary Sample Location	5/30/2013	2	0-1	Co	--
		5/30/2013		1-2	Not analyzed	--
SS-53	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/30/2013		1-2	Co	--

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SS-53A	Building 16 - Primary Sample Location	5/30/2013	2	0-1	Co	--
		5/30/2013		1-2	Co	--
SS-53B	Building 16 - Primary Sample Location	5/31/2013	2	0-1	Co and Cr VI	--
		5/31/2013		1-2	Co	--
SS-53C	Building 16 - Primary Sample Location	5/30/2013	2	0-1	Co and Cr VI	--
		5/30/2013		1-2	Co	--
SS-54	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Not analyzed	--
SS-55	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/31/2013		1-2	Not analyzed	--
SS-56	Building 16 - Primary Sample Location	5/30/2013	2	0-1	As, Cd, Cr, Co, Mn, Ni, and Cr VI	--
		5/30/2013		1-2	Not analyzed	--
SS-57	Primary Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Co	--
SS-58	Primary Sample Location	11/24/2014	2.5	0-1, 1-2, and 2-2.5	Co	--
SS-59	Primary Sample Location	11/24/2014	3	0-1 and 1-2	Co	--
		11/24/2014		2-3	Not analyzed	--
SS-59A	Provisional Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-60	Primary Sample Location	11/24/2014	2.5	0-1 and 1-2	Co	--
		11/24/2014		2-2.5	Not analyzed	--
SS-60A	Primary Sample Location	11/24/2014	2.5	0-1	Co	--
		11/24/2014		1-2 and 2-2.5	Not analyzed	--
SS-60B	Primary Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-61	Primary Sample Location	11/24/2014	3	0-1 and 1-2	Co	--
		11/24/2014		2-3	Not analyzed	--
SS-61A	Provisional Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-62	Primary Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-62A	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-63	Primary Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-63A	Provisional Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-64	Primary Sample Location	11/24/2014	3	0-1	Co	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-64A	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-65	Primary Sample Location	11/24/2014	3	0-1	Co and Cd	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-66	Primary Sample Location	11/24/2014	3	0-1	Co and Cd	--
		11/24/2014		1-2	Cd	--
		11/24/2014		2-3	Not analyzed	--
SS-67	Primary Sample Location	11/24/2014	3	0-1	Co and Cd	--
		11/24/2014		1-2 and 2-3	Not analyzed	--
SS-67A	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-67B	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-67C	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-67D	Provisional Sample Location	11/24/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-68	Primary Sample Location	11/21/2014	3	0-1	Co and Cd	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-68A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-69	Primary Sample Location	11/21/2014	3	0-1 and 1-2	Co and Cd	--
		11/21/2014		2-3	Not analyzed	--
SS-69A	Provisional Sample Location	11/21/2014	3	0-1	Co and Cd	--
		11/21/2014		1-2	Cd	--
		11/21/2014		2-3	Not analyzed	--

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Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
SS-70	Primary Sample Location	11/21/2014	3	0-1	Co and Cd	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-71	Primary Sample Location	11/21/2014	3	0-1	Co and Cd	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-71A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-72	Primary Sample Location	11/21/2014	3	0-1	Co	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-72A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-73	Primary Sample Location	11/21/2014	3	0-1	Co	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-74	Primary Sample Location	11/21/2014	5	0-1	Co, Cd, Mn, and Ni	--
		11/21/2014		1-2, 2-3, and 3-4	Co and Cd	--
		11/21/2014		4-5	Cd	--
SS-75	Primary Sample Location	11/21/2014	5	0-1 and 1-2	Co, Cd, Mn, and Ni	--
		11/21/2014		2-3 and 3-4	Co, Cd, and Ni	--
		11/21/2014		4-5	Not analyzed	--
SS-76	Primary Sample Location	11/21/2014	2	0-1	Co, Cd, Mn, and Ni	--
		11/21/2014		1-2	Not analyzed	--
SS-78	Primary Sample Location	11/21/2014	5	0-1	Co and Cd	--
		11/21/2014		1-2, 2-3, 3-4, and 4-5	Not analyzed	--
SS-78A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-79	Primary Sample Location	11/21/2014	3	0-1	Co, Cd, Mn, and Ni	--
		11/21/2014		1-2 and 2-3	Not analyzed	--
SS-79A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-80	Primary Sample Location	11/22/2014	2	0-1	Co, Cd, Mn, and Ni	--
		11/22/2014		1-2	Not analyzed	--
SS-80A	Provisional Sample Location	11/21/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-82	Primary Sample Location	11/22/2014	2	0-1	Co, Cd, Mn, and Ni	--
		11/22/2014		1-2	Not analyzed	--
SS-82A	Provisional Sample Location	11/22/2014	2.5	0-1, 1-2, and 2-2.5	Not analyzed	--
SS-82B	Provisional Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-87	Primary Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Co	--
SS-87A	Provisional Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-88	Primary Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Co	--
SS-88A	Provisional Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-89	Primary Sample Location	11/22/2014	2.5	0-1 and 1-2	Co	--
		11/22/2014		2-2.5	Not analyzed	--
SS-90	Primary Sample Location	11/22/2014	3	0-1 and 1-2	Co	--
		11/22/2014		2-3	Not analyzed	--
SS-90A	Provisional Sample Location	11/22/2014	3	0-1 and 1-2	Co	--
		11/22/2014		2-3	Not analyzed	--
SS-91	Primary Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Co	--
SS-92	Primary Sample Location	11/22/2014	1	0-1	Co	--
SS-93	Primary Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-93A	Provisional Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-94	Primary Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-94A	Provisional Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-95	Primary Sample Location	11/22/2014	3	0-1 and 1-2	Co	--
		11/22/2014		2-3	Not analyzed	--
SS-95A	Provisional Sample Location	11/22/2014	2	0-1 and 1-2	Co	--
SS-95B	Provisional Sample Location	11/22/2014	2.25	0-1	Co	--
		11/22/2014		1-2 and 2-2.25	Not analyzed	--
SS-95C	Provisional Sample Location	11/22/2014	2	0-1 and 1-2	Co	--

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Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
SS-96	Primary Sample Location	11/22/2014	3	0-1 and 1-2	Co	--
		11/22/2014		2-3	Not analyzed	--
SS-96A	Provisional Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-97	Primary Sample Location	11/20/2014	3	0-1	Co and Mn	--
		11/20/2014		1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-98	Primary Sample Location	11/20/2014	3	0-1	Co and Mn	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-98A	Provisional Sample Location	11/20/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-99	Primary Sample Location	11/20/2014	3	0-1	Co and Mn	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-99A	Provisional Sample Location	11/20/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-100	Primary Sample Location	11/20/2014	3	0-1	Co and Mn	--
		11/20/2014		1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-100A	Provisional Sample Location	11/20/2014	3	0-1 and 1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-101	Primary Sample Location	11/20/2014	3	0-1	Co and Mn	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-101A	Provisional Sample Location	11/20/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-101B	Provisional Sample Location	11/20/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-102	Primary Sample Location	11/20/2014	3	0-1 and 1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-102A	Provisional Sample Location	11/20/2014	3	0-1	Co	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-103	Primary Sample Location	11/20/2014	3	0-1	Co	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-104	Primary Sample Location	11/20/2014	3	0-1 and 1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-104A	Provisional Sample Location	11/20/2014	3	0-1, 1-2, and 2-3	Co	--
SS-105	Primary Sample Location	11/20/2014	3	0-1 and 1-2	Co	--
		11/20/2014		2-3	Not analyzed	--
SS-105A	Provisional Sample Location	11/20/2014	3	0-1	Co	--
		11/20/2014		1-2 and 2-3	Not analyzed	--
SS-106	Primary Sample Location	11/20/2014	2	0-1	Co and Mn	--
		11/20/2014		1-2	Co	--
SS-107	Primary Sample Location	11/20/2014	2	0-1	Co and Mn	--
		11/20/2014		1-2	Not analyzed	--
SS-107A	Provosional Sample Location	11/20/2014	2	0-1 and 1-2	Not analyzed	--
SS-108	Primary Sample Location	11/20/2014	2	0-1	Co and Mn	--
		11/20/2014		1-2	Co	--
SS-108A	Provisional Sample Location	11/20/2014	1.5	0-1 and 1-1.5	Co	--
SS-109	Primary Sample Location	11/20/2014	2	0-1	Co	--
		11/20/2014		1-2	Not analyzed	--
SS-109A	Provisional Sample Location	11/20/2014	1.75	0-1 and 1-1.75	Not analyzed	--
SS-110	Primary Sample Location	11/20/2014	1	0-1	Co	--
SS-110A	Provisional Sample Location	11/20/2014	1.5	0-1 and 1-1.5	Not analyzed	--
SS-111	Primary Sample Location	11/20/2014	1	0-1	Co	--
SS-111A	Provisional Sample Location	11/20/2014	2	0-1 and 1-2	Not analyzed	--
SS-112	Primary Sample Location	11/22/2014	1.5	0-1 and 1-1.5	Co	--
SS-113	Primary Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-113A	Provisional Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-114	Primary Sample Location	11/22/2014	1.5	0-1 and 1-1.5	Co	--
SS-114A	Provisional Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--

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SS-114B	Provisional Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-115	Primary Sample Location	11/22/2014	3	0-1	Co	--
		11/22/2014		1-2 and 2-3	Not analyzed	--
SS-115A	Provisional Sample Location	11/22/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-116	Primary Sample Location	11/23/2014	3	0-1	Co, Ni, and Mn	--
		11/23/2014		1-2 and 2-3	Mn	--
SS-116A	Primary Sample Location	11/23/2014	3	0-1	Mn	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-116B	Primary Sample Location	11/23/2014	3	0-1	Mn	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-116C	Primary Sample Location	11/23/2014	3	0-1	Mn	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-117	Primary Sample Location	11/23/2014	3	0-1	Co, Ni, and Mn	--
		11/23/2014		1-2 and 2-3	Not analyzed	--
SS-117A	Primary Sample Location	11/23/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-117B	Primary Sample Location	11/23/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-117C	Primary Sample Location	11/23/2014	3	0-1, 1-2, and 2-3	Not analyzed	--
SS-118	Primary Sample Location	5/20/2015	3	0-1 and 1-2	Cd, Co, Ni, and Mn	--
		5/20/2015		2-3	Not analyzed	--
SS-118A	Provisional Sample Location	5/20/2015	2	0-1 and 1-2	Cd and Co	--
SS-118B	Provisional Sample Location	5/20/2015	2	0-1 and 1-2	Cd and Co	--
SS-118C	Provisional Sample Location	5/20/2015	2	0-1 and 1-2	Cd and Co	
SS-119	Primary Sample Location	5/20/2015	3	0-1 and 1-2	Cd, Co, Ni, and Mn	--
		5/20/2015		2-3	Not analyzed	--
SS-119A	Provisional Sample Location	5/20/2015	2	0-1	Cd and Co	--
		5/20/2015		1-2	Not analyzed	--
SS-119B	Provisional Sample Location	5/20/2015	2	0-1	Cd and Co	--
		5/20/2015		1-2	Cd	--
SS-120	Primary Sample Location	5/20/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/20/2015		1-2 and 2-3	Not analyzed	--
SS-120A	Provisional Sample Location	5/20/2015	2	0-1 and 1-2	Not analyzed	--
SS-120B/SS-42	Collocated Confirmation Sample Location	5/20/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/20/2015		1-2 and 2-3	Not analyzed	--
SS-120C/SS-42B	Collocated Confirmation Sample Location	5/20/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/20/2015		1-2 and 2-3	Not analyzed	--
SS-121	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2	Cd	--
		5/19/2015		2-3	Not analyzed	--
SS-121A/SS-42A	Collocated Confirmation Sample Location	5/19/2015	2	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2	Not analyzed	--
SS-121B	Provisional Sample Location	5/19/2015	2	0-1	Cd	--
		5/19/2015		1-2	Not analyzed	--
SS-122/SS-42C	Collocated Confirmation Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-122A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-122B	Provisional Sample Location	5/19/2015	1	0-1	Not analyzed	--
SS-123/SS-42D	Collocated Confirmation Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-123A/SS-43B	Collocated Confirmation Sample Location	5/19/2015	2	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2	Not analyzed	--
SS-123B/SS-42F	Collocated Confirmation Sample Location	5/19/2015	2	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2	Not analyzed	--
SS-124	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2	Cd and Co	--
		5/19/2015		2-3	Not analyzed	--

Table 1 (Page 9 of 9)
Summary of Soil Sampling and Analysis
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Boring/Sample ID	Location	Date	Boring Depth (ft)	Soil Sample Depth Intervals (ft)	Laboratory Analysis	SPLP Analysis
SS-124A	Provisional Sample Location	5/19/2015	2	0-1	Cd and Co	--
		5/19/2015		1-2	Not analyzed	--
SS-124B	Provisional Sample Location	5/19/2015	2	0-1	Cd and Co	--
		5/19/2015		1-2	Not analyzed	--
SS-125	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-125A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-125B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-126	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-126A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-126B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-126C	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-127	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-127A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-127B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-127C	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-128	Primary Sample Location	5/19/2015	1	0-1	Cd, Co, Ni, and Mn	--
SS-128A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-128B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-129	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-129A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-129B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-129C	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-129D	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-130	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-130A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-130B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-131	Primary Sample Location	5/19/2015	3	0-1	Cd, Co, Ni, and Mn	--
		5/19/2015		1-2 and 2-3	Not analyzed	--
SS-131A	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-131B	Provisional Sample Location	5/19/2015	2	0-1 and 1-2	Not analyzed	--
SS-132	Primary Sample Location	5/18/2015	2	0-1	Cd, Co, Ni, and Mn	--
		5/18/2015		1-2	Not analyzed	--
SS-132A	Provisional Sample Location	5/18/2015	2	0-1 and 1-2	Not analyzed	--
SS-132B	Provisional Sample Location	5/18/2015	2	0-1 and 1-2	Not analyzed	--

Notes:
PPMs = Priority Pollutant Metals = antimony (Sb), arsenic (As), beryllium (Be), cadmium (Cd), chromium (Cr), copper (Cu), nickel (Ni), lead (Pb), selenium (Se), silver (Ag), thallium (Th), zinc (Zn), and mercury (Hg)
Co = cobalt; Mn = manganese
Cr VI = hexavalent chromium
SPLP = synthetic precipitation leaching procedure

Table 2 (Page 1 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-01		SS-01A			SS-02		SS-03		SS-04		SS-05		SS-06	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-01	SS-01-1FT	SS-01A (0-1')	SS-01A (1-2')	SS-01A (2-3')	SS-02	SS-02-1FT	SS-03	SS-03-1FT	SS-04	SS-04-1FT	SS-05	SS-05-1FT	SS-06	SS-06-1FT
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-2"	12-15"	0-1'	1-2'	2-3'	0-2"	12-15"	0-2"	12-15"	0-2"	12-15"	0-2"	12-15"	0-2"	12-15"
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	2/28/2012	2/29/2012	6/3/2013	6/3/2013	6/3/2013	2/28/2012	2/29/2012	2/28/2012	2/29/2012	2/28/2012	2/29/2012	2/28/2012	2/29/2012	2/28/2012	2/29/2012
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	<0.580	--	--	--	--	<0.527	--	<0.529	--	<0.577	--	0.672 J	--	1.01 J	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	3.02 J	2.61 J	--	--	--	5.30 J	4.16 J	3.76 J	2.90 J	2.93 J	1.58J	2.23 J	1.29 J	2.18 J	1.63 J
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	0.109 J	--	--	--	--	0.320 J	--	0.166 J	--	0.0846 J	--	0.185 J	--	0.138 J	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	58.2	--	**9.93**	7.52	--	7.82	--	2.00	--	16.8	--	5.81	--	47.8	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	11.8	9.79	--	--	--	58.0	10.8	11.5	8.57	18.5	5.10 J	8.26	4.05 J	56.9	7.63
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	9.45	--	--	--	--	27.1	--	5.92	--	32.0	--	4.05	--	123	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	74.7	5.99	414	337	--	52.6	10.5	15.1	5.53	218	30.6	83.8	5.11 J	512	45.1
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	8.21	--	--	--	--	10.7	--	16.1	--	11.8	--	10.3	--	20.3	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	<0.924	--	--	--	--	<0.839	--	<0.843	--	2.44 J	--	<1.00	--	7.81	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	1.070	30.5	**914**	**868**	86.3	1.740	74.4	174	7.82	8.450	190	539	39.9	22.900	542
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	0.0973 J	--	--	--	--	0.0994 J	--	0.0444 J	--	0.447 J	--	<0.0395	--	1.35 J	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	<0.484	--	--	--	--	<0.439	--	<0.441	--	<0.481	--	<0.525	--	1.18 J	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	57.9 J	--	--	--	--	72.9 J	--	28.8 J	--	174	--	31.7 J	--	357	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	1,410	61.6	**700**	**887**	114	1,130	204	364	95.0	5,870	89.9	293	40.6	14,400	315
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	0.0647	--	--	--	--	0.0393 J	--	0.0484 J	--	0.111	--	0.0724	--	0.237	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA

* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 2 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location										SS-06 (continued)			SS-06A			SS-06B			SS-06C	SS-07		SS-08		
Sample ID	Industrial	Protection of Groundwater	Protection of Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-06 (0-1')	SS-06 (2-3')	SS-06 (5-6')	SS-06A (0-1')	SS-06A (1-2')	SS-06A (2-3')	SS-06B (0-1')	SS-06B (1-2')	SS-06B (2-3')	SS-06C (1-2')	SS-07	SS-07-1FT	SS-08	SS-29	SS-30
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	2-3'	5-6'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	0-2"	12-15"	0-2"	0-2"	0-2"
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/1/2013	6/1/2013	6/1/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	2/28/2012	2/29/2012	2/28/2012	2/28/2012	2/28/2012
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	<0.517	--	0.641 J	<0.542	0.674 J
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	4.80 J	3.37 J	4.15 J	4.20 J	5.36 J
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	0.325 J	--	0.123 J	0.144 J	0.126 J
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	4.47	<1.39	--	**17.9**	2.38	--	4.35	--	--	2.44	14.0	--	6.71	4.60	9.20
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	7.79	9.80	--	--	--	--	--	--	--	--	46.0	11.5	109	46.1	204
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	12.3	--	37.9	24.9	41.3
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	34.5	10.9	--	90.6	--	--	118	--	--	--	307	78.6	734	315	529
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	18.2	--	21.4	11.9	34.2
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	<2.35	<2.78	--				<2.36	--	--	--	<0.824	--	5.16 J	<0.863	<0.868
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**635**	7.61	3.30	**281**	29.3	33.6	**1,000**	157	46.6	32.6	1.110	895	1.810	1.680	2.350
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	0.315 J	--	0.813 J	0.136 J	0.206 J
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	<0.432	--	<0.490	<0.452	<0.455
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	169	--	165	133	138
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	537	50.2	--	1,070	83.3	--	1,480	365	--	132	1,200	2,020	11,300	1,460	1,040
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	0.0919	--	0.0416	0.0775	0.0506 J
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	<3.06	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	7.79	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
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Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 3 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-09	SS-10		SS-11					SS-11A			SS-11B			SS-11C
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background		Published Background[2]				SS-09	SS-10	SS-10-1FT	SS-11	SS-11-1FT	SS-11 (0-1')	SS-11 (2-3')	SS-11 (4-5')	SS-11A (0-1')	SS-11A (1-2')	SS-11A (2-3')	SS-11B (0-1')	SS-11B (1-2')	SS-11B (2-3')	SS-11C (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations						0-2"	0-2"	12-15"	0-2"	12-15"	0-1'	2-3'	4-5'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	2/28/2012	2/28/2012	2/29/2012	2/28/2012	2/29/2012	6/1/2013	6/1/2013	6/1/2013	6/2/2013	6/2/2013	6/2/2013	6/4/2013	6/4/2013	6/4/2013	6/2/2013
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	<0.764	<0.539	--	1.63 J	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	3.12 J	2.52 J	2.79 J	1.79 J	1.76 J	--	--	--	4.55	<2.46	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	0.0961 J	0.147 J	--	0.179 J	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	6.49	43.6	--	27.4	--	5.55	<1.27	--	7.02	--	--	--			--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	16.0	30.4	14.3	136	8.70	12.5	8.63	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	11.1	17.1	--	76.3	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	199	508	657	7,200	454	518	23.5	--	126	--	--	**924**	**719**	45.1	5.98
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	32.3	11.1	--	40.0	--	--	--	--		--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	<1.22	<0.859	--	44.6	--	<2.41	<2.54	--	--	--	--	<2.58	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	3.360	1.660	711	11.900	554	**650**	39.1	<2.36	**869**	180	90.3	**1,170**	**358**	43.1	20.6
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	0.128 J	0.136 J	--	4.71 J	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	1.41 J	<0.450	--	<0.475	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	97.3 J	197	--	620	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	639	1,170	651	67,200	364	1,070	60.7	--	1,080	153	--	2,570	988	158	237
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	0.0733	0.0381 J	--	0.0989	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	<2.56	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	12.5	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 4 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-12		SS-13		SS-14						SS-14A/18D			SS-14B		
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-12	SS-12-1FT	SS-13	SS-13-1FT	SS-14	SS-14-1FT	SS-14 (0-1')	SS-14 (2-3')	SS-14 (5-6')	SS-14 (6-7')	SS-14A/18D (0-1')	SS-14A/18D (1-2')	SS-14A/18D (2-3')	SS-14B (0-1')	SS-14B (1-2')	SS-14B (2-3')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-2"	12-15"	0-2"	12-15"	0-2"	12-15"	0-1'	2-3'	5-6'	6-7'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	2/28/2012	2/29/2012	2/28/2012	2/29/2012	2/28/2012	2/29/2012	6/1/2013	6/1/2013	6/1/2013	6/1/2013	6/4/2013	6/3/2013	6/4/2013	6/4/2013	6/4/2013	6/4/2013
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	1.33 J	--	1.68 J	--	0.618 J	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	2.47 J	8.36	14.7	1.46	3.05 J	3.18 J	--	--	--	--	2.61	--	<2.69	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	0.0964 J	--	0.103 J	--	0.131 J	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	6.14	--	12.3	--	12.2	--	**8.45**	<1.22	--	--	**15.1**	3.81	--	6.05	4.63	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	30.3	59.2	72.1	6.06	107	33.1	23.0	8.29	--		--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	9.21	--	44.8	--	39.1	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	277	136	3,350	454	2,140	4,420	**1,080**	17.4	--		205	101	--	**1,400**	19.2	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	21.1	--	34.5	--	53.1	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	<0.814	--	4.82 J	--	3.27 J	--	--	--	--	--	--	--	--	<2.42	<2.86	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	1.430	273	7.150	223	5.290	4.680	**1,380**	29.0	6.49	3.43	**3,530**	**661**	**954**	**2,090**	90.5	**327**
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	0.225 J	--	0.678 J	--	0.653 J	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	<0.426	--	<0.457	--	<0.473	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	53.6 J	--	592	--	638	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	1,190	694	8,740	429	6,150	9,170	1,480	62.4	--	--	**3,150**	726	906	**3,910**	177	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	0.0470 J	--	0.0561	--	0.0890	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	<2.53	--		--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	23.0	--	--	--	--	--	--	--	--	--

Notes:
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 5 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-14C	SS-14D	SS-15		SS-16	SS-17				SS-17A			SS-17B		
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-14C (1-2')	SS-14D (1-2')	SS-15	SS-15-1FT	SS-16	SS-17	SS-17 (0-1')	SS-17 (2-3')	SS-17 (4-5')	SS-17A (0-1')	SS-17A (1-2')	SS-17A (2-3')	SS-17B (0-1')	SS-17B (1-2')	SS-17B (2-3')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							1-2'	1-2'	0-2"	12-15"	0-2"	0-2"	0-1'	2-3'	4-5'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/2/2013	6/3/2013	2/28/2012	2/29/2012	2/28/2012	2/28/2012	6/1/2013	6/1/2013	6/1/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	1.65 J	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	3.53 J	2.88 J	2.91 J	1.97 J	4.06	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	0.174 J	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	19.9	--	--	--	<1.31	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	122	12.2	34.8	13.8	7.81	6.75	--	--	--	--	--		
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	84.9	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	6.34	9.32	4.930	451	2.530	999	21.4	5.90	--	100	--	--	20.0	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	40.4	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	8.32	--	--	--	<2.62	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	9.20	12.8	11.300	179	5.060	3.030	84.5	23.8	4.32	**795**	46.1	52.9	176	18.8	30.7
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	1.69 J	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	<0.495	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	1,150	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	72.7	99.0	13,600	402	<0.0250	<0.0238	1,650	211	--	948	69.6	--	1,280	375	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	0.133	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	<2.82	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	7.81	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 6 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-17C			SS-17E	SS-18				SS-18A			SS-18B			SS-18C
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-17C (0-1')	SS-17C (1-2')	SS-17C (2-3')	SS-17E (1-2')	SS-18	SS-18 (0-1')	SS-18 (2-3')	SS-18 (4-5')	SS-18A (0-1')	SS-18A (1-2')	SS-18A (2-3')	SS-18B (0-1')	SS-18B (1-2')	SS-18B (2-3')	SS-18C (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	2-3'	1-2'	0-2"	0-1'	2-3'	4-5'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/2/2013	6/2/2013	6/2/2013	6/4/2013	2/28/2012	6/1/2013	6/1/2013	6/1/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	1.72 J	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	2.05	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	15.9	11.3	9.17	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	31.2	--	--	--	360	75.3	6.29	--	28.4	--	--	16.3	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	94.2	43.1	21.9	193	3.200	**990**	14.0	150	210	8.52	66.5	**381**	31.5	**268**	4.82
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	109	--	--	335	2,230	950	51.1	--	1,420	44.5	--	370	63.7	--	84.1
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	<2.17	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	11.3	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 7 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-19	SS-20	SS-21	SS-22				SS-22A			SS-22B			SS-23	SS-24	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-19	SS-20	SS-21	SS-22	SS-22 (0-1')	SS-22 (2-3')	SS-22 (3-4')	SS-22A (0-1')	SS-22A (1-2')	SS-22A (2-3')	SS-22B (0-1')	SS-22B (1-2')	SS-22B (2-3')	SS-23	SS-24	SS-24 (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-2"	0-2"	0-2"	0-2"	0-1'	2-3'	3-4'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-2"	0-2"	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	2/28/2012	2/28/2012	2/28/2012	2/28/2012	6/1/2013	6/1/2013	6/1/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	2/28/2012	2/28/2012	11/22/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	4.37 J	4.85 J	2.66 J	3.21 J	--	--	--	--	--	--	--	--	--	2.80 J	2.45 J	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.67
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	10.7	11.4	12.7	16.1	8.57	--	--	--	--	--	--	--	--	6.12	7.03 J	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	39.6	360	644	199	27.8	--	--	156	58.4	--	15.6	--	--	26.6	82.4	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	247	709	1,060	1,230	134	35.2	17.4	**1,430**	**384**	**462**	138	98.8	161.0	169	393	**499**
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	544	618	1,910	4,430	678	502	348	2,130	186	--	747	560	650	223	240	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	<2.68	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	8.57	--	--	--	--	--	--	--	--	--	--	--

Notes:
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Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
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Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
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Table 2 (Page 8 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-24 (Continued)		SS-24A	SS-24B	SS-25				SS-25A			SS-25B		
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-24 (1-2')	SS-24 (2-3')	SS-24A (1-2')	SS-24B (1-2')	SS-25	SS-25 (0-1')	SS-25 (2-3')	SS-25 (5-6')	SS-25A (0-1')	SS-25A (1-2')	SS-25A (2-3')	SS-25B (0-1')	SS-25B (1-2')	SS-25B (2-3')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							1-2'	2-3'	1-2'	1-2'	0-2"	0-1'	2-3'	5-6'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/22/2014	11/22/2014	6/1/2013	6/1/2013	2/28/2012	5/31/2013	5/31/2013	5/31/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																							
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	<0.877	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	72.2	7.74	11.6	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	24.0	16.6	13,600	33.4	4.00	--	8.86	--	--	9.09	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**517**	**616**	149	112	32,600	97.4	18.4	5.01	15.9	90.6	126	27.7	34.0	10.9
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	608	508	122,000	267	91.9	--	94.0	--	--	144	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																							
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	<2.33	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	7.74	--	--	--	--	--	--	--	--

Notes:
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Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
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[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 9 of 30)
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Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-25C			SS-25D	SS-25E	SS-25F	SS-25G		SS-26			SS-26A		
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-25C (0-1')	SS-25C (1-2')	SS-25C (2-3')	SS-25D (1-2')	SS-25E (1-2')	SS-25F (1-2')	SS-25G (0-1')	SS-25G (1-2')	SS-26	SS-26 (0-1')	SS-26 (2-3')	SS-26A (0-1)'	SS-26A (1-2')	SS-26A (2-3')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	2-3'	1-2'	1-2'	1-2'	0-1'	1-2'	0-2"	0-1'	2-3'	0-1'	1-2'	2-3'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/3/2013	6/1/2013	6/1/2013	2/28/2012	5/31/2013	5/31/2013	6/1/2013	6/1/2013	6/1/2013
Metals (6010/7471) mg/kg																							
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	3.67 J	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	22.8	43.1	17.7	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	5.90	--	--	--	--	--	--	--	591	372	<2.49	425	24.7	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	75.7	49.3	23.0	90.1	195	32.0	88.4	72.9	2,620	**499**	<2.49	**1,590**	149	78.0
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	407	--	--	--	--	--	--	--	2,360	137	<3.74	**2,650**	606	376
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																							
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	<2.43	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	43.1	--	--	--	--

Notes:
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Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada*, U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 10 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-26B			SS-26C	SS-26D		SS-26E	SS-26F		SS-27		SS-27A	SS-27B	SS-27C	SS-27D	SS-27E
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-26B (0-1')	SS-26B (1-2')	SS-26B (2-3')	SS-26C (1-2')	SS-26D (0-1')	SS-26D (1-2')	SS-26E (1-2')	SS-26F (0-1')	SS-26F (1-2')	SS-27	SS-27 (0-1')	SS-27A (0-1')	SS-27B (0-1')	SS-27C (0-1')	SS-27D (0-1')	SS-27E (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	2-3'	1-2'	0-1'	1-2'	1-2'	0-1'	1-2'	0-2"	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/31/2013	5/31/2013	5/31/2013	6/1/2013	5/31/2013	5/31/2013	6/3/2013	6/1/2013	6/1/2013	2/28/2012	6/1/2013	6/1/2013	6/1/2013	6/1/2013	6/1/2013	6/1/2013
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	16.5	5.42	3.80	3.73	2.93	4.07	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	68.3	10.3	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	8.54	--	--	6.61	--	--	5.10	--	--	59.1	24.9	14.9	9.56	**698**	51.7	55.9
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	246	49.5	15.2	29.1	11.8	3.25	35.6	**804**	160	525	120	46.1	34.0	**2,470**	**251**	**394**
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	427	342	--	102	129	--	42.5	--	--	858	724	153	206	1,150	471	459
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	<2.72	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	10.3	--	--	--	--	--

Notes:
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Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 11 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-27F	SS-27G	SS-27H	SS-28								SS-28A			SS-28B	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background						SS-27F (1-2')	SS-27G (0-1')	SS-27H (0-0.5')	SS-28	SS-28 (0-1')	DUP-9	SS-28 (2-3')	DUP-10	SS-28 (5-6')	DUP-11	SS-28 (8-9')	SS-28A (0-1')	SS-28A (1-2')	SS-28A (2-3')	SS-28B (0-1')	SS-28B (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations		Published Background[2]				1-2'	0-1'	0-0.5'	0-2"	0-1'	0-1'	2-3'	2-3'	5-6'	5-6'	8-9'	0-1'	1-2'	2-3'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/4/2013	6/1/2013	6/1/2013	2/28/2012	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/1/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	<1.00	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	980	11.4	10.4	8.95	15.0	--	7.53	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	920	17.5	17.5	3.65	5.32	--	3.74		97.0	--	--	7.92	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	25.6	192	**347**	21,000	171	223	6.64	5.78	6.34	3.74	<2.17	**2,170**	142	104	11.4	5.58
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	373	--	10,200	245	323	57.7	142	--	34.4	--	2,060	156	--	60.2	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	<2.50	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	11.4	--	--	--	--	--	--	--	--	--	--	--

Notes:
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Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 12 of 30)
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H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-28C	SS-28D	SS-31			SS-31A			SS-31B		SS-31C	SS-31D	SS-31E	SS-32	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-28C (1-2')	SS-28D (1-2')	SS-31 (0-1')	DUP-12	SS-31 (1-2')	SS-31A (0-1')	SS-31A (1-2')	SS-31A (2-3')	SS-31B (0-1')	SS-31B (1-2')	SS-31C (1-2')	SS-31D (1-2')	SS-31E (1-2')	SS-32 (0-1')	DUP-6
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							1-2'	1-2'	0-1'	0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	1-2'	1-2'	1-2'	1-2'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/3/2013	6/2/2013	6/2/2013	6/4/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	5.47	4.66	--	4.36	--	--	20.3	--	--	--	--	6.34	4.27
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	4.42	<2.33	145	147	32.3	17.3	8.20	<2.18	35.0	<2.30	63.5	<2.26	10.8	24.2	29.0
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	76.5	--	46.8	47.2	--	45.8	--	--	147	--	--	--	--	164	209
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 13 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																						
Sample Location		Protection of	Protection of							SS-32 (Continued)		SS-32A			SS-33			SS-33A	SS-33B	SS-33C	SS-34				SS-35	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-32 (1-2')	SS-32 (2-3')	SS-32A (0-1')	SS-32A (1-2')	SS-32A (2-3')	SS-33 (0-1')	DUP-5	SS-33 (1-2')	SS-33A (1-2')	SS-33B (1-2')	SS-33C (1-2')	SS-34 (0-1')	DUP-8	SS-34 (1-2')	SS-34 (2-3')	SS-35 (0-1')	DUP-7
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	1-2'	1-2'	1-2'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																										
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	32.7	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	7.08	6.03	--	--	--	--	116	194	--	--	66.6	67.1
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	28.6	<2.26	207	85.5	14.9	57.2	52.5	3.46	<2.17	19.4	5.89	22.4	26.8	13.6	10.9	**604**	**356**
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	--	277	225	--	--	--	--	36.1	63.1	--	--	1,330	546
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																										
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
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Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
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**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 14 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																						
Sample Location		Protection of	Protection of							SS-35 (Continued)		SS-35A	SS-36			SS-37				SS-38			SS-39			
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-35 (1-2')	SS-35 (2-3')	SS-35A (1-2')	SS-36 (0-1')	SS-36 (1-2')	SS-36 (2-3')	SS-37 (0-1')	DUP-3	SS-37 (1-2')	SS-37 (2-3')	SS-38 (0-1')	SS-38 (1-2')	SS-38 (2-3')	SS-39 (0-1')	DUP-4	SS-39 (1-2')	SS-39 (2-3')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							1-2'	2-3'	1-2'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013	6/2/2013
Metals (6010/7471) mg/kg																										
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	36.3	--	--	20.6	27.7	--	--	65.1	--	--	38.2	28.7	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	140	67.9	73.9	99.4	93.7	52.4	183	**315**	**260**	184	**588**	**406**	230	**573**	**529**	177	233
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	383	--	394	75.7	--	--	427	660	290	--	1,200	530	321	960	900	122	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																										
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 15 of 30)
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Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																						
Sample Location		Protection of	Protection of							SS-41			SS-42				SS-42A		SS-42B			SS-42C		SS-42D		
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background						SS-41 (0-1')	SS-41 (1-2')	SS-41 (2-3')	SS-42 (0-1')	DUP-1	SS-42 (1-2')	SS-42 (2-3')	SS-42A (0-1')	SS-42A (1-2')	SS-42B (0-1')	SS-42B (1-2')	SS-42B (2-3')	SS-42C (0-1')	SS-42C (1-2')	SS-42D (0-1')	DUP-13	SS-42D (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations		Published Background[2]				0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	6/1/2013	6/1/2013	6/1/2013	5/30/2013	5/30/2013	5/30/2013	5/30/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/17/2013	9/16/2013
Metals (6010/7471) mg/kg																										
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	3.91	--	--	30.5	17.4	--	--	--	--	--	--	--	--	--	20.1	17.5	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	12.3	156	70.7	22.3	27.4	6.67	2.74	**347**	4.36	14.0	<2.28	--	34.4	4.27	**331**	**255**	<2.17
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	45.1	--	--	88.1	60.3	--	--	--	--	--	--	--	--	--	64.1	54.4	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																										
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 16 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-42E	SS-42F				SS-43			SS-43A			SS-43B		SS-43C		SS-43D	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-42E (0-1')	SS-42F (0-1')	SS-42F (1-2')	SS-42F (2-3')	SS-43 (0-1')	SS-43 (1-2')	SS-43 (2-3')	SS-43A (0-1'	SS-43A (1-2')	SS-43A (2-3')	SS-43B (0-1')	SS-43B (1-2')	SS-43C (0-1')	SS-43C (1-2')	SS-43D (0-1')	SS-43D (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	9/16/2013	9/17/2013	9/17/2013	9/17/2013	5/31/2013	5/31/2013	5/31/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013	9/16/2013
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	6.36	--	--	**551**	39.9	--	6.70	49.9	--	12.5	5.50	7.07	2.76	26.1	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	2.85	34.0	6.59	4.67	**493**	47.4	2.68	3.52	38.3	3.64	6.45	2.98	3.32	<2.14	19.9	<2.20
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	97.5	--	--	616	92.2	--	74.7	64.0	--	136	53.4	70.5	24.4	111	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 17 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-44			SS-44A			SS-44B		SS-44C		SS-44D				SS-44E	SS-44F
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background		Published Background[2]				SS-44 (0-1')	SS-44 (1-2')	SS-44 (2-3')	SS-44A (0-1')	SS-44A (1-2')	SS-44A (2-3')	SS-44B (0-1')	SS-44B (1-2')	SS-44C (0-1')	SS-44C (1-2')	SS-44D (0-1')	SS-44D (1-2')	SS-44D (2-3')	DUP-16	SS-44E (0-1')	SS-44F (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations						0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	2-3'	2-3'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/31/2013	5/31/2013	5/31/2013	5/31/2013	5/31/2013	5/31/2013	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	19.3	30.7	--	**579**	50.2	--	295	--	418	--	355	--	11.4	13.8	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	9.60	50.3	13.8	**422**	46.6	27.5	**356**	5.97	**294**	25.8	**368**	52.5	9.04	14.0	7.26	77.2
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	187	338	--	953	98.7	--	--	--	--	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--		--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
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Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 18 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
																			Building 16						
Sample Location										SS-44G	SS-45		SS-45A	SS-45B	SS-45C		SS-45E	SS-46		SS-47		SS-48		SS-49	
Sample ID	Industrial	Protection of Groundwater	Site-Specific Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-44G (0-1')	SS-45 (0-1')	SS-45 (1-2')	SS-45A (0-1')	SS-45B (0-1')	SS-45C (0-1')	SS-45C (1-2')	SS-45E (0-1')	SS-46 (0-1')	SS-46 (1-2')	SS-47 (0-1')	SS-47 (1-2')	SS-48 (0-1')	SS-48 (1-2')	SS-49 (0-1')	SS-49 (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/23/2014	5/31/2013	5/31/2013	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	5/30/2013	5/31/2013	5/30/2013	5/31/2013	5/31/2013	5/31/2013	5/30/2013	5/31/2013
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	2.61	--	3.70	--	4.47	--	2.54	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	<1.03	--	<1.09	--	<1.15	--	<1.20	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	21.6	--	18.6	--	13.6	--	10.2	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	**611**	70.3	58.1	6.24	**568**	49.3	22.2	7.72	--	5.18	--	3.53	--	4.35	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	235	**986**	109	97.7	4.99	**619**	70.1	41.5	12.8	<2.17	84.0	<2.13	96.9	30.4	**288**	9.60
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	1,110	63.8	--	--	--	--	--	38.1	--	86.6	--	116	--	348	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	<2.31	--	<2.49	--	<2.33	--	<2.35	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	21.6	--	18.6	--	13.6	--	10.2	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
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Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
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[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
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J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 19 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals						Building 16 (Continued)																
Sample Location		Protection of	Protection of							SS-50			SS-51		SS-52		SS-52A	SS-53		SS-53A		SS-53B		SS-53C	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-50 (0-1')	DUP-2	SS-50 (1-2')	SS-51 (0-1')	SS-51 (1-2')	SS-52 (0-1')	SS-52 (1-2')	SS-52A (0-1')	SS-53 (0-1')	SS-53 (1-2')	SS-53A (0-1')	SS-53A (1-2')	SS-53B (0-1')	SS-53B (1-2')	SS-53C (0-1')	SS-53C (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/31/2013	5/31/2013	5/31/2013	5/30/2013	5/31/2013	5/30/2013	5/31/2013	5/30/2013	5/30/2013	5/30/2013	5/30/2013	5/30/2013	5/31/2013	5/31/2013	5/30/2013	5/30/2013
Metals (6010/7471) mg/kg																										
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	2.72	2.38	--	2.63	--	3.75	--	--	2.50	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	<1.10	<1.09	--	<1.13	--	<1.09	--	--	<1.19	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	5.57	6.67	--	13.8	--	10.9	--	--	5.20	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	<2.21	2.82	--	3.86	--	4.29	--	--	<2.38	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	121	250	6.95	43.1	2.43	80.5	2.87	<2.41	29.5	29.9	54.5	2.76	17.2	11.5	40.4	8.52
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	163	344	--	43.8	--	118	--	--	61.6	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																										
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	<2.10	<2.66	--	<2.38	--	<2.41	--	--	<2.38	--	--	--	<2.21	--	<2.28	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	5.57	6.67	--	13.8	--	10.9	--	--	5.20	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 20 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals						Building 16 (Continued)															
Sample Location		Protection of	Protection of							SS-54	SS-55	SS-56	SS-57		SS-58			SS-59		SS-59A	SS-60			SS-60A	SS-60B
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-54 (0-1')	SS-55 (0-1')	SS-56 (0-1')	SS-57 (0-1')	SS-57 (1-2')	SS-58 (0-1')	SS-58 (1-2')	SS-58 (2-2.25')	SS-59 (0-1')	SS-59 (1-2')	SS-59A (0-1')	SS-60 (0-1')	DUP-17	SS-60 (1-2')	SS-60A (0-1')	SS-60B (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'	2-2.25'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/30/2013	5/30/2013	5/30/2013	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	3.15	2.28	3.01	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	<1.10	<1.11	<1.10	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	15.2	16.4	15.1	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	4.23	5.16	4.92	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	<2.20	<2.21	2.61	**414**	24.0	**4,260**	**297**	10.1	**811**	44.9	110	**316**	**329**	100	2.97	23.1
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	34.1	15.7	24.5	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	<2.44	<2.68	<2.34	--	--	--	--	--	--	--	--	--		--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	15.2	16.4	15.1	--	--	--	--	--	--	--	--	--		--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 21 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location										SS-61		SS-61A	SS-62	SS-63	SS-63A	SS-64	SS-65	SS-66		SS-67	SS-68	SS-69		SS-69A	
Sample ID	Industrial	Protection of Groundwater	Protection of Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-61 (0-1')	SS-61 (1-2')	SS-61A (0-1')	SS-62 (0-1')	SS-63 (0-1')	SS-63A (0-1')	SS-64 (0-1')	SS-65 (0-1')	SS-66 (0-1')	SS-66 (1-2')	SS-67 (0-1')	SS-68 (0-1')	SS-69 (0-1')	SS-69 (1-2')	SS-69A (0-1')	SS-69A (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/24/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	2.24	**16.1**	1.92	0.982	6.81	**26.9**	<2.70	**20.4**	2.37
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**576**	47.2	52.6	16.6	115	22.6	105	53.9	125	--	28.7	27.0	**469**	21.7	70.8	--
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Ref.
1. Eastern USA soils
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**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 22 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																						
Sample Location		Protection of	Protection of							SS-70	SS-71	SS-72	SS-73	SS-74						SS-75				SS-76	SS-78
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background						SS-70 (0-1')	SS-71 (0-1')	SS-72 (0-1')	SS-73 (0-1')	SS-74 (0-1')	SS-74 (1-2')	DUP-15	SS-74 (2-3')	SS-74 (3-4')	SS-74 (4-5')	SS-75 (0-1')	SS-75 (1-2')	SS-75 (2-3')	SS-75 (3-4')	SS-76 (0-1')	SS-78 (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations		Published Background[2]				0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	1-2'	2-3'	3-4'	4-5'	0-1'	1-2'	2-3'	3-4'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014	11/21/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	1.09	2.05	--	--	3.60	**16.7**	**14.1**	**14.2**	**8.04**	<0.601	**32.0**	**10.7**	2.46	3.27	<1.17	<1.35
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	298	--	204	--	--	--	**2,920**	**766**	81.7	127	16.4	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	122	73.6	8.90	78.2	**675**	**890**	**624**	**652**	231	--	**6,650**	**1,130**	**325**	157	19.4	7.92
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	987	--	803	--	--	--	**6,990**	2,330	--	--	115	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 23 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-79	SS-80	SS-82	SS-87			SS-87A	SS-88			SS-88A	SS-89		SS-90	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-79 (0-1')	SS-80 (0-1')	SS-82 (0-1')	SS-87 (0-1')	SS-87 (1-2')	SS-87 (2-3')	SS-87A (0-1')	SS-88 (0-1')	SS-88 (1-2')	SS-88 (2-3')	SS-88A (0-1')	SS-89 (0-1')	SS-89 (1-2')	SS-90 (0-1')	SS-90 (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/21/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	<1.34	<6.55	<1.29	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	6.06	<13.1	4.17	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	11.8	14.1	7.22	**1,360**	**329**	204	169	**568**	**263**	45.7	173	**1,310**	213	**1,740**	146
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	274	221	159	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 24 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-90A		SS-91			SS-92	SS-93	SS-94	SS-95		SS-95A		SS-95B	SS-96		SS-96A
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-90A (0-1')	SS-90A (1-2')	SS-91 (0-1')	SS-91 (1-2')	SS-91 (2-3')	SS-92 (0-1')	SS-93 (0-1')	SS-94 (0-1')	SS-95 (0-1')	SS-95 (1-2')	SS-95A (0-1')	SS-95A (1-2')	SS-95B (0-1')	SS-96 (0-1')	SS-96 (1-2')	SS-96A (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**519**	126	**379**	**280**	241	**445**	181	28.6	**696**	174	**1,300**	74.9	244	**401**	138	116
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Hexavalent chromium (VI) analyzed by EPA Method 7199
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NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 25 of 30)
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Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location		Protection of	Protection of							SS-97			SS-98	SS-99	SS-100		SS-100A		SS-101	SS-102		SS-102A	SS-103	SS-104	
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-97 (0-1')	DUP-14	SS-97 (1-2')	SS-98 (0-1')	SS-99 (0-1')	SS-100 (0-1')	SS-100 (1-2')	SS-100A (0-1')	SS-100A (1-2')	SS-101 (0-1')	SS-102 (0-1')	SS-102 (1-2')	SS-102A (0-1')	SS-103 (0-1')	SS-104 (0-1')	SS-104 (1-2')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	184	**360**	21.2	71.0	52.3	**797**	9.28	**274**	3.49	49.5	**270**	7.57	75.7	99.3	**791**	120
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	106	165	--	87.3	53.9	928	--	--	--	112	--	--	--	--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--		--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA

* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 26 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location										SS-104A			SS-105		SS-105A	SS-106		SS-107	SS-108		SS-108A		SS-109	SS-110	SS-111
Sample ID	Industrial	Protection of Groundwater	Protection of Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-104A (0-1')	SS-104A (1-2')	SS-104A (2-3')	SS-105 (0-1')	SS-105 (1-2')	SS-105A (0-1')	SS-106 (0-1')	SS-106 (1-2')	SS-107 (0-1')	SS-108 (0-1')	SS-108 (1-2')	SS-108A (0-1')	SS-108A (1-1.5')	SS-109 (0-1')	SS-110 (0-1')	SS-111 (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	1-1.5'	0-1'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/20/2014	11/20/2014	1/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014	11/20/2014
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**1,010**	**340**	**488**	**271**	129	143	**754**	**311**	221	**1,380**	247	**1,750**	**293**	220	193	145
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	--	--	1,540	--	1,390	1,520	--	--		--	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 27 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-112		SS-113	SS-114		SS-114A	SS-114B	SS-115	SS-116			SS-116A	SS-116B	SS-116C	SS-117
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background						SS-112 (0-1')	SS-112 (1-1.5')	SS-113 (0-1')	SS-114 (0-1')	SS-114 (1-1.5')	SS-114A (0-1')	SS-114B (0-1')	SS-115 (0-1')	SS-116 (0-1')	SS-116 (1-2')	SS-116 (2-3')	SS-116A (0-1')	SS-116B (0-1')	SS-116C (0-1')	SS-117 (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening	Concentrations		Published Background[2]				0-1'	1-1.5'	0-1'	0-1'	1-1.5'	0-1'	0-1'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/22/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014	11/23/2014
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	--	--	--	--	--	--	17.6	--	--	--	--	--	44.3
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**458**	**560**	33.4	**496**	**453**	8.56	26.6	84.1	148	--	--	--	--	--	149
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	--	--	--	--	--	--	**4,010**	**4,450**	110	217	1,080	641	210
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
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Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 28 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																					
Sample Location										SS-118				SS-118A			SS-118B		SS-118C		SS-119			SS-119A
Sample ID	Industrial	Protection of Groundwater	Protection of Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-118 (0-1')	DUP-22	SS-118 (1-2')	DUP-23	SS-118A (0-1')	DUP-24	SS-118A (1-2')	SS-118B (0-1')	SS-118B (1-2')	SS-118C (0-1')	SS-118C (1-2')	SS-119 (0-1')	DUP-21	SS-119 (1-2')	SS-119A (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	1-2'	1-2'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015
Metals (6010/7471) mg/kg																									
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	**52.4**	**41.4**	6.66	1.74	**37.0**	**287**	**8.08**	**8.70**	<1.15	**97.0**	2.90	**11.5**	**23.3**	<1.14	4.12
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	500	491	45.7	14.1	--	--	--	--	--	--	--	158	306	--	--
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	**927**	**763**	89.8	23.9	**397**	**1,730**	47.3	**267**	34.7	**1,740**	4.45	133	**316**	8.65	21.6
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	338	325	146	128	--	--	--	--	--	--	--	268	321	--	--
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																									
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 29 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																	
Sample Location		Protection of	Protection of							SS-119B		SS-120		SS-120B/SS-42	SS-120C/SS-42B	SS-121		SS-121A/SS-42A	SS-121B	SS-122/SS-42C	SS-123/SS-42D	SS-123A/SS-43B
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-119B (0-1')	SS-119B (1-2')	SS-120 (0-1')	DUP-20	SS-120B/SS-42 (0-1')	SS-120C/SS-42B (0-1')	SS-121 (0-1')	SS-121 (1-2')	SS-121A/SS-42A (0-1')	SS-121B (0-1')	SS-122/SS-42C (0-1')	SS-123/SS-42D (0-1')	SS-123A/SS-43B (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/20/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015
Metals (6010/7471) mg/kg																						
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	**14.7**	<1.13	3.81	3.70	1.22	2.63	**8.25**	1.55	1.87	<1.08	4.74	2.88	<1.13
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	--	--	95.0	73.4	15.4	15.4	69.3	--	13.6	--	54.4	161	8.19
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	142	--	91.7	80.9	18.6	10.8	79.9	--	20.9	--	90.0	149	10.3
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	--	--	201	158	68.7	150	216	--	126	--	147	162	92.5
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																						
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA

* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
**Regression analyses did not indicate good correlation due to a limited number of samples for Synthetic Precipitate Leaching Procedure (SPLP) analysis. However, because the empirical leaching data for these compounds were relatively consistent with generic screening levels, the generic protection of groundwater screening levels were used as screening levels for the Site.
Samples collected in February 2012 were analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471, or for the presence of arsenic, chromium, cobalt, manganese, and nickel (SS-16 through SS-28) using EPA Method 6010
Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 2 (Page 30 of 30)
Summary of Detected Metals in Site Soil
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Regional Screening Levels		Site-Specific	Background Metals																				
Sample Location		Protection of	Protection of							SS-123B/SS-42F	SS-124			SS-124A	SS-124B	SS-125	SS-126		SS-127	SS-128	SS-129	SS-130	SS-131	SS-132
Sample ID	Industrial	Groundwater	Groundwater	Site-Specific Background Concentrations		Published Background[2]				SS-123B/SS-42F (0-1')	SS-124 (0-1')	DUP-19	SS-124 (1-2')	SS-124A (0-1')	SS-124B (0-1')	SS-125 (0-1')	SS-126 (0-1')	DUP-18	SS-127 (0-1')	SS-128 (0-1')	SS-129 (0-1')	SS-130 (0-1')	SS-131 (0-1')	SS-132 (0-1')
Sample Depth (inches or ft)	Screening	MCL-Based	Screening							0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'
Date Collected	Level	(DAF 20)	Level	Range	2X Mean	Range	Mean	N	Ref.	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/19/2015	5/18/2015	5/18/2015
Metals (6010/7471) mg/kg																								
Antimony	470	5.4	NA	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	3	5.8	NA	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Beryllium	2,300	64	NA	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	980	7.6	**	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3	<1.12	1.40	**13.7**	<1.14	<1.06	<1.10	<1.15	<1.11	<1.08	<1.21	<1.21	<1.19	<1.26	<1.26	<1.34
Chromium (total)	NS	3,600,000	NA	5.57 - 26.5	22.7	7.0 - 70	31	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	47,000	920	NA	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	22,000	520 [1]	**	3.55 - 7.23	10.1	n.d. - 30	10	20	2	7.43	63.0	184	--	--	--	6.40	7.73	14.4	38.0	8.65	23.6	12.8	5.82	16.8
Lead	800	280	NA	4.41 - 102	32.1	n.d. - 20	6.3	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	5,800	5.2	NA	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	350	5.4 [1]	250	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2	11.6	76.5	**764**	6.44	5.19	21.5	6.52	6.50	16.3	32.7	12.8	26.9	15.8	6.24	20.6
Silver	5,800	16 [1]	NA	<1.08 - <1.31	1.17	n.d. - 5.0	NS	1,319	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Thallium	12	2.8	NA	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	350,000	7,400 [1]	NA	<11.3 - 19.2	25.0	11 - 59	26	16	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Manganese	26,000	560 [1]	2,570	22.4 - 252	203.2	8.0 - 3,394	594	10	3	93.4	87.8	1,140	--	--	--	42.3	31.1	60.0	41.7	11.5	57.5	106	247	266
Mercury	46	2	NA	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals (7199) mg/kg																								
Chromium (VI)	6.3	0.0134 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (III)	1,800,000	800,000,000 [1]	NA	--	--	NS	NS	NS	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
Analytical results are compared to the U.S. Environmental Protection Agency Regional Screening Levels (Nov. 2015) (TR=1E-6, HQ=1)
Underline indicates 2012 concentration collected from 0-2 inch or 12-15 inch intervals initially exceeded one or more generic screening levels. However, subsequent sampling was conducted at these locations in 2013-2015 at ADEM-specified sampling intervals (i.e., 0-1 ft, 1-2 ft, 2-3 ft) and the 2012 data is not used in this evaluation.
Blue shading indicates concentration exceeds the generic Industrial RSL, site-specific Protection of Groundwater screening level, and site-specific background concentrations
Green shading indicates concentration exceeds the site-specific Protection of Groundwater screening level (for cobalt and manganese), generic Protection of Groundwater RSLs (for other metals), and site-specific background concentrations
[1] MCL-Based Protection of Ground Water RSL is not specified; therefore, the Risk-Based Protection of Ground Water RSL with a DAF of 20 is shown
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Samples collected in May, June, and September 2013 were analyzed for select metals by EPA Method 6010
Hexavalent chromium (VI) analyzed by EPA Method 7199
Chromium (III) determined by subtracting hexavalent chromium from total chromium
NS = not specified; NA - Not Applicable; n.d. = Not Detected; -- = constituent not analyzed; N = number of samples
J = estimated concentration; constituent was deteceted at a concentration below the laboratory reporting limit

Table 3 (Page 1 of 1)
Evaluation of Background Metals
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Sample Location	BG-1		BG-2		BG-3		BG-4		BG-5		Site-Specific Background					
Sample ID	BG-1 (0-1')	BG-1 (1-2')	BG-2 (0-1')	BG-2 (1-2')	BG-3 (0-1')	BG-3 (1-2')	BG-4 (0-1')	BG-4 (1-2')	BG-5 (0-1')	BG-5 (1-2')	Detected Background Range	2X Mean[2]	Published Background[1]			
Sample Depth (ft)	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2						
Date Collected	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113	5/29/20113			Range	Mean	N	Ref.
Metals (6010/7471) mg/kg																
Antimony	<11.0	<11.5	<11.3	<11.9	<10.8	<11.5	<11.9	<11.9	<12.1	<13.1	<10.8 - <13.1	11.7	<1.0 - 8.8	0.76	131	1
Arsenic	3.45	<2.30	3.15	6.27	<2.17	3.09	3.32	<2.39	3.06	<2.63	<2.17 - 6.27	5.42	0.8 - 11	4.7	20	2
Beryllium	<1.10	<1.15	<1.13	<1.19	<1.08	<1.15	<1.19	<1.19	<1.21	<1.31	<1.08 - <1.31	1.17	n.d. - 1.0	0.15	20	2
Cadmium	<1.10	<1.15	<1.13	<1.19	<1.08	<1.15	<1.19	<1.19	<1.21	<1.31	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	3
Chromium	11.7	9.21	14.6	26.5	6.74	7.11	10.4	12.6	8.88	5.57	5.57 - 26.5	22.7	7.0 - 70	31	20	2
Copper	2.96	4.40	6.33	10.6	3.25	2.56	3.80	<2.39	3.06	<2.63	<2.39 - 10.6	7.89	2.0 - 20	9.6	20	2
Nickel	4.78	5.69	3.72	6.22	3.55	3.74	7.23	5.90	5.15	4.28	3.55 - 7.23	10.1	n.d. - 30	10	20	2
Lead	10.5	4.74	8.22	7.15	6.93	4.41	5.85	5.06	102	5.52	4.41 - 102	32.1	n.d. - 20	6.3	20	2
Selenium	<2.19	<2.30	<2.25	<2.38	<2.17	<2.31	<2.39	<2.39	<2.43	<2.63	<2.17 - <2.63	2.34	<0.1 - 0.9	0.35	20	2
Cobalt	5.18	<2.30	<2.25	<2.38	2.64	<2.31	5.11	4.13	4.05	3.23	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	2
Silver	<1.10	<1.15	<1.13	<1.19	<1.08	<1.15	<1.19	<1.19	<1.21	<1.31	<1.08 - <1.31	1.17	n.d. - 5.0	--	1,319	4
Thallium	<2.19	<2.30	<2.25	<2.38	<2.17	<2.31	<2.39	<2.39	<2.43	<2.63	<2.17 - <2.63	2.34	<0.1 - 1.8	--	260	*
Zinc	17.9	16.0	<11.3	<11.9	15.4	<11.5	16.8	<11.9	19.2	16.5	<11.3 - 19.2	25.0	11 - 59	26	16	2
Manganese	252	47.9	53.0	22.4	173	25.2	134	43.5	103	162	22.4 - 252	203.2	8.0 - 3,394	594	10	3
Mercury	<0.112	<0.116	<0.111	<0.120	<0.109	<0.118	<0.125	<0.120	<0.121	<0.127	<0.109 - <0.127	0.118	0.02 - 0.34	0.086	20	2

Notes:
Concentrations are reported in milligrams per kilogram (mg/kg)
Laboratory analytical method is shown in parentheses
[1] *Elements in North American Soils: Second Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D, 2005.*
Ref.
1. Eastern USA soils
2. Alabama soils
3. Southeastern USA soils
4. Soils of the conterminous USA

[2]2x mean background calculated using non-detects at one-half the detection limit
* *Major- and Trace-Element Concentrations in Soils from Two Continential-Scale Transects of the United States and Canada* , U.S. Department of Interior, U.S. Geologic Survey. Open-File Report 2005-1253, Table 3. 2005.
Samples analyzed for priority pollutant list metals, cobalt, and mangense by EPA Method 6010 and for mercury by EPA Method 7471
n.d. = not detected; -- = not specified; N = number of samples collected

Table 4 (Page 1 of 1)
Summary of Soil Leach Test Results
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

			Cadmium	
Sample Location	**Sample ID**	**Sample Date**	**Total (mg/kg)**	**SPLP (mg/L)**
SS-1A	SS-1A (0-1)	6/3/2013	9.93	0.0344
SS-6A	SS-6A (0-1)	6/2/2013	17.9	0.0041
SS-14	SS-14 (0-1)	6/1/2013	8.45	0.0012
SS-14A/18D	SS-14A/18D (0-1)	6/4/2013	15.1	0.293

Calculated Non-Residential Groundwater Screening Level (mg/l) = 0.0231

Generic Protection of Groundwater Regional Screening Level with DAF of 20 = 7.6 mg/kg

* Site-Specific Protection of Groundwater Screening Level not determined due to poor Totals/SPLP data correlation. Empirical data indicates site-specific concentration is consistent with generic RSL

			Cobalt	
Sample Location	**Sample ID**	**Sample Date**	**Total (mg/kg)**	**SPLP (mg/L)**
SS-11A	SS-11A (2-3)	6/2/2013	90.3	0.374
SS-11B	SS-11B (2-3)	6/4/2013	43.1	0.0876
SS-14A/18D	SS-14A/18D (0-1)	6/4/2013	3,530	5.19
	SS-14A/18D (1-2)	6/3/2013	661	0.293
	SS-14A/18D (2-3)	6/4/2013	954	1.01
SS-14B	SS-14B (2-3)	6/4/2013	327	0.0399
SS-18	SS-18 (4-5)	6/1/2013	150	0.258
SS-18A	SS-18A (0-1)	6/2/2013	210	0.223
	SS-18A (2-3)	6/2/2013	66.5	0.0675
SS-22A	SS-22A (2-3)	6/2/2013	462	1.01
SS-26A	SS-26A (0-1)	6/1/2013	1,590	0.490
SS-26F	SS-26F (0-1)	6/1/2013	804	1.16
SS-41	SS-41 (2-3)	6/1/2013	70.7	0.0172
SS-43	SS-43 (0-1)	5/31/2013	493	0.845
SS-44	SS-44 (1-2)	5/31/2013	50.3	0.114
SS-48	SS-48 (1-2)	5/31/2013	30.4	0.0005
SS-49	SS-49 (1-2)	5/31/2013	9.6	0.0005

Calculated Non-Residential Groundwater Screening Level (mg/l) = 0.153

Site-Specific Protection of Groundwater Screening Level based on totals/SPLP Correlation = 250 mg/kg

			Manganese	
Sample Location	**Sample ID**	**Sample Date**	**Total (mg/kg)**	**SPLP (mg/L)**
SS-11A	SS-11A (0-1)	6/2/2013	1,080	0.252
SS-11B	SS-11B (0-1)	6/4/2013	2,570	0.686
	SS-11B (1-2)	6/4/2013	988	0.394
SS-14	SS-14 (0-1)	6/1/2013	1,080	0.0349
SS-14A/18D	SS-14A/18D (2-3)	6/4/2013	906	0.361
SS-14B	SS-14B (0-1)	6/4/2013	3,910	2.50
SS-22B	SS-22B (1-2)	6/2/2013	560	0.435
	SS-22B (2-3)	6/2/2013	650	0.287
SS-24B	SS-24B (1-2)	6/1/2013	508	0.492
SS-26A	SS-26A (1-2)	6/1/2013	606	0.164
SS-26B	SS-26B (0-1)	5/31/2013	427	0.060
SS-27	SS-27 (0-1)	6/1/2013	724	0.0354
SS-27E	SS-27E (1-2)	6/1/2013	459	0.623
SS-38	SS-38 (0-1)	6/2/2013	1,200	0.211
	SS-38 (1-2)	6/2/2013	530	0.262

Calculated Non-Residential Groundwater Screening Level (mg/l) = 1.08

Site-Specific Protection of Groundwater Screening Level based on Empirical Data = 2,570 mg/kg

* Poor totals/SPLP correlation. Empirical data indicates concentrations above 2,570 mg/kg may pose leaching concern.

			Nickel	
Sample Location	**Sample ID**	**Sample Date**	**Total (mg/kg)**	**SPLP (mg/L)**
SS-1A	SS-1A (0-1)	6/3/2013	414	1.49
SS-11	SS-11 (0-1)	6/1/2013	518	0.158
SS-11B	SS-11B (0-1)	6/4/2013	924	0.370
	SS-11B (1-2)	6/4/2013	719	1.05
SS-14B	SS-14B (0-1)	6/4/2013	1,400	1.17
SS-44A	SS-44A (0-1)	5/31/2013	579	0.842

Calculated Non-Residential Groundwater Screening Level (mg/l) = 0.996

Generic Protection of Groundwater Regional Screening Level with DAF of 20 = 520 mg/kg

* Site-Specific Protection of Groundwater Screening Level not determined due to poor data correlation.

Notes:
SPLP = Synthetic Precipitation Leaching Procedure

Table 5 (Page 1 of 1)
Summary of Monitoring Well Construction and Groundwater Elevation Data
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Monitoring Well ID	Previous Monitoring Well IDs	Primary Screened Zone	Completion Date	Well Diameter (Inches)	Casing Material	Screen Length (ft)	Screened Interval (ft msl)		Surface Casing Depth (ft bgs)	Total Well Depth (ft below TOC)	Ground Surface Elevation (ft msl)	TOC Elevation (ft msl)	June 4, 2013 Depth to Water (ft below TOC)	June 4, 2013 Groundwater Elevation (ft msl)	December 11, 2014 Depth to Water (ft below TOC)	December 11, 2014 Groundwater Elevation (ft msl)	June 23, 2015 Depth to Water (ft below TOC)	June 23, 2015 Groundwater Elevation (ft msl)
Shallow Monitor Wells																		
MW-1	NA	Zones 2/3	6/11/2015	2	PVC	15	990.72	1,005.72	NA	30	1,020.72	1,020.52	NI	NI	NI	NI	12.27	1,008.25
MW-2	SS-2	Zones 1/2	1988	2	PVC	10.5	994.06	1,004.56	NA	20	1,013.32	1,014.21	10.93	1,003.28	10.00	1,004.21	11.29	1,002.92
MW-3	SS-3	--	5/26/1995	2	PVC	10	976.66	986.66	NA	16	NM	993.11	9.12	983.99	7.37	985.74	Well Abandoned 6/14/2015	
MW-3R	NA	Zones 2/3	6/15/2015	2	PVC	15	949.82	964.82	NA	40.5	987.82	990.34	NI	NI	NI	NI	14.58	975.76
MW-4	SS-4	Zones 1/2	5/26/1995	2	PVC	10	986.56	996.56	NA	25.5	1,009.47	1,012.07	16.55	995.52	15.32	996.75	16.60	995.47
MW-5	SS-5	--	5/26/1995	2	PVC	10	NM	NM	NA	18	NM	NM	Well Not Located		Well Abandoned 6/26/2014		Well Abandoned 6/26/2014	
MW-5R	NA	Zone 2	12/6/2014	2	PVC	15	978.71	993.71	NA	24.5	1,000.22	1,003.21	NI	NI	11.94	991.27	12.60	990.61
MW-6	SS-6	Zones 1/2	4/24/1992	4	PVC	10	990.24	1,000.24	NA	26	NM	1,016.04	19.38	996.66	18.76	997.28	19.55	996.49
MW-7	SS-7	--	3/29/1993	2	PVC	5.2	992.03	997.23	NA	10	999.58	1,002.03	6.29	995.74	Well Abandoned 12/7/2014		Well Abandoned 12/7/2014	
MW-7R	NA	Zones 2/3	12/7/2014	2	PVC	10	969.57	979.57	NA	34	999.90	1,003.57	NI	NI	17.62	985.95	20.91	982.66
MW-8	NA	Zones 2/3	12/4/2014	2	PVC	10	975.73	985.73	NA	24	996.33	999.73	NI	NI	5.55	994.18	6.65	993.08
MW-9	NA	Zones 2/3	12/7/2014	2	PVC	5	975.67	980.67	NA	13	985.21	988.67	NI	NI	2.10	986.57	5.12	983.55
MW-10	NA	Zone 2	6/16/2015	2	PVC	15	949.82	964.82	NA	33	979.82	982.51	NI	NI	NI	NI	6.80	975.71
MW-11	NA	Zones 2/3	6/17/2015	2	PVC	15	956.28	971.28	NA	27	980.28	982.85	NI	NI	NI	NI	9.69	973.16
Deeper Monitor Wells																		
MW-1D	NA	Zones 4/5	6/11/2015	2	PVC	10	926.70	936.70	35	94	1,020.70	1,020.26	NI	NI	NI	NI	26.91	993.35
MW-2D	SS-2D/DS-2/LS-2	--	4/24/1992	4	PVC	open borehole	924.69	947.62	64.6	90	1,012.22	1,014.76	22.62	992.14	20.72	994.04	21.80	992.96
MW-3D	DS-3	--	1988	6	PVC	open borehole	923.07	977.55	13	68	990.55	991.17	Well Not Located		14.00	977.17	Well Abandoned 6/14/2015	
MW-3DR*	NA	Zones 5/6	6/15/2015	2	PVC	10	903.35	913.35	40	88	988.35	991.38	NI	NI	NI	NI	0.98	990.40
MW-4D	DS-4	--	1988	6	PVC	open borehole	NM	NM	24	52	NM	NM	Well Not Located		Well Not Located		Well Not Located	
MW-5D	SS-5D(F)/DS-5	Zones 3/4	5/26/1995	4	PVC	open borehole	932.01	955.51	43.8	71	999.31	1,003.01	27.35	975.66	26.09	976.92	27.40	975.61
MW-6D	SS-6D/DS-6	Zones 4/5	5/26/1995	4	PVC	open borehole	945.41	962.51	50.9	68 (1)	NM	1,013.41	31.79	981.62	27.50	985.91	30.89	982.52
MW-7D	SS-7D (G)	Zones 4/5	5/26/1995	4	PVC	open borehole	931.30	954.65	46.5	73	1,001.15	1,004.20	26.66	977.54	25.31	978.89	26.67	977.53
MW-8D	NA	Zones 4/5	12/4/2014	2	PVC	10	948.35	958.35	35	51	995.93	999.35	NI	NI	5.64	993.71	7.73	991.62
MW-9D*	NA	Zones 4/5	12/5/2014	2	PVC	4	949.03	953.03	31	38	983.24	987.03	NI	NI	0.40	986.63	3.03	984.00
MW-10D	NA	Zone 4	6/16/2015	2	PVC	5	931.79	936.79	37	51	979.79	982.47	NI	NI	NI	NI	6.72	975.75
MW-11D	NA	Zone 5	6/17/2015	2	PVC	12	916.16	928.16	34.5	67	980.16	982.82	NI	NI	NI	NI	7.03	975.79

Stream Elevation Station	Location	Top of Gauge Elevation (ft msl)	June 4, 2013 Water Elevation on Gauge (ft)	June 4, 2013 Surface Water Elevation (ft msl)	December 11, 2014 Water Elevation on Gauge (ft)	December 11, 2014 Surface Water Elevation (ft msl)	June 23, 2015 Water Elevation on Gauge (ft)	June 23, 2015 Surface Water Elevation (ft msl)
Upstream	Upstream near Old Guntersville Road	975.29	NI	NI	1.36	972.65	0.8	972.09

Notes:
TOC = Top of PVC well casing; ft msl = feet relative to mean sea level; NA = Not Applicable; NM = Not Measured; NI = Not Installed
TOC elevations surveyed by Morell Engineering in June 2013, December 2014, and June 2015; TOC information based on surveys dated April 23, 2014, December 19, 2014, and June 26, 2015; Stream gauge elevations based on surveys dated December 19, 2014 and June 26, 2015
Well construction information for wells installed prior to December 2014 based on information obtained from a prior assessment report (*Summary Report of First Year, Site Investigation,* Schreuder, Inc., July 31, 1996)
(1) The total depth of MW-6D on June 4, 2013 was approximately 50.41 ft below TOC
* = Monitoring well is artesian

Table 6 (Page 1 of 1)
Summary of Vertical Hydraulic Gradients (June 23, 2015)
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Well Pair	Location Relative to MW-1	Well Identification	Total Well Depth (ft below TOC)	Groundwater Elevation (ft)	Veritcal Gradient
1	--	MW-1	30	1008.25	Downward
		MW-1D	94	993.35	
2	Downgradient	MW-2	20	1002.92	Downward
		MW-2D	90	992.96	
3	Downgradient	MW-3R	40.5	975.76	Upward
		MW-3DR	88	990.40	
4	Downgradient	MW-5R	24.5	990.61	Downward
		MW-5D	71	975.61	
5	Downgradient	MW-6	26	996.49	Downward
		MW-6D	68	982.52	
6	Downgradient	MW-7R	34	982.66	Downward
		MW-7D	73	977.53	
7	Downgradient	MW-8	24	993.08	Downward
		MW-8D	51	991.62	
8	Downgradient	MW-9	13	983.55	Upward
		MW-9D	38	984.00	
9	Downgradient	MW-10	33	975.71	Neutral
		MW-10D	51	975.75	
10	Downgradient	MW-11	27	973.16	Upward
		MW-11D	67	975.79	

Notes:
TOC = Top of PVC well casing; ft msl = feet relative to mean sea level

Table 7 (Page 1 of 1)
Summary of Hydraulic Conductivity Data
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Well No.	Aquifer Targeted	Date Conducted	Hydraulic Conductivity (ft/day)	Solution Method	Well Depth (ft below TOC)	Screen Length (ft)
MW-2	Zones 1/2	12/11/2014	0.06	Bouwer-Rice	20	10.5
Shallow Zones 1 and 2 Geometric Mean			0.06			
MW-1	Zones 2/3	6/23/2015	0.1	Bouwer-Rice	30	15
MW-5R	Zone 2	12/11/2014	0.1	Bouwer-Rice	24.5	15
MW-7R	Zones 2/3	12/11/2014	0.3	Bouwer-Rice	34	10
MW-8	Zones 2/3	12/11/2014	2	Bouwer-Rice	24	10
MW-10	Zone 2	6/23/2015	1	Bouwer-Rice	33	15
MW-11	Zones 2/3	6/23/2015	1	Bouwer-Rice	27	15
Shallow Zones 2 and 3 Geometric Mean			0.5			
MW-1D	Zones 4/5	6/23/2015	0.3	Bouwer-Rice	93.5	10
MW-7D	Zones 4/5	12/11/2014	2	Bouwer-Rice	73	26.4
MW-8D	Zones 4/5	12/11/2014	5	Bouwer-Rice	51	10
MW-10D	Zone 4	6/23/2015	130	Bouwer-Rice	51	5
MW-11D	Zone 5	6/23/2015	1	Bouwer-Rice	67	12
Deep Zones 4 and 5 Geometric Mean			3			
MW-3DR	Zones 5/6	6/23/2015	79.11	Bouwer-Rice	88	10
Deeper Zones 5 and 6 Geometric Mean			80			

Note:
Slug tests conducted by H&H in December 2014 and June 2015

Table 8 (Page 1 of 1)
Summary of Groundwater Analytical Detections
Umicore CSM NA
Arab, Alabama
H&H Job No. UMI-001

Well ID	Sample Date	Metals (EPA Method 6010B) (mg/L)			
		Cadmium	**Cobalt**	**Manganese**	**Nickel**
MCL [1]		0.005	NS	NS	NS
Non-Residential Site-Specific GW Screening Level [2]		0.023	0.153	1.08	0.996
MW-1	6/21/2015	<0.00100	<0.0100	0.704	0.0118
MW-1D	6/21/2015	<0.00100	<0.0100	<0.0150	<0.0100
MW-2	12/9/2014	<0.00500	0.0824	0.0260	0.00917
MW-2D	12/9/2014	<0.00500	<0.0100	0.0159	<0.00500
MW-3R	6/21/2015	<0.00100	0.0285	1.63	0.0343
	6/21/2015 (DUP-1)	<0.00100	0.0282	1.66	0.0353
MW-3DR	6/21/2015	<0.00100	<0.0100	0.0773	<0.0100
MW-3D	12/8/2014	<0.00500	0.0293	0.842	0.0106
MW-4	12/9/2014	**0.109**	0.0454	0.0941	0.0966
MW-5R	12/9/2014	**0.643**	0.872	7.11	1.16
MW-5D	12/8/2014	<0.00500	<0.0100	2.11	0.0119
MW-6	12/9/2014	<0.00500	0.0129	0.200	<0.00500
MW-6D	12/11/2014	<0.00500	<0.0100	1.25	0.00585
MW-7R	12/9/2014	<0.00500	<0.0100	1.16	<0.00500
MW-7D	12/9/2014	<0.00500	<0.0100	0.799	<0.00500
MW-8	12/9/2014	<0.00500	0.0225	0.538	<0.00500
	12/9/2014 (DUP-1)	<0.00500	0.0219	0.534	<0.00500
MW-8D	12/9/2014	<0.00500	<0.0100	0.340	<0.00500
MW-9	12/9/2014	<0.00500	<0.0100	0.398	<0.00500
MW-9D	12/9/2014	<0.00500	<0.0100	0.281	<0.00500
MW-10	6/21/2015	<0.00100	<0.0100	0.191	<0.0100
MW-10D	6/21/2015	<0.00100	<0.0100	0.0731	<0.0100
MW-11	6/21/2015	<0.00100	<0.0100	0.388	<0.0100
MW-11D	6/21/2015	<0.00100	<0.0100	0.0523	<0.0100

Notes:
mg/L = milligrams per liter; GW = Groundwater
(1). Maximum Contaminant Level (MCL) from U.S. Environmental Protection Agency Regional Screening Levels (RSL) table dated June 2015
(2). Non-residential groundwater screening Level calculated using EPA's RSL Calculator assuming groundwater usage at the Site under a conservative non-residential screnario
Bold concentration exceeds MCL
Orange shading indicates concentration significantly exceeds background and the calculated non-residential groundwater screening level
Blue shading indicates concentration exceeds the calculated non-residential Site-specific groundwater screening level but is consistent with background levels
NS = Not Specified
"<" indicates not detected above the indicated laboratory reporting limit
"DUP" - blind duplicate sample

Table 9 (Page 1 of 1)
Summary of Monitoring Well Geochemical Parameters
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

	Field Parameter (units)						
Well ID	**Date**	**DO (mg/L)**	**Temperature (°C)**	**Conductivity (µs/cm^2)**	**pH**	**ORP (mV)**	**Turbidity (NTU)**
MW-1	6/21/2015	2.77	20.2	102.2	6.37	17.7	9.93
MW-1D	6/21/2015	1.48	18.85	270	10.82	-137.5	9.76
MW-2	12/9/2014	1.81	16.60	296	6.15	161.6	1.71
MW-2D	12/9/2014	4.36	16.98	321	9.88	-9.1	1.96
MW-3R	6/21/2015	0.48	18.4	607.3	6.41	16.2	4.23
MW-3D	12/8/2014	3.17	12.71	1,644	4.99	287.6	7.66
MW-3DR	6/21/2015	0.69	19.74	241	7.58	-107.3	4.31
MW-4	12/9/2014	2.99	15.53	383	5.81	160.0	1.33
MW-5R	12/9/2014	1.74	16.20	1,295	4.73	218.1	7.61
MW-5D	12/8/2014	0.43	13.80	854	6.10	-7.2	9.86
MW-6	12/9/2014	1.23	14.48	14,290	6.48	112.1	1.73
MW-6D	12/11/2014	0.24	16.20	498	6.20	-62.4	4.08
MW-7R	12/9/2014	0.61	14.68	418	6.04	24.1	9.45
MW-7D	12/9/2014	0.55	13.33	522	6.46	-7.6	8.13
MW-8	12/9/2014	0.40	14.79	218	6.36	-50.9	9.37
MW-8D	12/9/2014	0.60	16.13	264	6.31	-33.4	1.00
MW-9	12/9/2014	1.72	14.28	346	6.02	96.1	7.17
MW-9D	12/9/2014	0.63	14.29	191	6.77	-68.4	7.29
MW-10	6/21/2015	0.32	19.4	541.9	7.63	-66.5	3.04
MW-10D	6/21/2015	1.09	18.93	449	7.68	-53.2	9.12
MW-11	6/21/2015	0.35	20.2	352.1	7.99	-104.4	4.36
MW-11D	6/21/2015	0.72	20.99	244	7.47	-104.9	9.72

Notes:
DO = Dissolved Oxygen; ORP = Oxidation-Reduction Potential
mg/L= milligrams per liter; mv= millivolts; µS/cm= microsiemens per centimeter

Table 10 (Page 1 of 1)
Summary of Surface Water Analytical Detections
Umicore CSM NA
Arab, Alabama
H&H Job No. UMI-001

Sample ID	**SW-1**	**SW-2**	**SW-3**	**ADEM Water Quality Criteria for Freshwater Aquatic Life Criteria[1]**		**US EPA Region 4 Hazardous Waste Site Surface Water Screening Values[2]**	
Location	Upstream near Old Guntersville Road	Downstream of on-site drainage and Shoal Creek confluence	Downstream near Highway 69				
Sample Date	12/10/14	12/10/14	12/10/14				
Units	(µg/L)	(µg/L)	(µg/L)	**Acute**	**Chronic**	**Acute**	**Chronic**
EPA Method 6010B							
Cadmium	<5.0	<5.0	<5.0	0.528	0.094	2	0.25
Cobalt	<10.0	<10.0	<10.0	NS	NS	120	19
Manganese	89.7	89.8	105	NS	NS	1,680	93
Nickel	<5.0	<5.0	<5.0	146.2	16.2	470	52

Notes:
[1]ADEM Water Quality Criteria for freshwater as published in Table 1 of the ADEM Admin. Code 335-6-10 ("Aquatic Life Criteria")
[2] US EPA Supplemental Guidance to ERAGS: Region 4, Ecological Risk Assessment - Region 4 Surface Water Screening Values for Hazardous Waste Sites, Updated 2015 (Table 1a - Freshwater Screening Values)
Concentrations reported in micrograms per liter (µg/L)
NS = Not Specified

Table 11 (Page 1 of 1)
Summary of Sediment Analytical Detections
Umicore CSM NA
Arab, Alabama
H&H Job No. UMI-001

Sample ID	Site-Specific Background Concentrations		Published Background[2]				SED-1	SED-2	SED-3	US EPA Region 4 Sediment Screening Value[1] (mg/kg)
Location							Upstream	Downstream of on-site drainage and Shoal Creek confluence	Downstream near Highway 69	
Sample Date							12/10/14	12/10/14	12/10/14	
Units	Range	2X Mean	Range	Mean	N	Ref.	(mg/kg)	(mg/kg)	(mg/kg)	
EPA Method 6010B										
Cadmium	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	2	<0.459	<0.470	0.545	1
Cobalt	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	1	4.82	4.97	4.26	50
Manganese	22.4 - 252	203.2	8.0 - 3,394	594	10	2	97.6	43.3	212	460
Nickel	3.55 - 7.23	10.1	n.d. - 30	10	20	1	2.99	2.92	6.35	22.7

Notes:
[1] US EPA Supplemental Guidance to ERAGS: Region 4, Ecological Risk Assessment - Region 4 Sediment Screening Values for Hazardous Waste Sites, Updated 2015 (Table 2a - Freshwater Sediment Screening Values)
[2] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*
Concentrations reported in milligrams per kilogram (mg/kg)
NS = Not Specified
Ref.
1. Alabama soils
2. Southeastern USA soils

Table 12 (Page 1 of 1)
Selected Statistical Summary and Comparison of Site Soil Concentrations to Ecological Screening Levels
(Soil Outside the Fenceline)
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Analytes of Interest	Background Metals: Site-Specific Background Concentrations: Range	Background Metals: Site-Specific Background Concentrations: 2X Mean	Background Metals: Published Background[5]: Range	Background Metals: Published Background[5]: Mean	Background Metals: Published Background[5]: N	Background Metals: Published Background[5]: Ref.	Frequency of Detection	Mean Concentration (mg/kg)	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Range of Eco-SSLs for Soil Invertebrates and Avian and Mammalian Wildlife (mg/kg)
Surface Soil (0-1 ft bgs)											
Cadmium [1]	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	2	25 of 44	6.8	20.4	5.6	0.36 - 630
Cobalt [2]	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	1	175 of 175	297	1,750	422	120 - 2,100
Manganese [3]	22.4 - 252	203.2	8.0 - 3,394	594	10	2	101 of 101	534	2,650	791	450 - 65,000
Nickel [4]	3.55 - 7.23	10.1	n.d. - 30	10	20	1	93 of 94	99	698	171	130 - 2,800
Subsurface Soil											
Cadmium [1]	<1.08 - <1.31	1.17	1.0 - 10	4.3	12	2	40 of 65	6.6	20.4	6.2	0.36 - 630
Cobalt [2]	<2.25 - 5.18	5.79	n.d. - 15	3.9	20	1	337 of 349	205	1,430	293	120 - 2,100
Manganese [3]	22.4 - 252	203.2	8.0 - 3,394	594	10	2	161 of 162	449	2,650	628	450 - 65,000
Nickel [4]	3.55 - 7.23	10.1	n.d. - 30	10	20	1	131 of 133	93	766	154	130 - 2,800

Notes:

Statistics were developed following the ProUCL-recommended identification and removal of outlier values as described in the HSWMR Focused Risk Evaluation dated March 4, 2016.

[1]Ecological Soil Screening Levels for Cadmium, Interim Final OSWER Directive 9285.7-65, March 2005

[2]Ecological Soil Screening Levels for Cobalt, Interim Final OSWER Directive 9285.7-67, March 2005

[3]Ecological Soil Screening Levels for Manganese, Interim Final OSWER Directive 9285.7-71, April 2007

[4]Ecological Soil Screening Levels for Nickel, Interim Final OSWER Directive 9285.7-76, March 2007

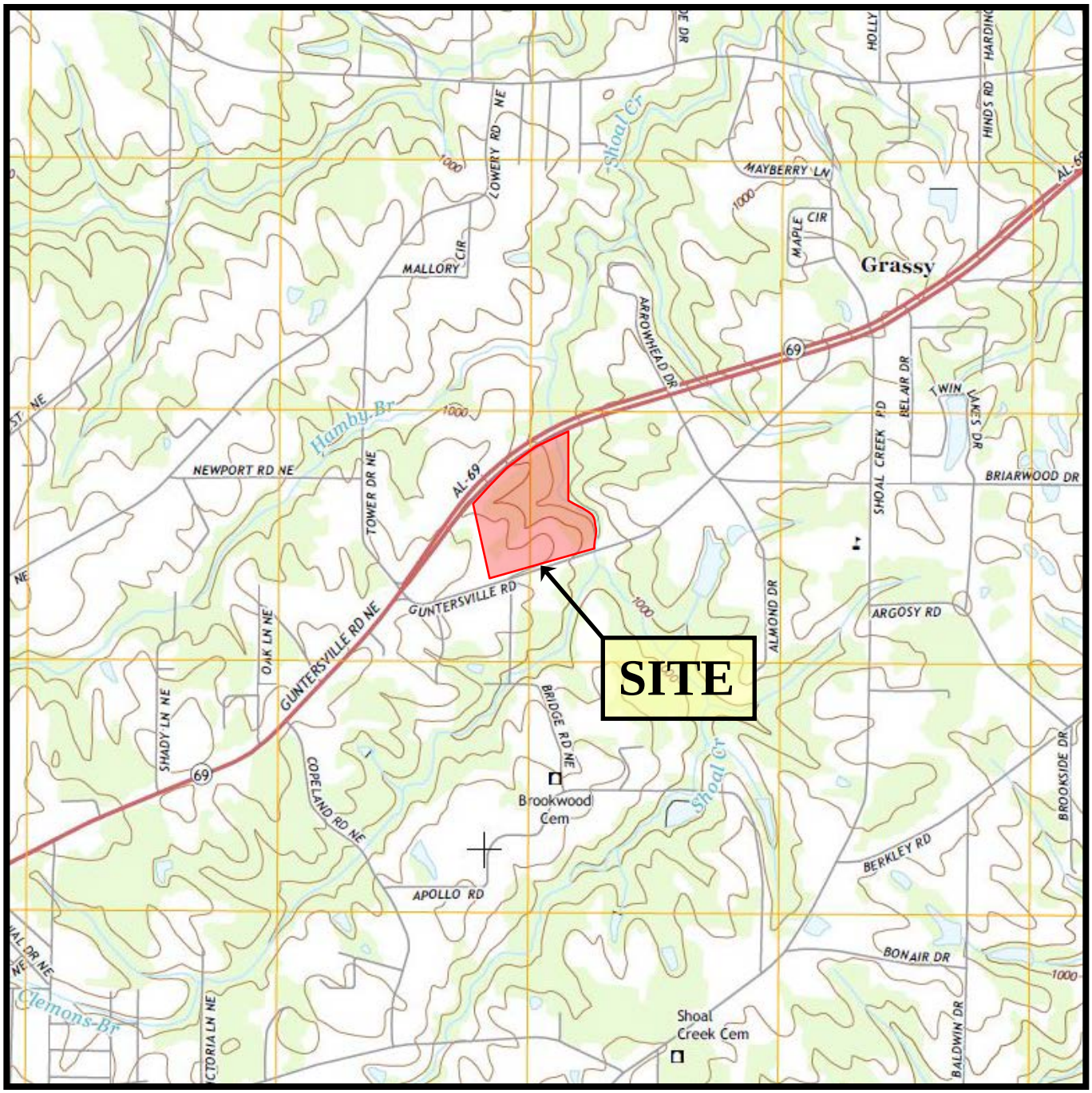
Eco-SSL = Ecological Soil Screening Levels; UCL = Upper Confidence Limit

N = number of samples; bgs = below ground surface; n.d. = Not Detected

[5] *Elements in North American Soils: Section Edition, James Dragun, Ph. D and Khaled Chekiri, Ph. D. 2005*

Ref.

1. Alabama soils
2. Southeastern USA soils



N

APPROXIMATE

0 2000 4000

SCALE IN FEET

U.S.G.S. QUADRANGLE MAP

ARAB, AL, 2014

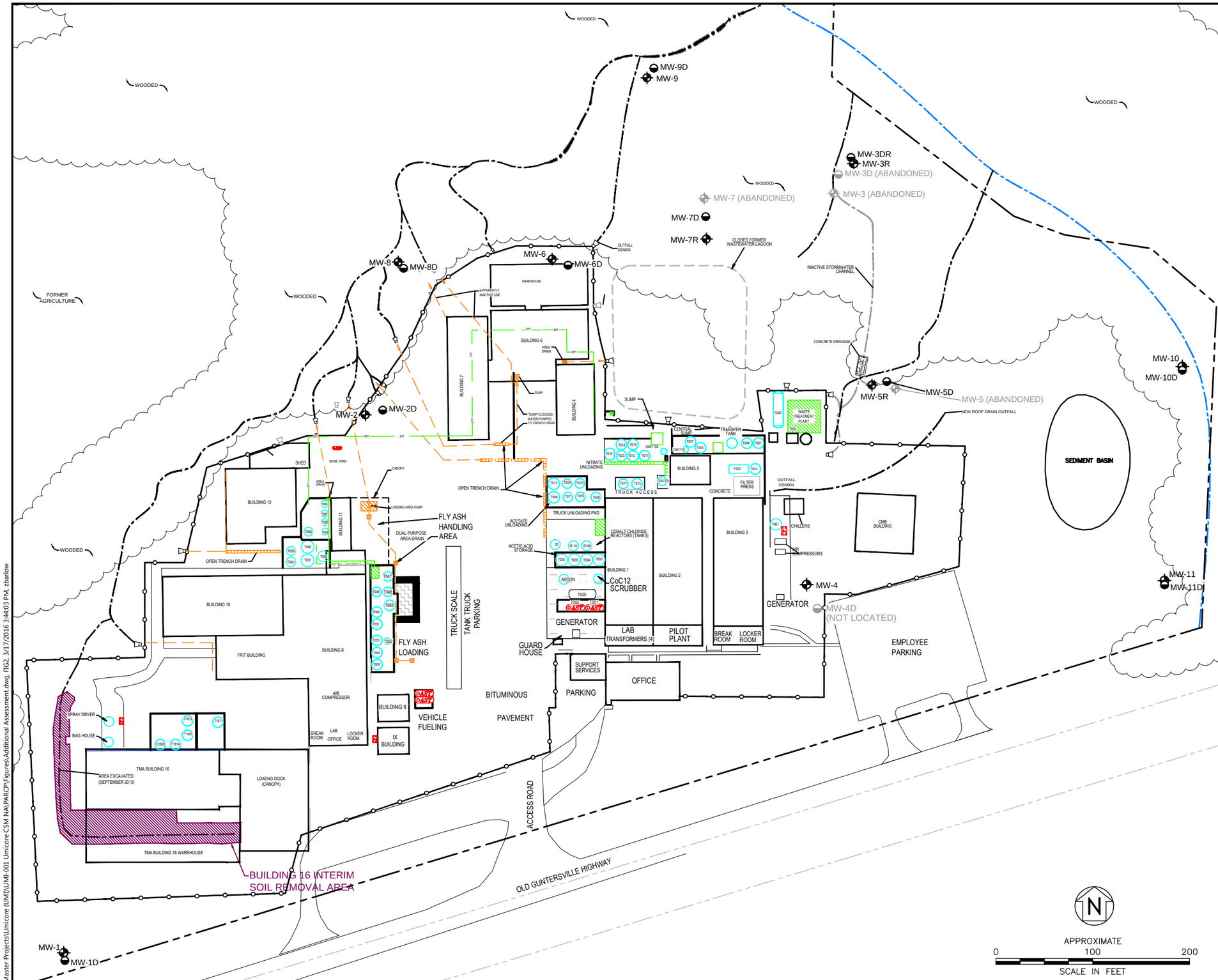
QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE	**SITE LOCATION MAP**
PROJECT	**UMICORE CSM NA FACILITY** **ARAB, ALABAMA**

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

DATE:	3-2-16	REVISION NO:	0
JOB NO:	UMI-001	FIGURE:	1



LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- DEEP TYPE MONITORING WELL
- SHALLOW TYPE MONITORING WELL

NOTES:

1. MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

TITLE

SITE LAYOUT MAP

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

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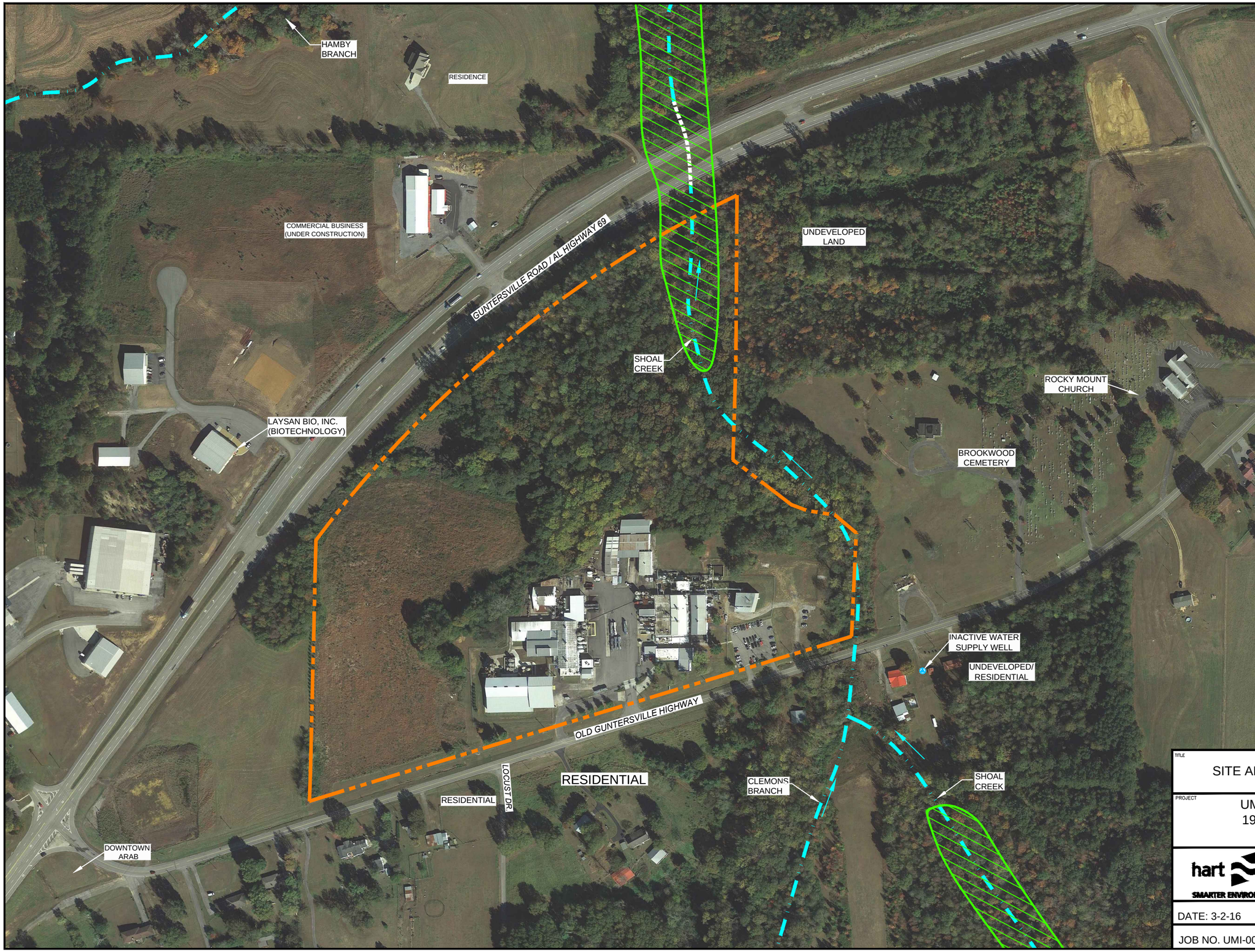
DATE: 3–2–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 2

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Additional Assessment.dwg, FIG2, 3/17/2016 3:44:03 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- APPROXIMATE STREAM
- CREEK/STREAM FLOW DIRECTION
- INACTIVE WATER SUPPLY WELL
- APPROXIMATE POTENTIAL WETLAND BOUNDARY

NOTE:

1. AERIAL PHOTOGRAPH OVERLAY TAKEN FROM GOOGLE EARTH (IMAGERY DATE OCTOBER 29, 2015).

N

APPROXIMATE
0 300 600
SCALE IN FEET

TITLE
SITE AND SURROUNDING AREA MAP

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERSVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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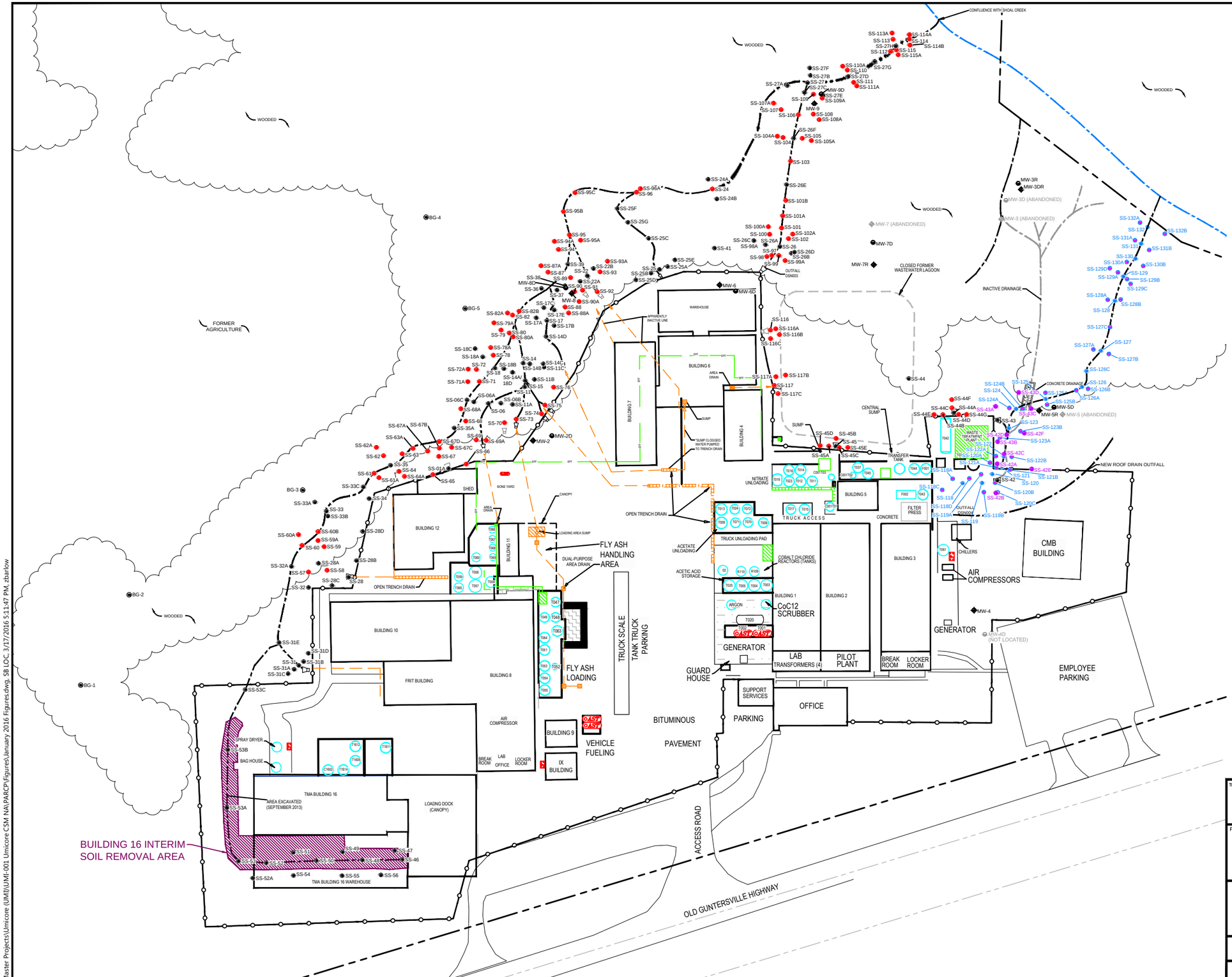
DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 3

\\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Site & Surrounding Area Map.dwg, FIG 3, 3/7/2016 4:22:44 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- ABANDONED MONITORING WELL (SHALLOW)
- MONITORING WELL NOT LOCATED (DEEP)
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (MAY 2015)
- PROVISIONAL SOIL SAMPLE LOCATIONS (MAY 2015)

NOTES:

1. MONITORING WELL AND SOIL BORINGS LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
SOIL SAMPLE LOCATIONS (2014-2015)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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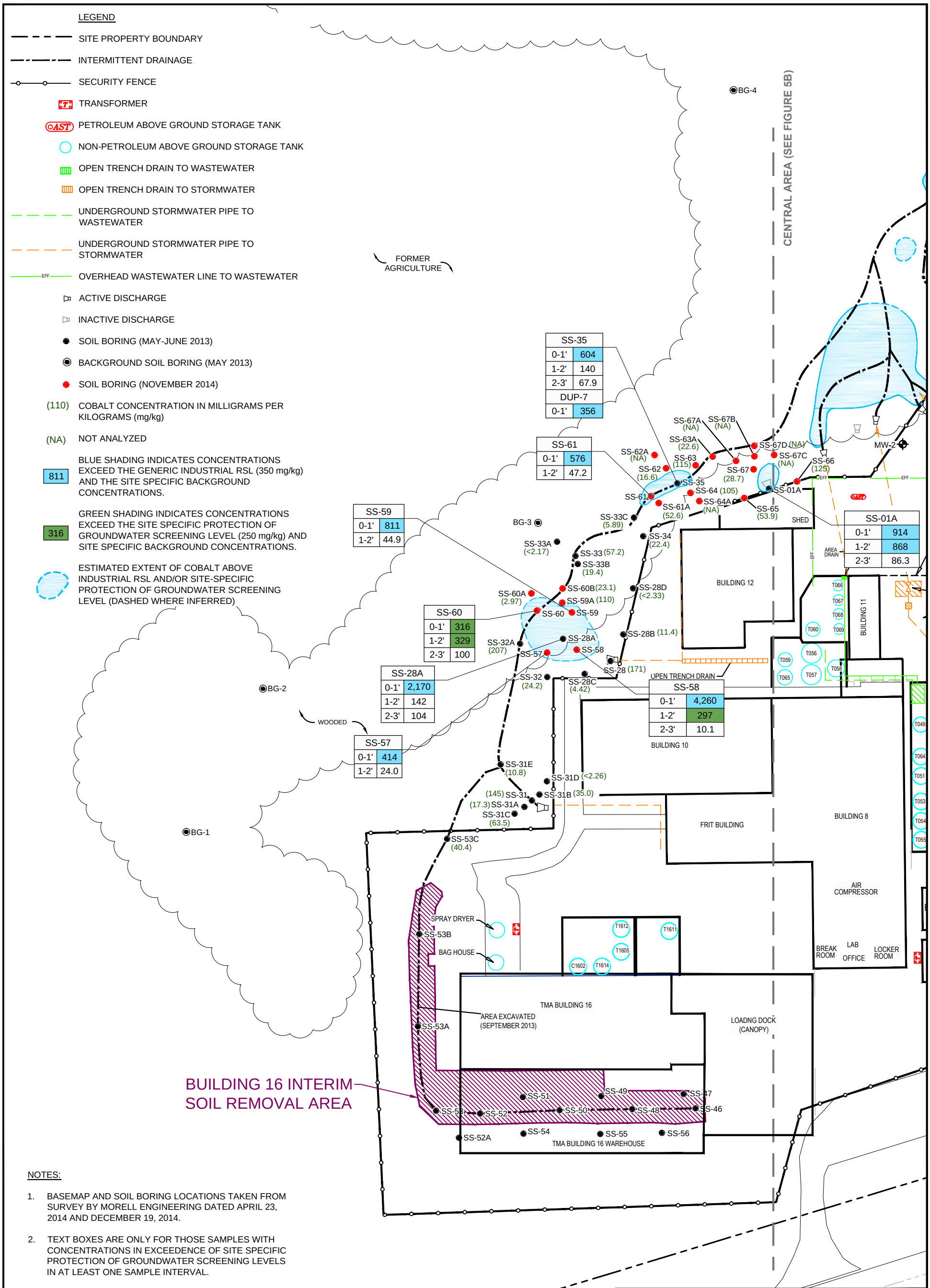
License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 4

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, SB LOC 3/17/2016 5:11:47 PM, zbarlow



NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

SAMPLE IDENTIFICATION

SS-61	
0-1'	576
1-2'	47.2

COBALT CONCENTRATION (mg/kg)

SS-31E (10.8)

SAMPLE DEPTH (BGS)

N

APPROXIMATE 0 60 120 SCALE IN FEET

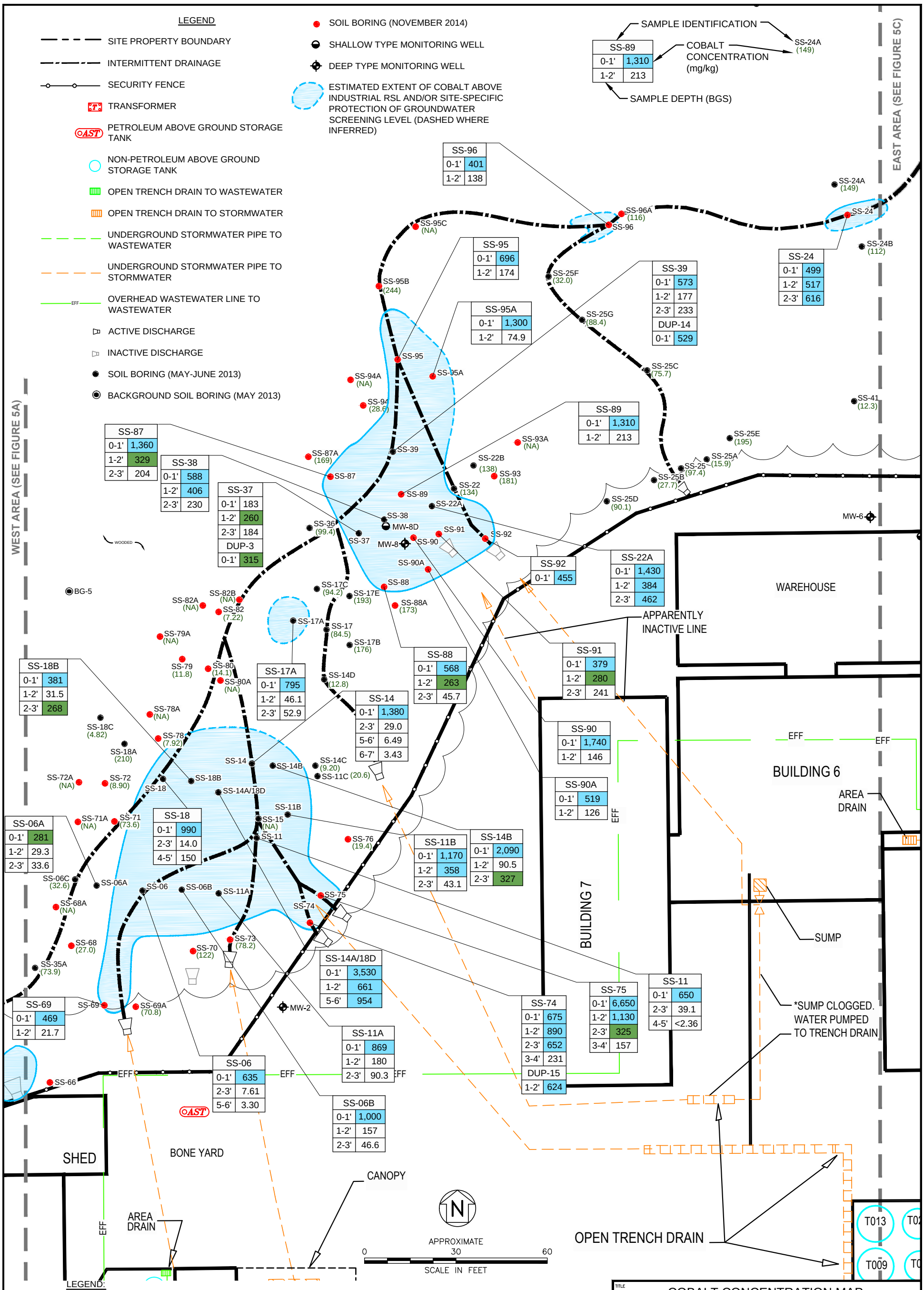
TITLE
COBALT CONCENTRATION MAP (WEST)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 5A

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Cobalt West, 3/17/2016 5:12:06 PM, zbarlow



LEGEND:

(70.8) COBALT CONCENTRATION IN MILLIGRAMS PER KILOGRAMS (mg/kg)

(NA) NOT ANALYZED

635 BLUE SHADING INDICATES CONCENTRATIONS EXCEED THE GENERIC INDUSTRIAL RSL (350 mg/kg) AND THE SITE SPECIFIC BACKGROUND CONCENTRATIONS.

281 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL (250 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS.

NOTE:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 10, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE
COBALT CONCENTRATION MAP (CENTRAL)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
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704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0
JOB NO. UMI-001 | FIGURE NO. 5B

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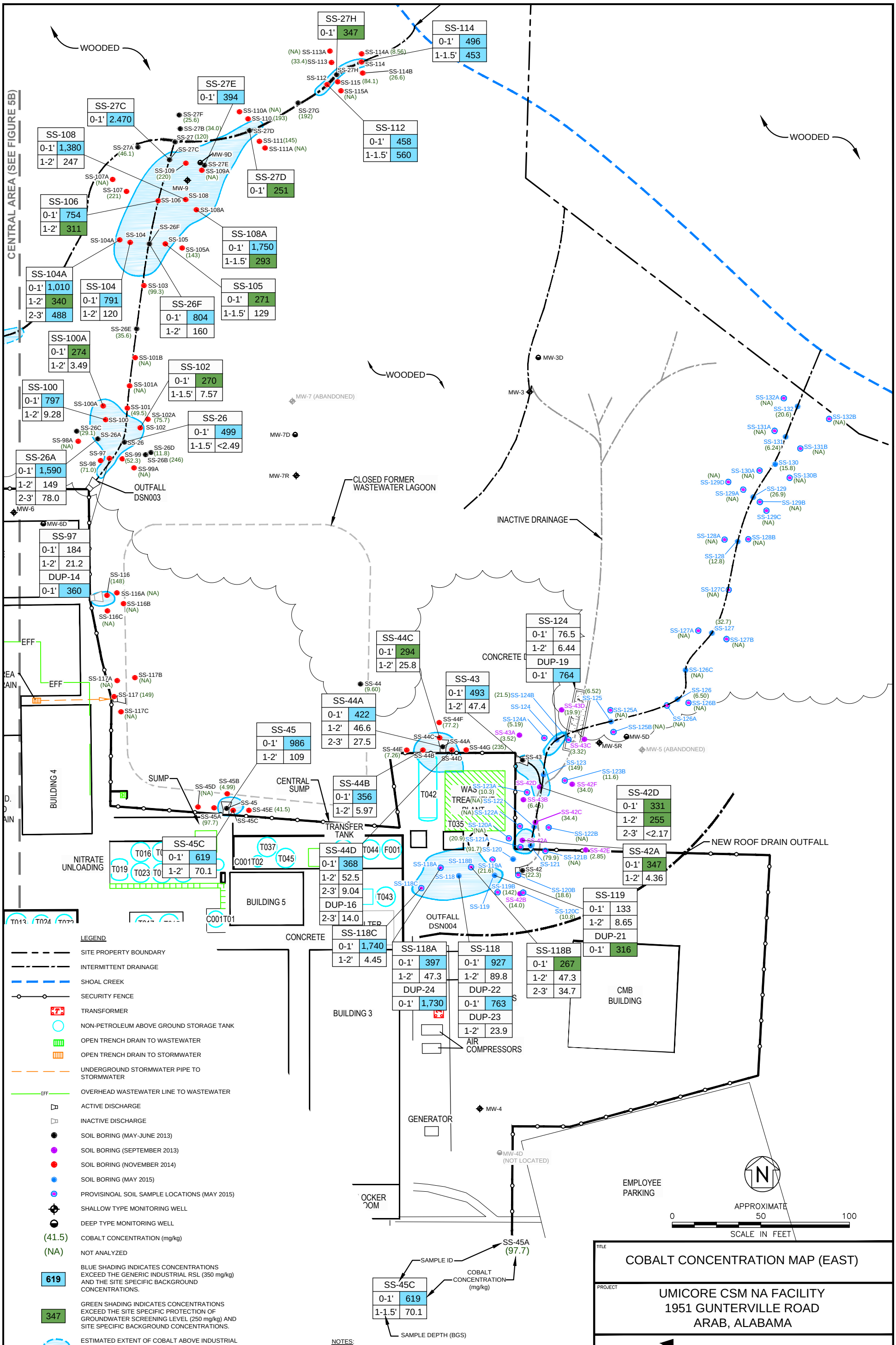

LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (MAY 2015)
- PROVISINOAL SOIL SAMPLE LOCATIONS (MAY 2015)
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- (41.5) COBALT CONCENTRATION (mg/kg)
- (NA) NOT ANALYZED
- 619 BLUE SHADING INDICATES CONCENTRATIONS EXCEED THE GENERIC INDUSTRIAL RSL (350 mg/kg) AND THE SITE SPECIFIC BACKGROUND CONCENTRATIONS.
- 347 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL (250 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS.
- ESTIMATED EXTENT OF COBALT ABOVE INDUSTRIAL RSL AND/OR SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL (DASHED WHERE INFERRED)

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEYS BY MORELL ENGINEERING DATED APRIL 23, 2014, DECEMBER 19, 2014, AND JUNE 26, 2015.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE

COBALT CONCENTRATION MAP (EAST)

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
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License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 5C

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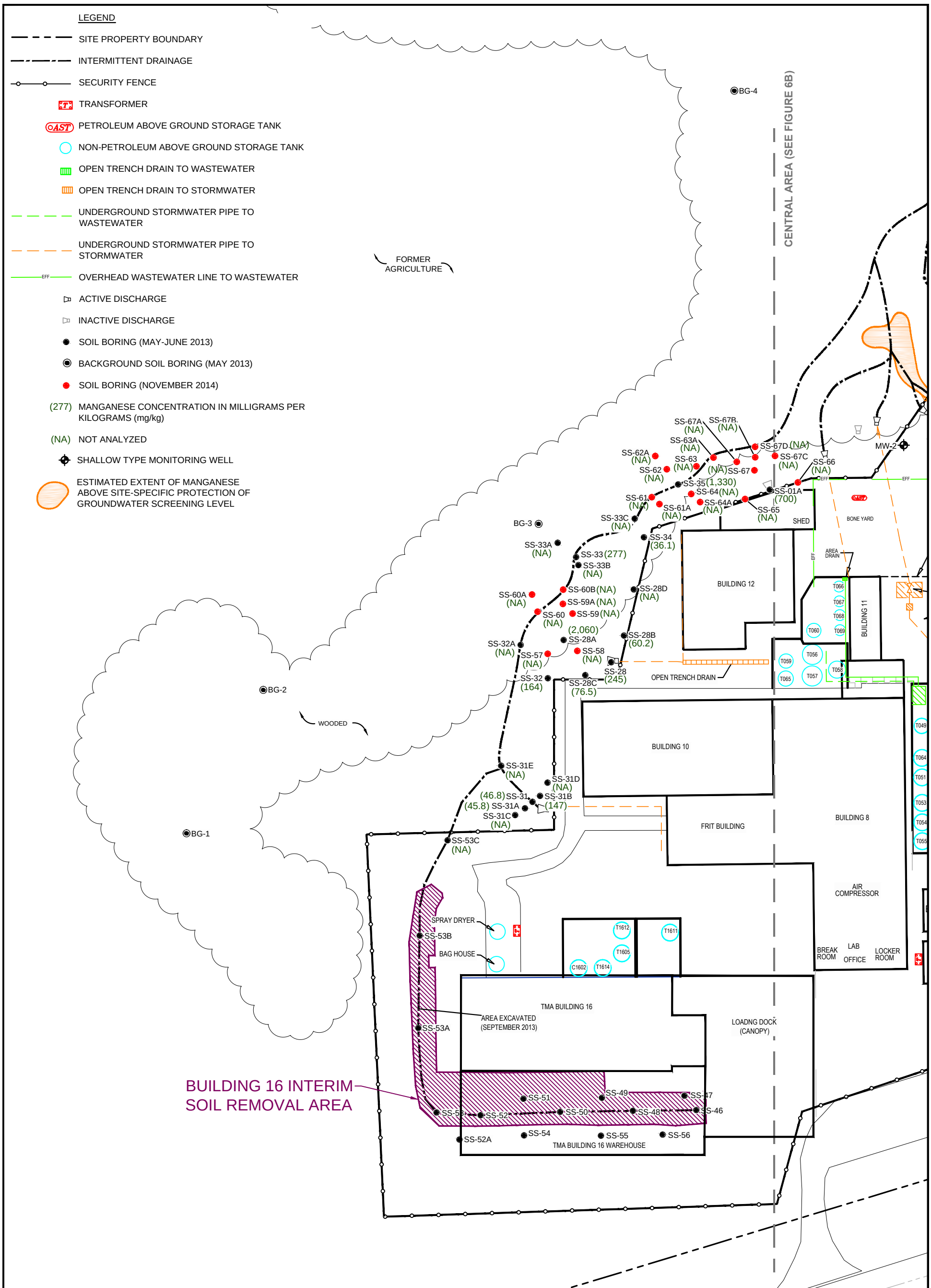

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

N

APPROXIMATE
0 60 120
SCALE IN FEET

TITLE
MANGANESE CONCENTRATION MAP (WEST)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

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DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 6A

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LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- (1,200) MANGANESE CONCENTRATION IN MILLIGRAMS PER KILOGRAMS (mg/kg)
- (NA) NOT ANALYZED
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL

3,150 — GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL (2,570 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS.

ESTIMATED EXTENT OF MANGANESE ABOVE SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

WEST AREA (SEE FIGURE 6A)

EAST AREA (SEE FIGURE 6C)

SS-24A (608)
SS-24 (NA)
SS-24B (508)
SS-96A (NA)
SS-96 (NA)
SS-95C (NA)
SS-95B (NA)
SS-25F (NA)
SS-25G (NA)
SS-25C (407)
SS-95 (NA)
SS-95A (NA)
SS-94A (NA)
SS-94 (NA)
SS-41 (45.1)
SS-93A (NA)
SS-25E (NA)
SS-25A (94.0)
SS-25 (267)
SS-25B (144)
SS-25D (NA)
SS-87A (NA)
SS-39 (960)
SS-22B (747)
SS-93 (NA)
SS-87 (NA)
SS-22 (678)
SS-89 (NA)
SS-22A (2,130)
SS-38 (1,200)
MW-8D
SS-36 (75.7)
SS-37 (427)
MW-8
SS-90 (NA)
SS-91 (NA)
SS-92 (NA)
SS-90A (NA)
MW-6
BG-5
SS-17C (109)
SS-17E (335)
SS-88 (NA)
SS-88A (NA)
SS-82B (NA)
SS-82A (NA)
SS-82 (159)
SS-17A (948)
SS-17 (1,650)
SS-17B (1,280)
SS-79A (NA)
SS-79 (274)
SS-80 (221)
SS-80A (NA)
SS-14D (99.0)
SS-78A (NA)
SS-18C (84.1)
SS-78 (NA)
SS-18A (1,420)
SS-14 (1,480)
SS-14B
SS-14C (72.7)
SS-11C (237)
SS-72A (NA)
SS-72 (NA)
SS-18 (950)
SS-18B (370)
SS-14A/18D
SS-11B (2,570)
SS-71A (NA)
SS-71 (NA)
SS-15 (NA)
SS-11 (1,070)
SS-76 (115)
SS-06C (132)
SS-06A (1,070)
SS-06 (537)
SS-06B (1,480)
SS-11A (1,080)
SS-75
SS-68A (NA)
SS-74 (987)
SS-68 (NA)
SS-70 (NA)
SS-73 (NA)
SS-35A (394)
MW-2D
SS-69 (NA)
SS-69A (NA)
MW-2
SS-66 (NA)

SS-14B	
0-1'	3,910
1-2'	177

SS-75	
0-1'	6,990
1-2'	2,330

SS-14A/18D	
0-1'	3,150
1-2'	726
5-6'	906

WAREHOUSE

APPARENTLY INACTIVE LINE

BUILDING 6

AREA DRAIN

BUILDING 7

SUMP

*SUMP CLOGGED. WATER PUMPED TO TRENCH DRAIN

EFF

WOODED

AST

SHED

BONE YARD

CANOPY

AREA DRAIN

OPEN TRENCH DRAIN

T013

T009

NOTE:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

N

APPROXIMATE
0 30 60
SCALE IN FEET

SAMPLE IDENTIFICATION — SS-11B (2,570)

SS-14A/18D	
0-1'	3,150
1-2'	726
2-3'	906

MANGANESE CONCENTRATION (mg/kg)

SAMPLE DEPTH (BGS)

TITLE: MANGANESE CONCENTRATION MAP (CENTRAL)

PROJECT: UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
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704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0

JOB NO. UMI-001 | FIGURE NO. 6B

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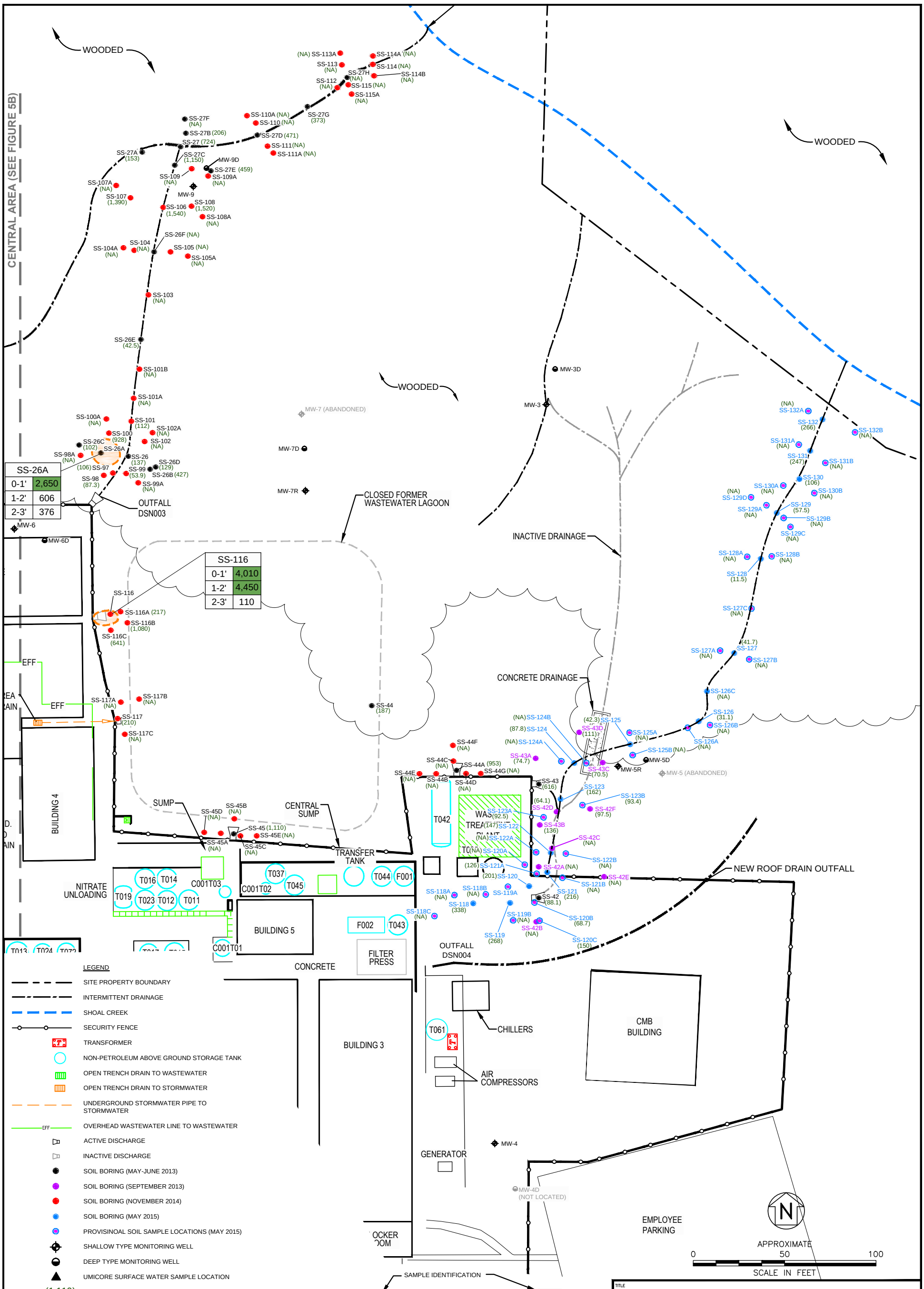

LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (MAY 2015)
- PROVISINOAL SOIL SAMPLE LOCATIONS (MAY 2015)
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- UMICORE SURFACE WATER SAMPLE LOCATION
- (1,110) MANGANESE CONCENTRATION (mg/kg)
- (NA) NOT ANALYZED
- 2,650 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL (2,570 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS.
- ESTIMATED EXTENT OF MANGANESE ABOVE SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

SAMPLE IDENTIFICATION — SS-45 (1,110) — MANGANESE CONCENTRATION (mg/kg)

SS-116	
0-1'	4,010
1-2'	4,450
2-3'	110

SAMPLE DEPTH (BGS)

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEYS BY MORELL ENGINEERING DATED APRIL 23, 2014, DECEMBER 19, 2014, AND JUNE 26, 2015.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE
MANGANESE CONCENTRATION MAP (EAST)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0
JOB NO. UMI-001 | FIGURE NO. 6C

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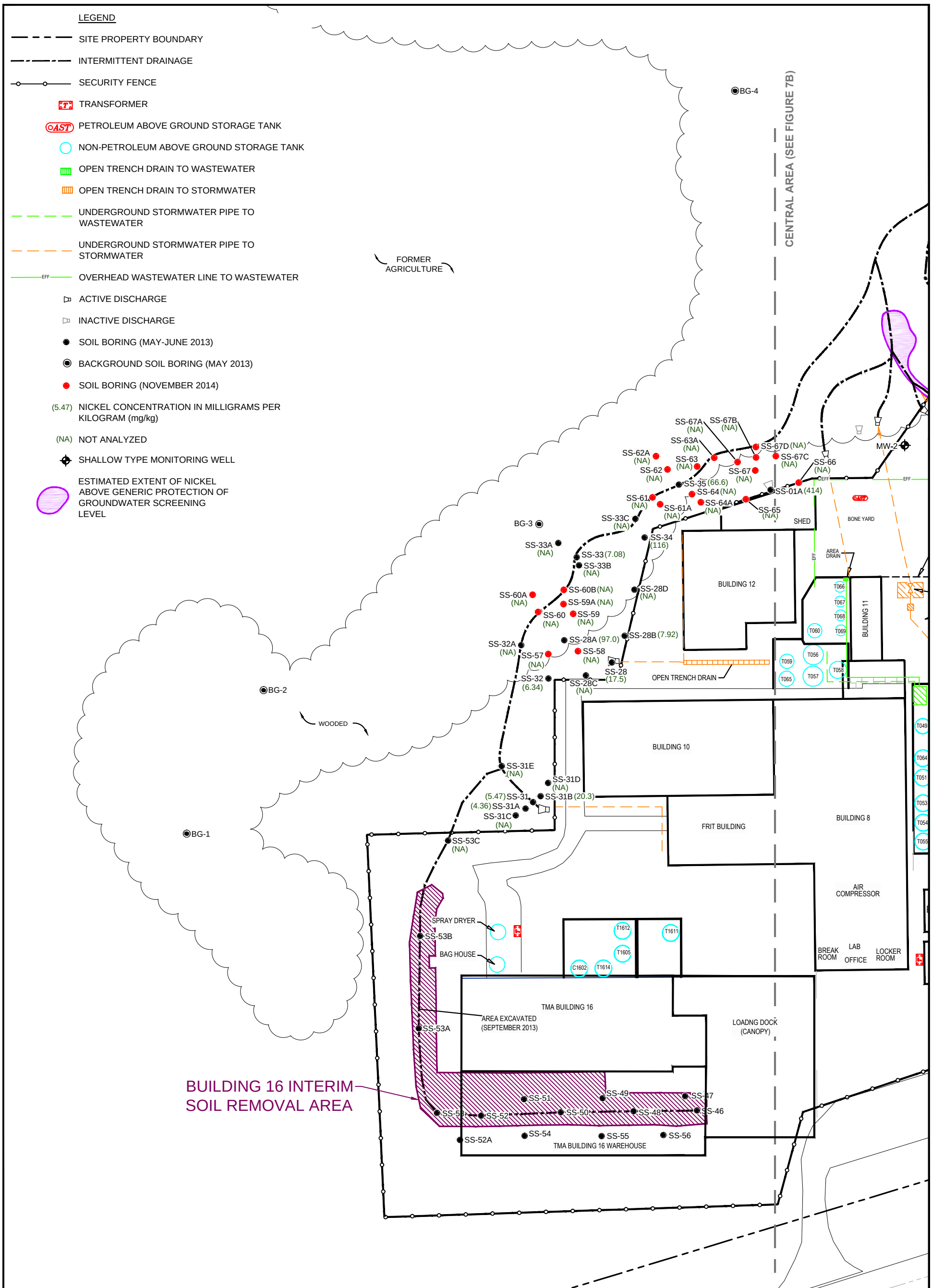

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE
NICKEL CONCENTRATION MAP (WEST)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
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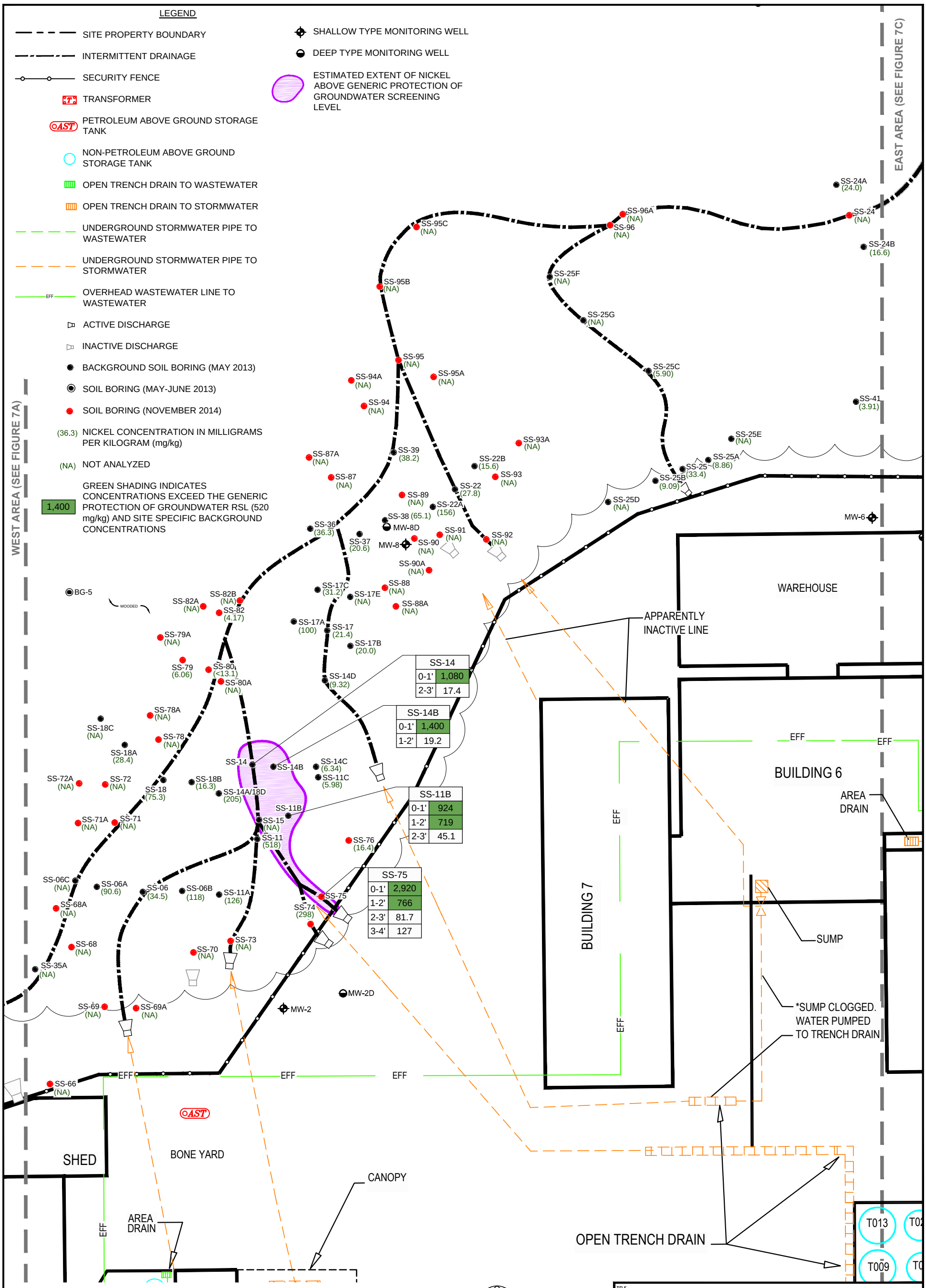
License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 7A

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Nickel West, 3/17/2016 5:12:33 PM, zbarlow



NOTE:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF GENERIC PROTECTION OF GROUNDWATER RSLs IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

N

APPROXIMATE
0 30 60
SCALE IN FEET

SAMPLE IDENTIFICATION: SS-74 (298)

SS-14B	
0-1'	1,400
1-2'	19.2

NICKEL CONCENTRATION (mg/kg)

SAMPLE DEPTH (BGS)

TITLE
NICKEL CONCENTRATION MAP (CENTRAL)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
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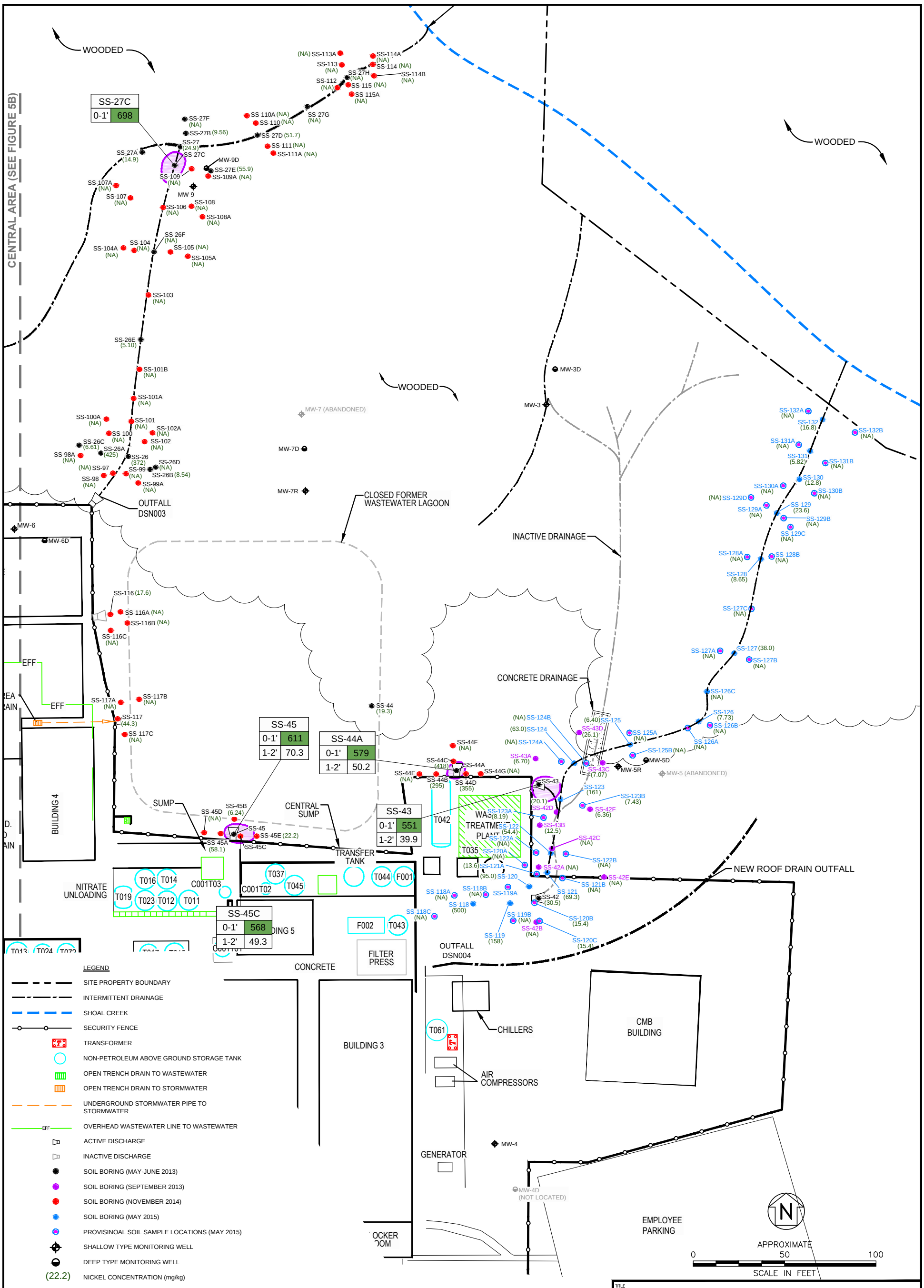
License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 7B

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Nickel Central, 3/17/2016 5:16:07 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- EFF — OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (MAY 2015)
- PROVISINOAL SOIL SAMPLE LOCATIONS (MAY 2015)
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- (22.2) NICKEL CONCENTRATION (mg/kg)
- (NA) NOT ANALYZED
- 568 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE GENERIC PROTECTION OF GROUNDWATER RSL (520 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS
- ESTIMATED EXTENT OF NICKEL ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL

SAMPLE IDENTIFICATION: SS-45C; NICKEL CONCENTRATION (mg/kg): 0-1' 568; SAMPLE DEPTH (BGS): 1-2' 49.3

SS-42 (30.5)

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEYS BY MORELL ENGINEERING DATED APRIL 23, 2014, DECEMBER 19, 2014, AND JUNE 26, 2015.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVELS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE

NICKEL CONCENTRATION MAP (EAST)

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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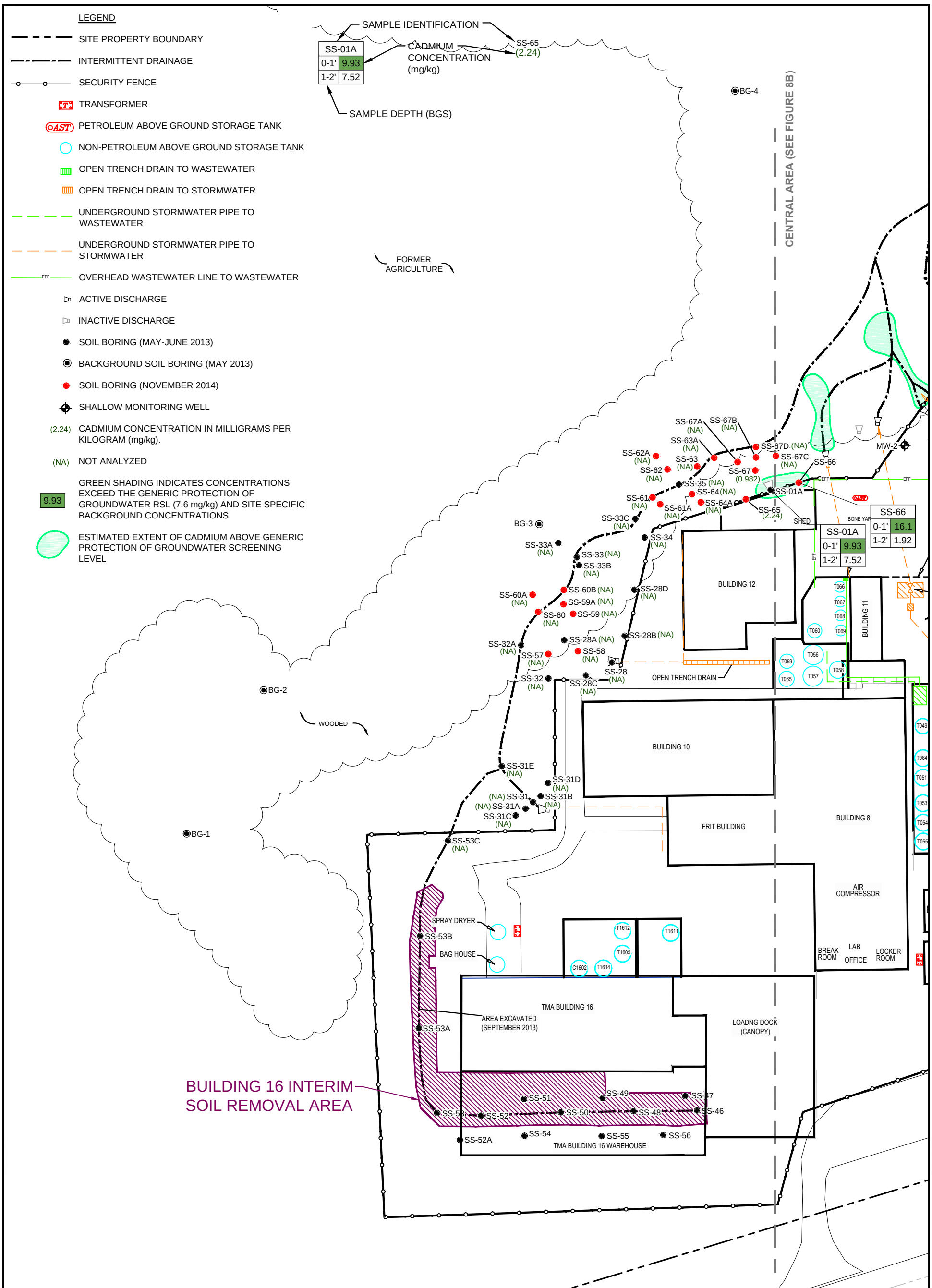
DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 7C

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Constituent Concentration Figures East.dwg, Nickel East 7C, 3/17/2016 5:17:45 PM, zbarlow



NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF THE GENERIC PROTECTION OF GROUNDWATER RSL AND SITE-SPECIFIC BACKGROUND CONCENTRATIONS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

N

APPROXIMATE
0 60 120
SCALE IN FEET

TITLE
CADMIUM CONCENTRATION MAP (WEST)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 8A

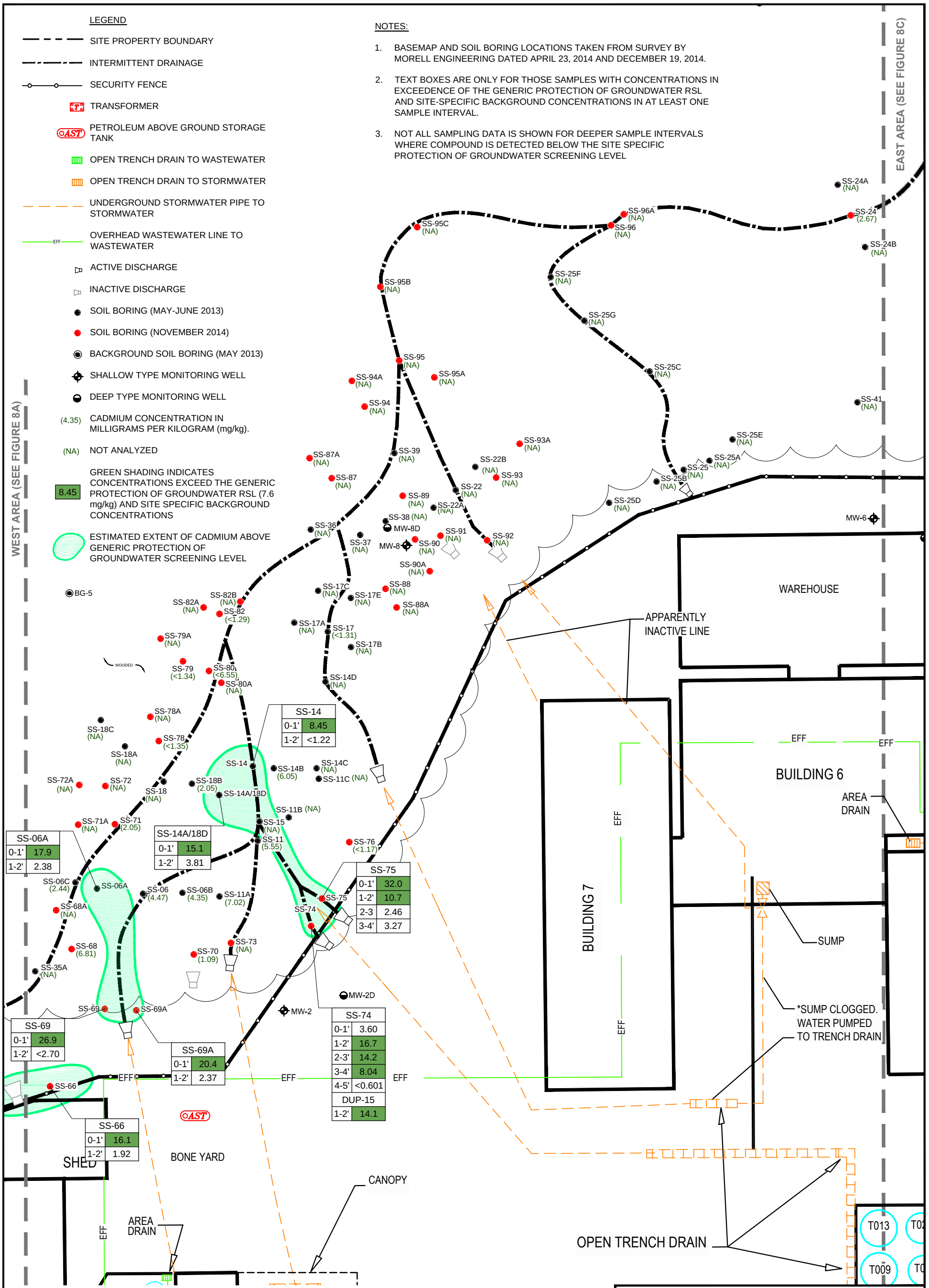
S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Cadmium West, 3/17/2016 5:22:39 PM, zbarlow

LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- SOIL BORING (NOVEMBER 2014)
- BACKGROUND SOIL BORING (MAY 2013)
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- (4.35) CADMIUM CONCENTRATION IN MILLIGRAMS PER KILOGRAM (mg/kg).
- (NA) NOT ANALYZED
- 8.45 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE GENERIC PROTECTION OF GROUNDWATER RSL (7.6 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS
- ESTIMATED EXTENT OF CADMIUM ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014 AND DECEMBER 19, 2014.
2. TEXT BOXES ARE ONLY FOR THOSE SAMPLES WITH CONCENTRATIONS IN EXCEEDENCE OF THE GENERIC PROTECTION OF GROUNDWATER RSL AND SITE-SPECIFIC BACKGROUND CONCENTRATIONS IN AT LEAST ONE SAMPLE INTERVAL.
3. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL



TITLE
CADMIUM CONCENTRATION MAP (CENTRAL)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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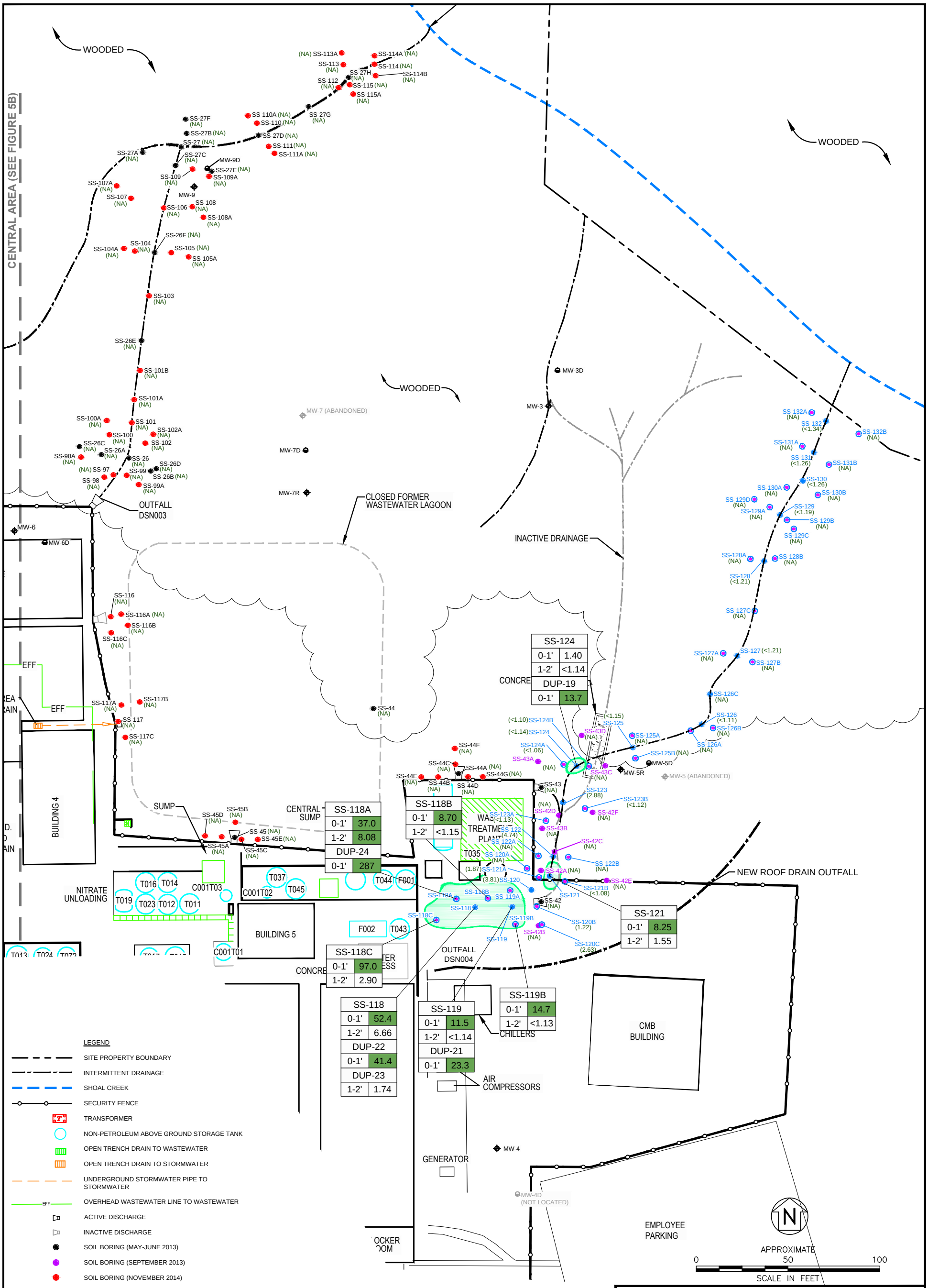
DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 8B

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Cadmium Central, 3/17/2016 5:24:53 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SOIL BORING (MAY-JUNE 2013)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (MAY 2015)
- PROVISINOAL SOIL SAMPLE LOCATIONS (MAY 2015)
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- (NA) NOT ANALYZED
- 14.7 GREEN SHADING INDICATES CONCENTRATIONS EXCEED THE GENERIC PROTECTION OF GROUNDWATER RSL (7.6 mg/kg) AND SITE SPECIFIC BACKGROUND CONCENTRATIONS
- ESTIMATED EXTENT OF CADMIUM ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL

SAMPLE IDENTIFICATION

SS-119B	
0-1'	14.7
1-2'	<1.13

CADMIUM CONCENTRATION (mg/kg)

SS-42 (30.5)

SAMPLE DEPTH (BGS)

NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEY BY MORELL ENGINEERING DATED APRIL 23, 2014, DECEMBER 19, 2014, JUNE 26, 2015.
2. NOT ALL SAMPLING DATA IS SHOWN FOR DEEPER SAMPLE INTERVALS WHERE COMPOUND IS DETECTED BELOW THE SITE SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL

TITLE

CADMIUM CONCENTRATION MAP (EAST)

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
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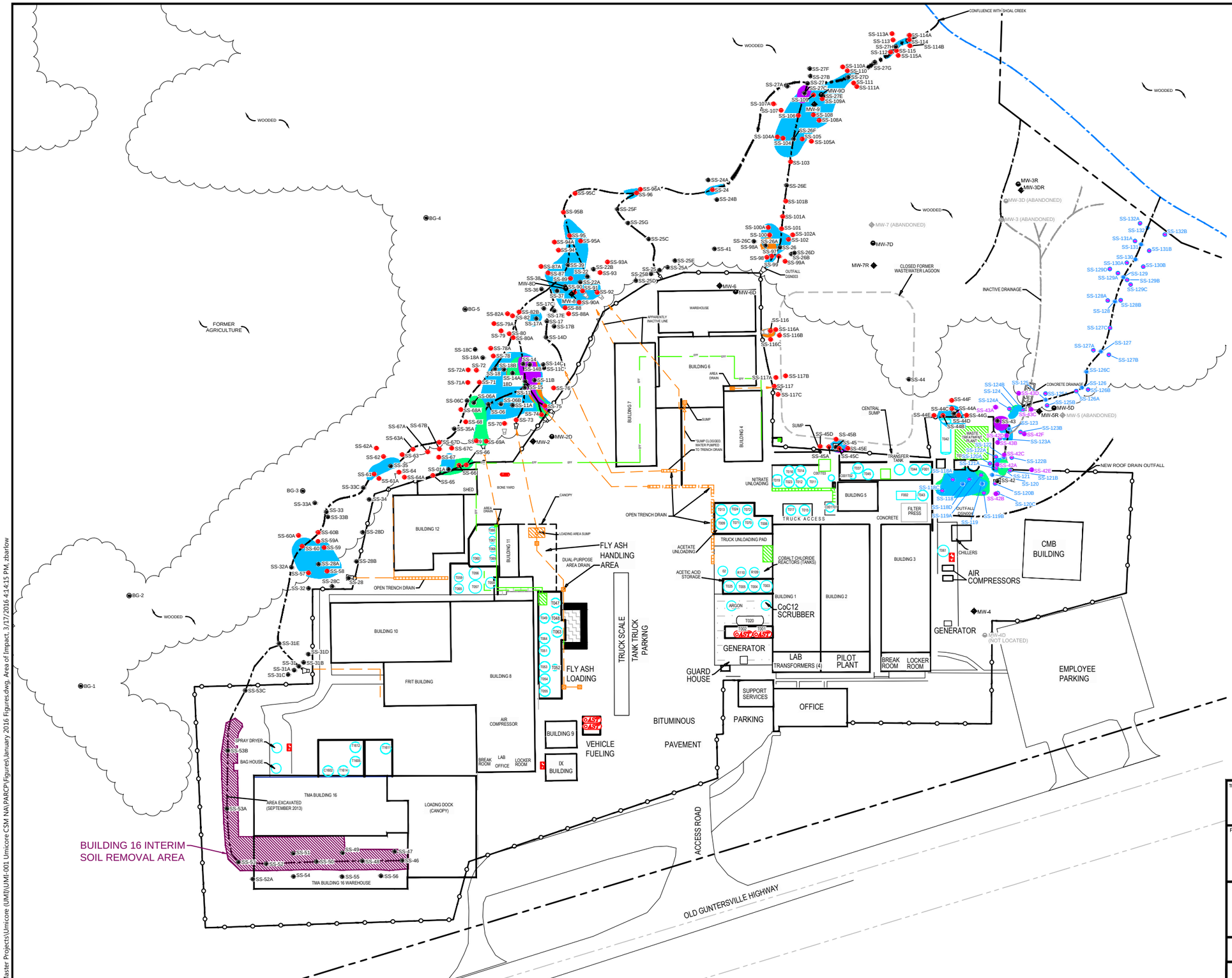
DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 8C

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Constituent Concentration Figures East.dwg, Cadmium East 8C, 3/17/2016 5:28:37 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- ABANDONED MONITORING WELL (SHALLOW)
- MONITORING WELL NOT LOCATED (DEEP)
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (MAY 2015)
- PROVISIONAL SOIL SAMPLE LOCATIONS (MAY 2015)
- ESTIMATED EXTENT OF COBALT ABOVE INDUSTRIAL RSL AND/OR SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF MANGANESE ABOVE SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF NICKEL ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF CADMIUM ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL

NOTES:

1. MONITORING WELL AND SOIL BORINGS LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
OVERALL AREAS OF SOIL IMPACTS

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
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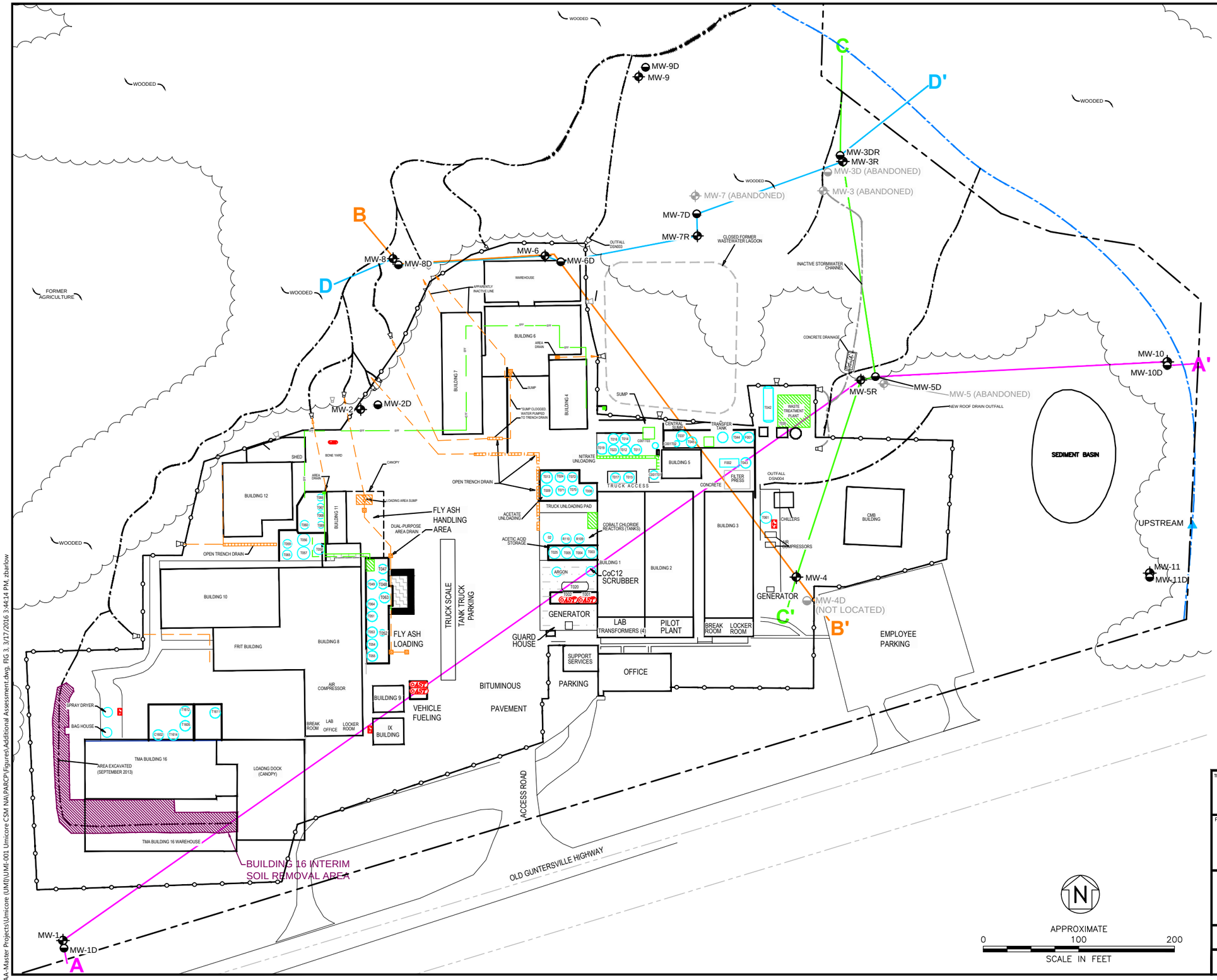
DATE: 3-2-16	REVISION NO. 0
JOB NO. UMI-001	FIGURE NO. 9

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\January 2016 Figures.dwg, Area of Impact, 3/17/2016 4:14:15 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- TRANSECT LOCATION

NOTES:

1. MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 26, 2015.

TITLE

CROSS-SECTION LOCATION MAP

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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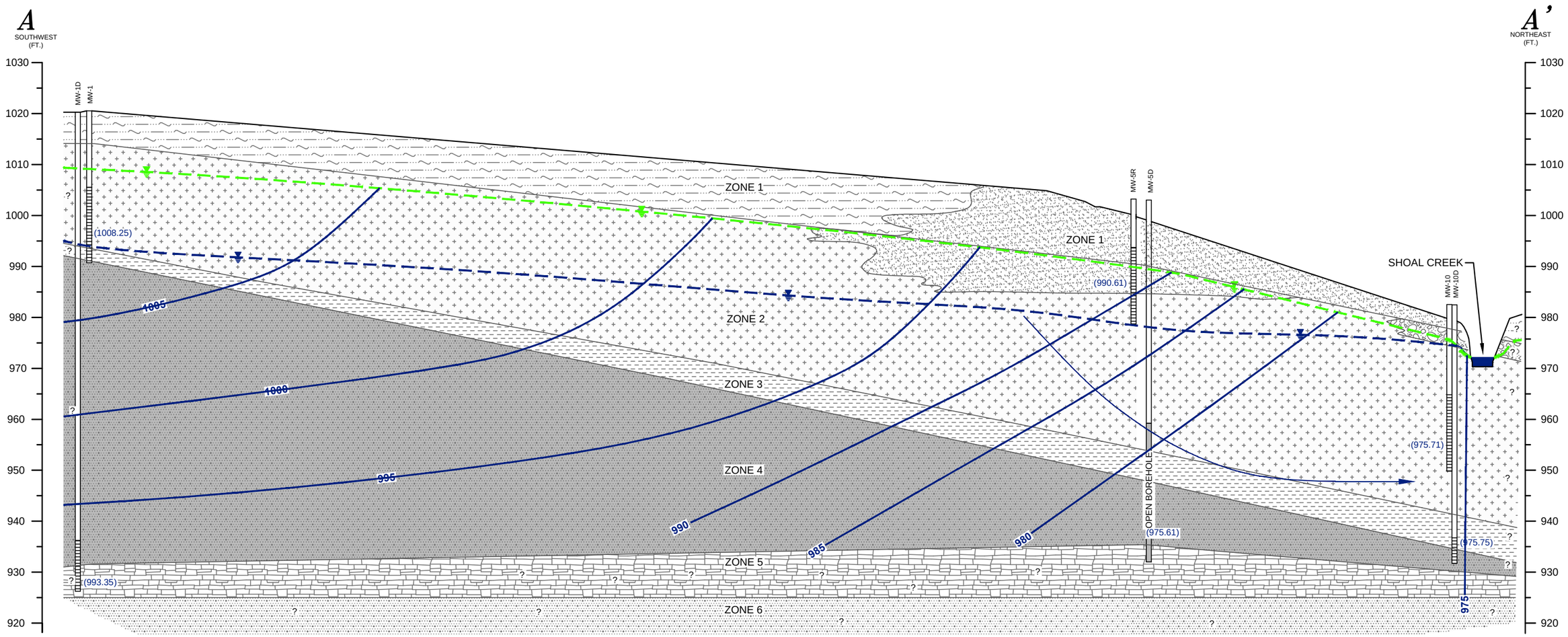
DATE: 3–2–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 10

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Additional Assessment.dwg, FIG 3, 3/17/2016 3:44:14 PM, zbarlow



LEGEND

- SANDY SILT WITH VARYING PERCENTAGES OF CLAY
- FINE TO MEDUIM GRAINED SAND WITH VARYING PERCENTAGES OF SILT
- PARTIALLY WEATHERED ROCK
- ARENITE
- GREYWACKE
- ARENITE WITH INTERBEDDED GREYWACKE LENSES
- GREYWACKE WITH INTERBEDDED SHALE LENSES
- SHALE

MW-1 — MONITORING WELL DEPICTING SCREEN INTERVAL

6/12/15 SHALLOW POTENTIOMETRIC SURFACE

6/12/15 DEEP POTENTIOMETRIC SURFACE

(1008.25) GROUNDWATER ELEVATION (FT)

1000 POTENTIOMETRIC CONTOUR

20 — APPROXIMATE — 0 — 100

SCALE IN FEET

VERTICAL EXAGGERATION = 5X

SAMPLE ID

	MW-1	MW-1D	MW-5R	MW-5D	MW-10	MW-10D
CADMIUM	<0.00100	<0.00100	**0.643**	<0.00500	<0.00100	<0.00100
COBALT	<0.00100	<0.00100	0.872	<0.00100	<0.00100	<0.00100
MANGANESE	0.704	<0.00150	7.11	2.11	0.191	0.0731
NICKEL	0.0118	<0.00100	1.16	0.0119	<0.00100	<0.00100

CONCENTRATION IN GROUNDWATER (mg/L)

COMPOUND

NOTES:
1. REFER TO FIGURE 10 OF THIS REPORT FOR CROSS-SECTION TRANSECT.
2. BOLD CONCENTRATION EXCEEDS THE MCL.

TITLE
CROSS-SECTION A-A'

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
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Charlotte, North Carolina 28203
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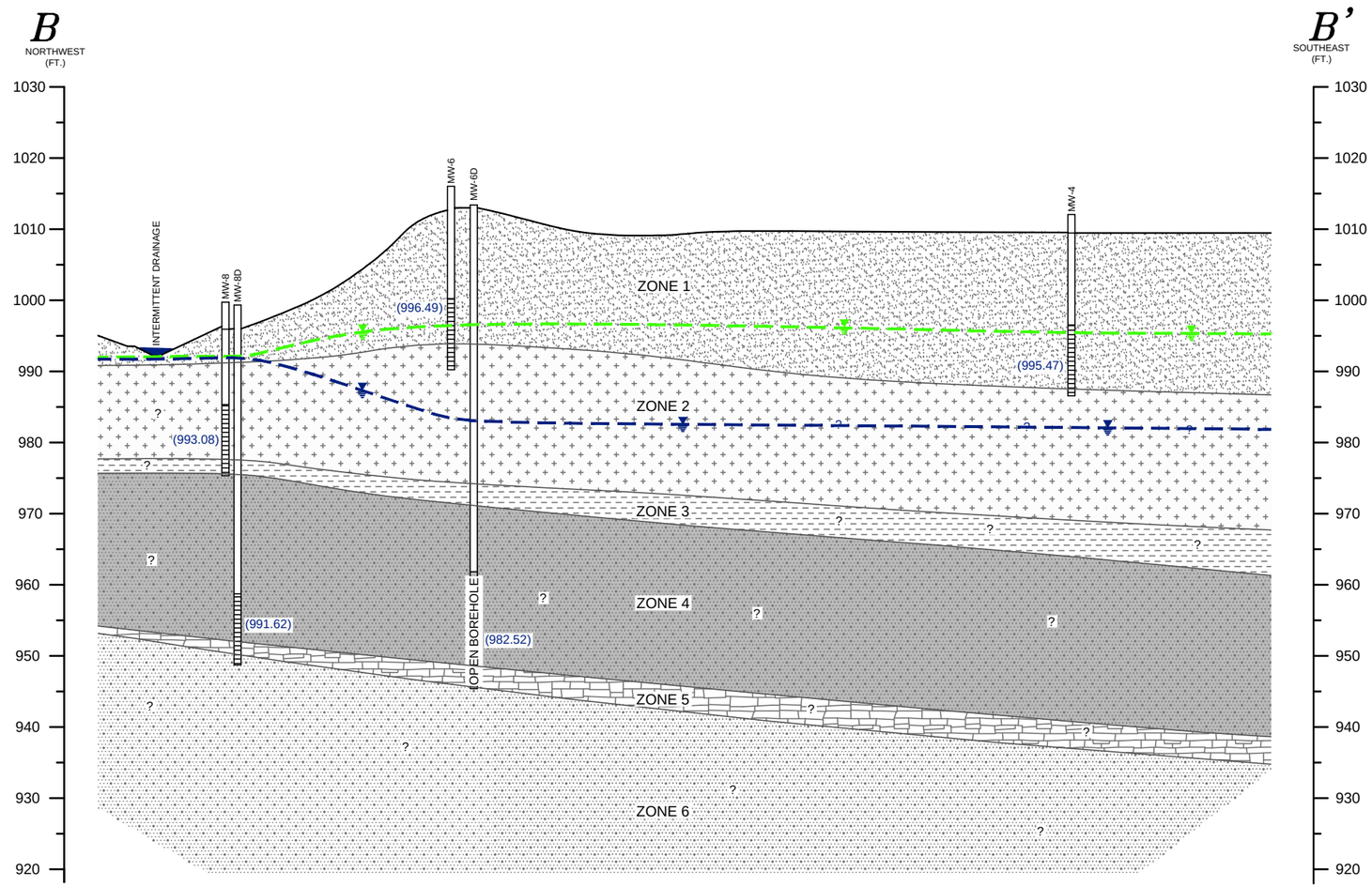
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0

JOB NO. UMI-001 | FIGURE NO. 11

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Cross-Section.dwg, FIG A-A', 3/17/2016 2:45:53 PM, zbarlow



LEGEND

MW-1 — MONITORING WELL DEPICTING SCREEN INTERVAL

6/12/15 SHALLOW POTENTIOMETRIC SURFACE

6/12/15 DEEP POTENTIOMETRIC SURFACE

(982.52) GROUNDWATER ELEVATION (FT)

FINE TO MEDUIM GRAINED SAND WITH VARYING PERCENTAGES OF SILT

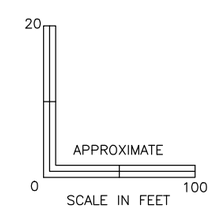
ARENITE

ARENITE WITH INTERBEDDED GREYWACKE LENSES

GREYWACKE WITH INTERBEDDED SHALE LENSES

GREYWACKE

SHALE



VERTICAL EXAGGERATION = 5X

SAMPLE ID

	MW-8	MW-8D	MW-6	MW-6D	MW-4
CADMIUM	<0.00500	<0.00500	<0.00500	<0.00500	**0.109**
COBALT	0.0225	<0.0100	0.0129	<0.00100	0.0454
MANGANESE	0.538	0.340	0.200	1.25	0.0941
NICKEL	<0.00500	<0.00500	<0.00500	0.00585	0.0966

CONCENTRATION IN GROUNDWATER (mg/L)

COMPOUND

NOTES:
1. REFER TO FIGURE 10 OF THIS REPORT FOR CROSS-SECTION TRANSECT
2. BOLD CONCENTRATION EXCEEDS THE MCL.

TITLE
CROSS-SECTION B-B'

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
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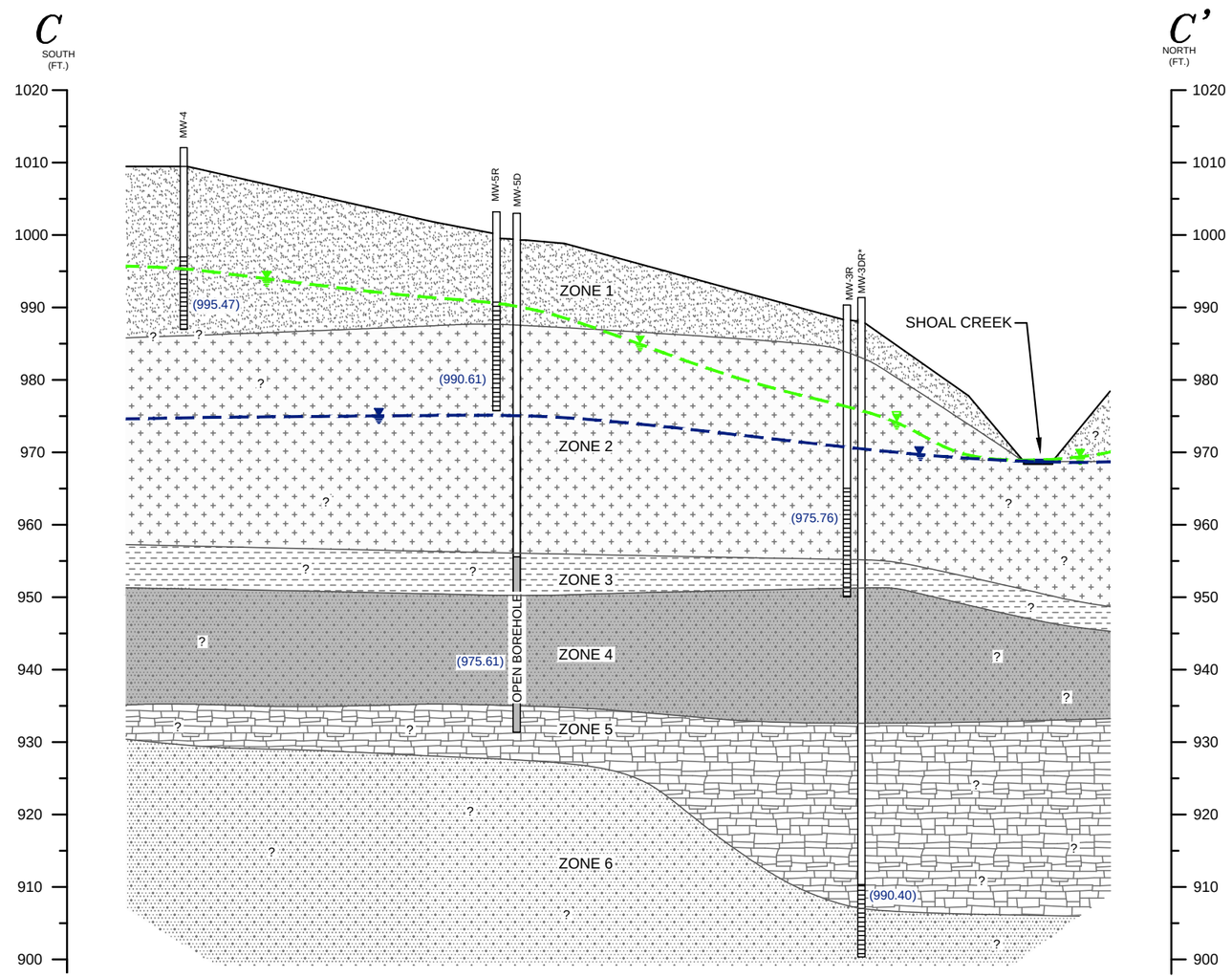
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0

JOB NO. UMI-001 | FIGURE NO. 12

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Cross-Section.dwg, FIG B-B', 3/17/2016 2:45:41 PM, zbarlow



LEGEND

MW-1 — MONITORING WELL DEPICTING SCREEN INTERVAL

6/12/15 SHALLOW POTENTIOMETRIC SURFACE

6/12/15 DEEP POTENTIOMETRIC SURFACE

(975.61) GROUNDWATER ELEVATION (FT)

FINE TO MEDUIM GRAINED SAND WITH VARYING PERCENTAGES OF SILT

ARENITE

ARENITE WITH INTERBEDDED GREYWACKE LENSES

GREYWACKE WITH INTERBEDDED SHALE LENSES

SHALE

GREYWACKE

SAMPLE ID

	MW-4	MW-5R	MW-5D	MW-3DR	MW-3R
CADMIUM	0.109	**0.643**	<0.00500	<0.00100	<0.00100
COBALT	0.0454	0.872	<0.0100	<0.0100	0.0285
MANGANESE	0.0941	7.11	2.11	0.0773	1.63
NICKEL	0.0966	1.16	0.0119	<0.0100	0.0343

CONCENTRATION IN GROUNDWATER (mg/L)

COMPOUND

NOTES:
1. REFER TO FIGURE 10 OF THIS REPORT FOR CROSS–SECTION TRANSECT.
2. BOLD CONCENTRATION EXCEEDS THE MCL.

20 — APPROXIMATE — 0 — 100
SCALE IN FEET

VERTICAL EXAGGERATION = 5X

TITLE
CROSS-SECTION C-C'

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
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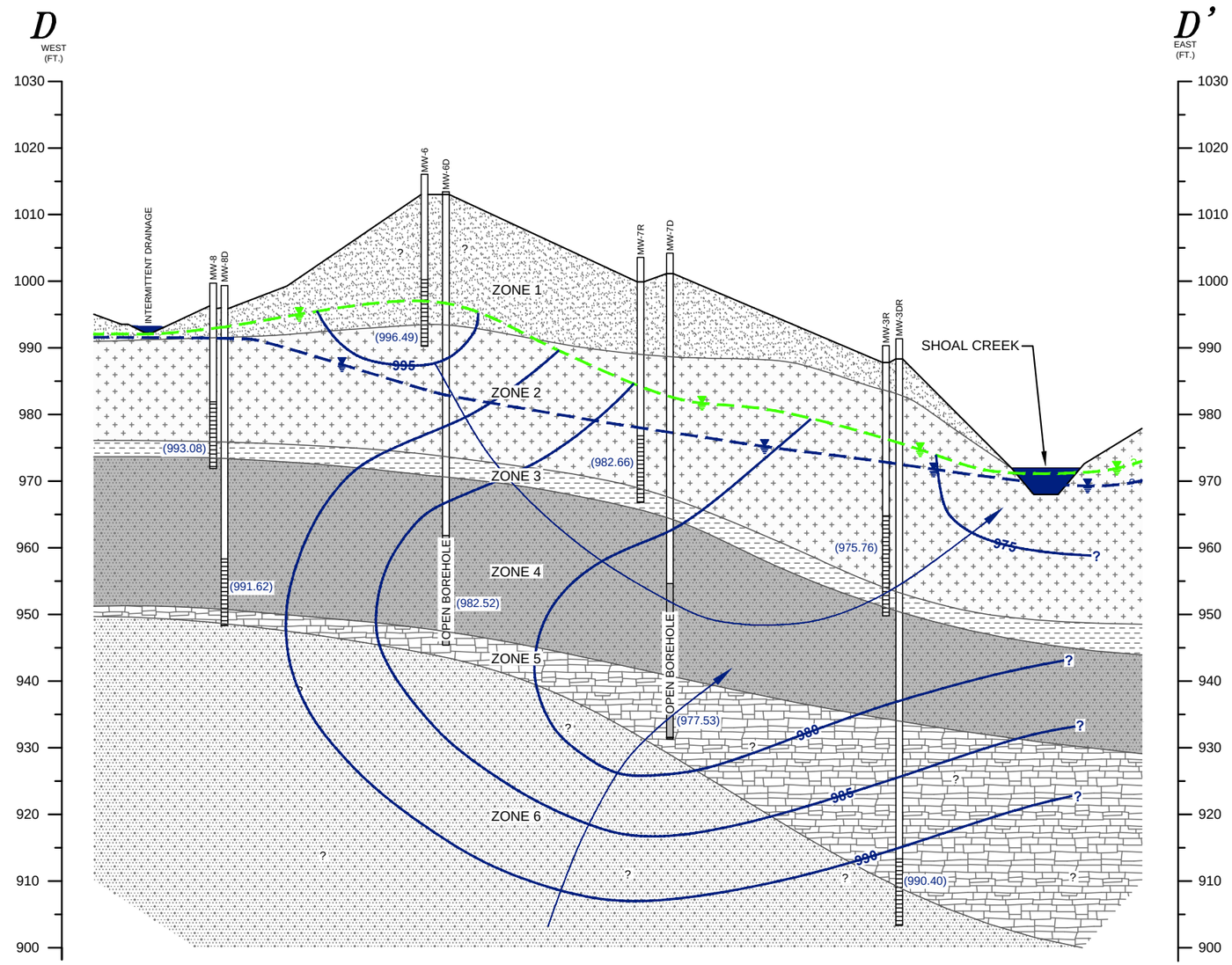
License # C-1269 / #C-245 Geology

DATE: 3–2–16 | REVISION NO. 0
JOB NO. UMI–001 | FIGURE NO. 13

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Cross-Section.dwg, FIG C-C', 3/17/2016 2:45:28 PM, zbarlow



LEGEND

MW-8 — MONITORING WELL DEPICTING SCREEN INTERVAL

6/12/15 SHALLOW POTENTIOMETRIC SURFACE

6/12/15 DEEP POTENTIOMETRIC SURFACE

(993.08) GROUNDWATER ELEVATION (FT)

990 POTENTIOMETRIC CONTOUR

FINE TO MEDUIM GRAINED SAND WITH VARYING PERCENTAGES OF SILT

ARENITE

ARENITE WITH INTERBEDDED GREYWACKE LENSES

GREYWACKE WITH INTERBEDDED SHALE LENSES

SHALE

GREYWACKE

SAMPLE ID

	MW-8	MW-8D	MW-6	MW-6D	MW-7R	MW-7D	MW-3R	MW-3DR
CADMIUM	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00100	<0.00100
COBALT	0.0225	<0.0100	0.0129	<0.00100	<0.00100	<0.00100	0.0285	<0.00100
MANGANESE	0.538	0.340	0.200	1.25	1.16	0.789	1.63	0.0773
NICKEL	<0.00500	<0.00500	<0.00500	0.00585	<0.00500	<0.00500	0.0343	<0.00100

COMPOUND

CONCENTRATION IN GROUNDWATER (mg/L)

NOTES:
1. REFER TO FIGURE 10 OF THIS REPORT FOR CROSS–SECTION TRANSECT.
2. BOLD CONCENTRATION EXCEEDS THE MCL.

20 — APPROXIMATE — 0 — 100
SCALE IN FEET

VERTICAL EXAGGERATION = 5X

TITLE
CROSS-SECTION D-D'

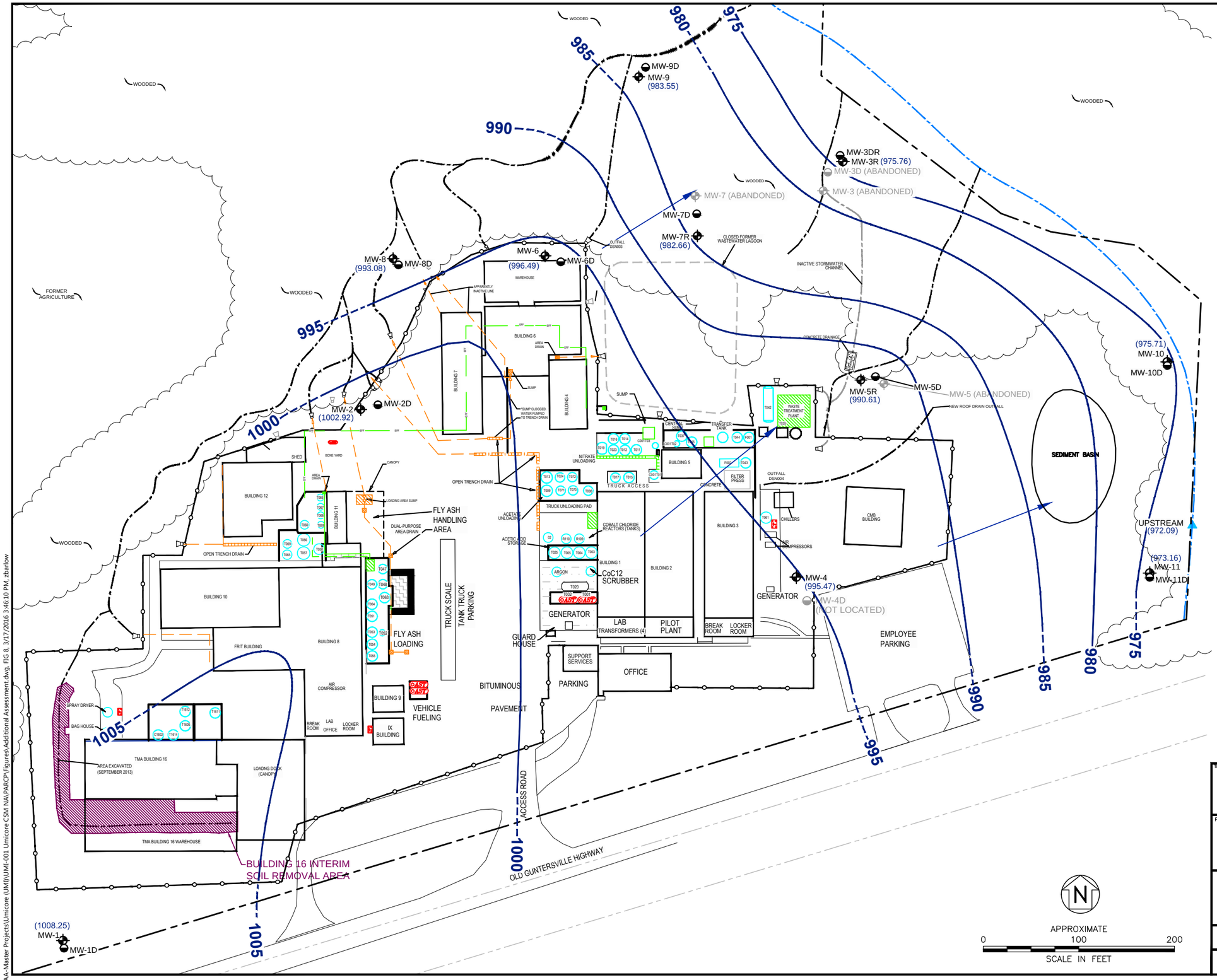
PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3–2–16 | REVISION NO. 0

JOB NO. UMI–001 | FIGURE NO. 14

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Cross-Section.dwg, FIG D-D', 3/17/2016 2:45:14 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- (975.71) GROUNDWATER ELEVATION (FT MSL)
- 1000 GROUNDWATER ELEVATION CONTOUR (FT MSL) (DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTE

MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

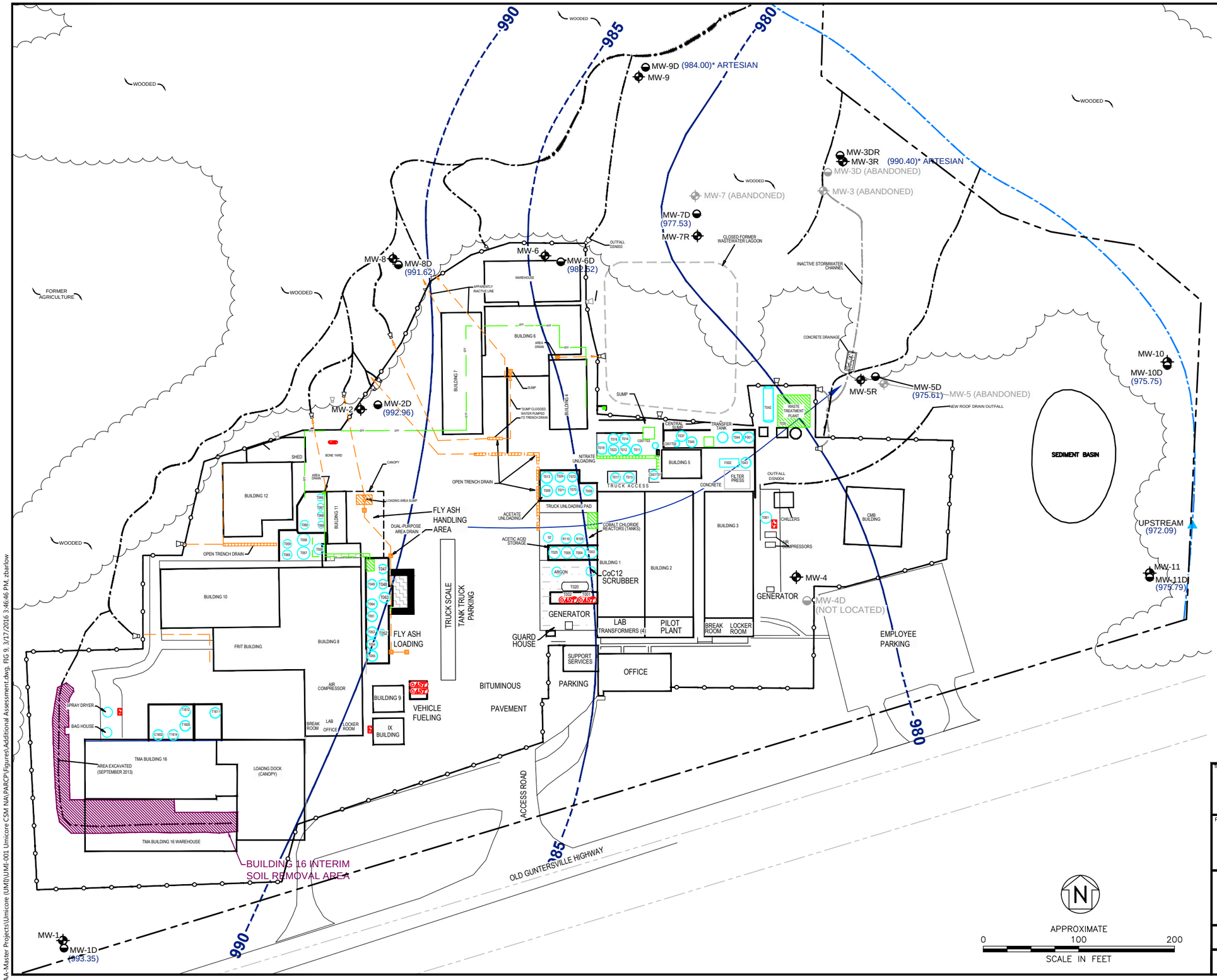
TITLE
SHALLOW GROUNDWATER POTENTIOMETRIC SURFACE MAP (JUNE 23, 2015)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3–2–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 15

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Additional Assessment.dwg, FIG 8, 3/17/2016 3:46:10 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- (975.75) GROUNDWATER ELEVATION (FT MSL)
- 980 GROUNDWATER ELEVATION CONTOUR (FT MSL) (DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES:

1. MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.
2. MW-3DR IA AN ARTESIAN WELL WHICH IS SCREENED IN A DEEPER AQUIFER AND IS NOT CONSIDERED IN CONTOURING.

TITLE

DEEP GROUNDWATER POTENTIOMETRIC SURFACE MAP (JUNE 23, 2015)

PROJECT

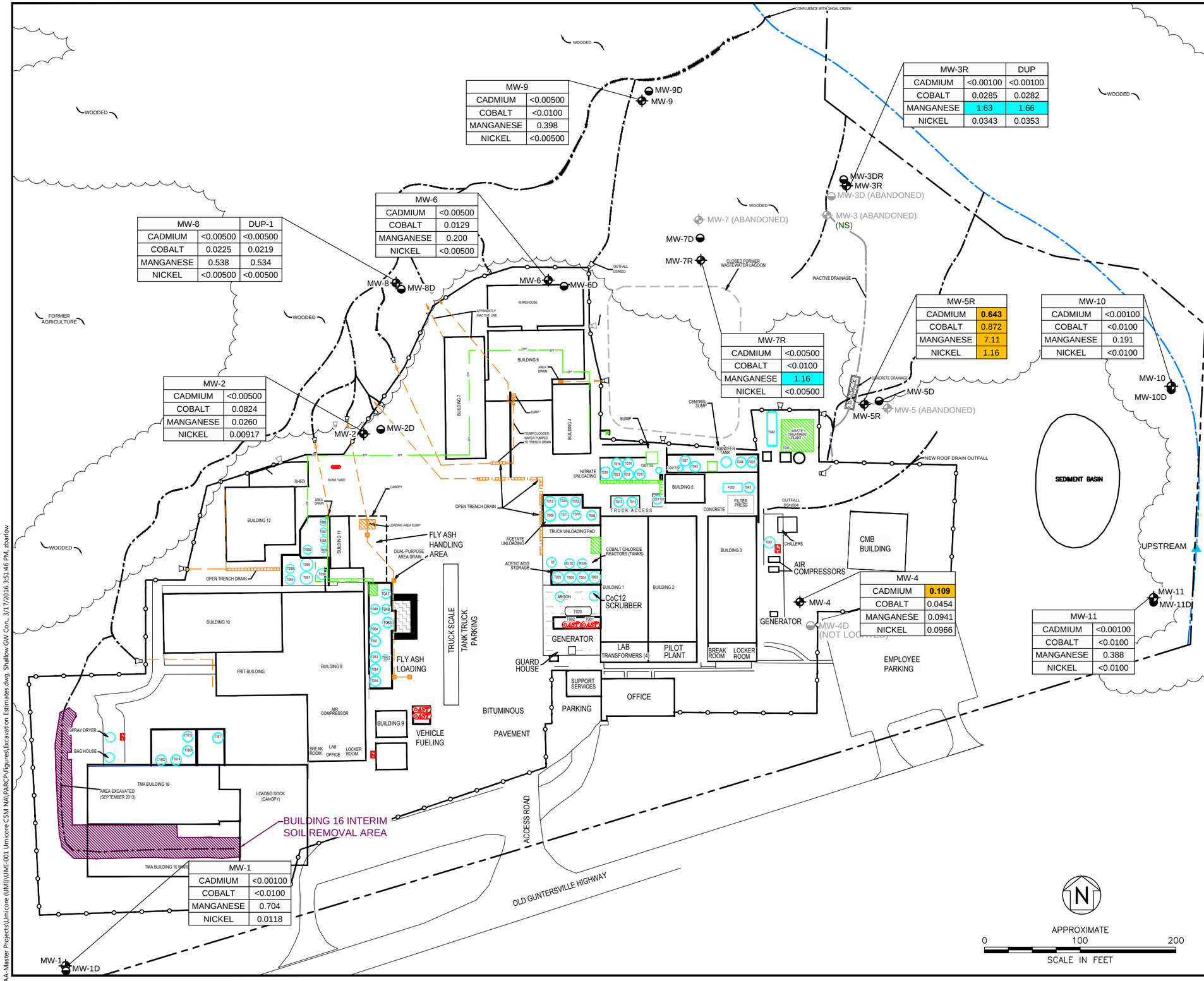
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3–2–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 16

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Additional Assessment.dwg, FIG 9, 3/17/2016 3:46:46 PM, zbarlow



MW-9	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	0.398
NICKEL	<0.00500

MW-3R	DUP
CADMIUM <0.00100	<0.00100
COBALT 0.0285	0.0282
MANGANESE 1.63	1.66
NICKEL 0.0343	0.0353

MW-6	
CADMIUM	<0.00500
COBALT	0.0129
MANGANESE	0.200
NICKEL	<0.00500

MW-8	DUP-1
CADMIUM <0.00500	<0.00500
COBALT 0.0225	0.0219
MANGANESE 0.538	0.534
NICKEL <0.00500	<0.00500

MW-7R	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	1.16
NICKEL	<0.00500

MW-5R	
CADMIUM	**0.643**
COBALT	0.872
MANGANESE	7.11
NICKEL	1.16

MW-10	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.191
NICKEL	<0.0100

MW-2	
CADMIUM	<0.00500
COBALT	0.0824
MANGANESE	0.0260
NICKEL	0.00917

MW-4	
CADMIUM	**0.109**
COBALT	0.0454
MANGANESE	0.0941
NICKEL	0.0966

MW-11	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.388
NICKEL	<0.0100

MW-1	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.704
NICKEL	0.0118

LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- (NS) NOT SAMPLED
- **BOLD** CONCENTRATIONS EXCEED EPA MCL.
- 7.11 ORANGE SHADING INDICATES CONCENTRATION EXCEEDS THE CALCULATED NON-RESIDENTIAL SITE-SPECIFIC GROUNDWATER SCREENING LEVEL.
- 1.16 BLUE SHADING INDICATES CONCENTRATION EXCEEDS THE CALCULATED NON-RESIDENTIAL GROUNDWATER SCREENING LEVEL BUT IS CONSISTENT WITH BACKGROUND LEVELS

MONITORING WELL ID

MW-2	
CADMIUM	<0.00500
COBALT	0.0824
MANGANESE	0.0260
NICKEL	0.00917

COMPOUND CONCENTRATION IN MILLIGRAMS PER LITER (mg/L)

COMPOUND

NOTES

1. MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.
2. GROUNDWATER SAMPLES COLLECTED DECEMBER 8-11, 2014, EXCEPT MW-1, MW-3R, MW-10, AND MW-11 WHICH WERE SAMPLED ON JUNE 21, 2015.
3. MW-3 WAS NOT SAMPLED IN DECEMBER 2014 DUE TO MONITORING WELL INTEGRITY ISSUES AND WAS ABANDONED IN JUNE 2015.

TITLE

SHALLOW GROUNDWATER CONCENTRATION MAP

PROJECT

UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
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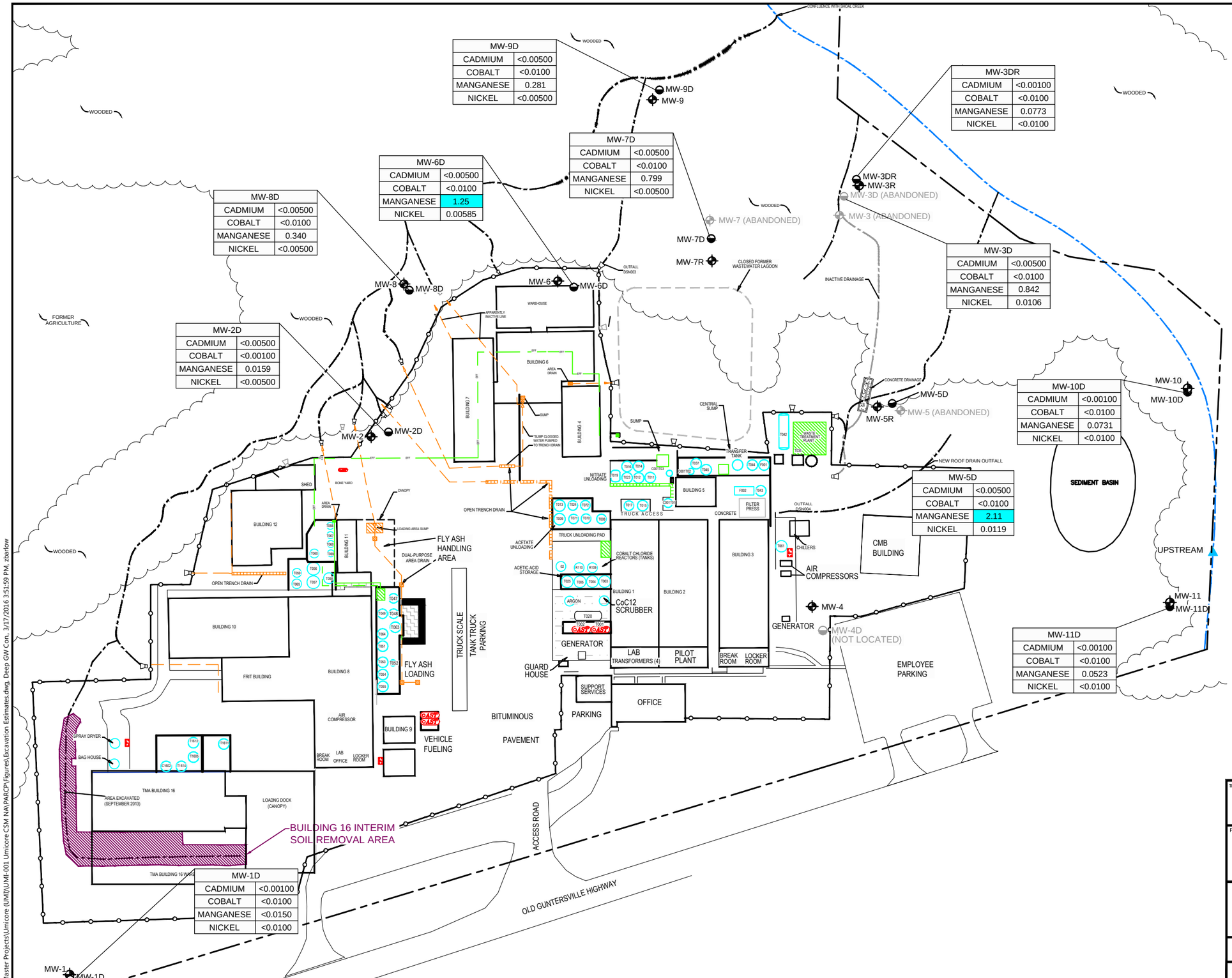
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0

JOB NO. UMI-001 | FIGURE NO. 17

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Excavation Estimates.dwg, Shallow GW Con, 3/17/2016 3:51:46 PM, zbarlow



MW-9D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	0.281
NICKEL	<0.00500

MW-3DR	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.0773
NICKEL	<0.0100

MW-7D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	0.799
NICKEL	<0.00500

MW-6D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	1.25
NICKEL	0.00585

MW-8D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	0.340
NICKEL	<0.00500

MW-3D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	0.842
NICKEL	0.0106

MW-2D	
CADMIUM	<0.00500
COBALT	<0.00100
MANGANESE	0.0159
NICKEL	<0.00500

MW-10D	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.0731
NICKEL	<0.0100

MW-5D	
CADMIUM	<0.00500
COBALT	<0.0100
MANGANESE	2.11
NICKEL	0.0119

MW-11D	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	0.0523
NICKEL	<0.0100

MW-1D	
CADMIUM	<0.00100
COBALT	<0.0100
MANGANESE	<0.0150
NICKEL	<0.0100

LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- 2.11 BLUE SHADING INDICATES CONCENTRATION EXCEEDS THE CALCULATED NON-RESIDENTIAL GROUNDWATER SCREENING LEVEL BUT IS CONSISTENT WITH BACKGROUND LEVELS

MONITORING WELL ID

MW-2D	
CADMIUM	<0.00500
COBALT	<0.00100
MANGANESE	0.0159
NICKEL	<0.00500

COMPOUND CONCENTRATION IN MILLIGRAMS PER LITER (mg/L)

COMPOUND

NOTES:

1. MONITORING WELL LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.
2. GROUNDWATER SAMPLES COLLECTED DECEMBER 8-11, 2014, EXCEPT MW-1D, MW-3DR, MW-10D, AND MW-11D WHICH WERE SAMPLED ON JUNE 21, 2015 .

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
DEEP GROUNDWATER CONCENTRATION MAP

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0
JOB NO. UMI-001 | FIGURE NO. 18

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Excavation Estimates.dwg, Deep GW Con, 3/17/2016 3:51:59 PM, zbarlow

LEGEND

- SITE PROPERTY BOUNDARY
- SHOAL CREEK
- INTERMITTENT DRAINAGE
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- SHALLOW TYPE MONITORING WELL
- DEEP TYPE MONITORING WELL
- SURFACE WATER SAMPLE LOCATION (DECEMBER 2014)

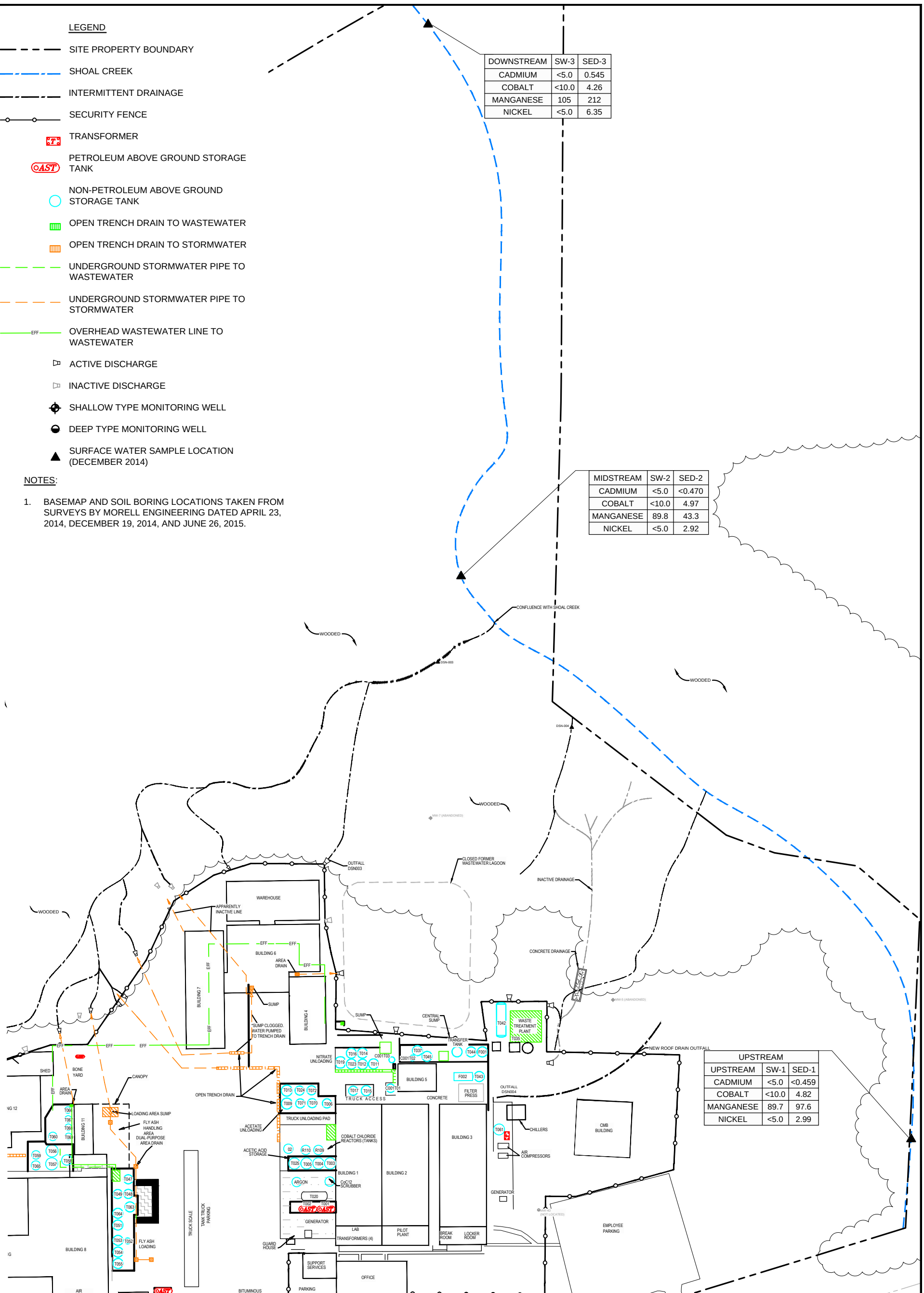
NOTES:

1. BASEMAP AND SOIL BORING LOCATIONS TAKEN FROM SURVEYS BY MORELL ENGINEERING DATED APRIL 23, 2014, DECEMBER 19, 2014, AND JUNE 26, 2015.

DOWNSTREAM	SW-3	SED-3
CADMIUM	<5.0	0.545
COBALT	<10.0	4.26
MANGANESE	105	212
NICKEL	<5.0	6.35

MIDSTREAM	SW-2	SED-2
CADMIUM	<5.0	<0.470
COBALT	<10.0	4.97
MANGANESE	89.8	43.3
NICKEL	<5.0	2.92

UPSTREAM		
UPSTREAM	SW-1	SED-1
CADMIUM	<5.0	<0.459
COBALT	<10.0	4.82
MANGANESE	89.7	97.6
NICKEL	<5.0	2.99



SAMPLE LOCATION
SURFACEWATER SAMPLE IDENTIFICATION
SEDIMENT SAMPLE IDENTIFICATION

DOWNSTREAM	SW-3	SED-3
CADMIUM	<5.0	0.545
COBALT	<10.0	4.26
MANGANESE	**105**	212
NICKEL	<5.0	6.35

CONCENTRATION (mg/kg)
CONCENTRATION (µg/L)
CONSTITUENT OF CONCERN

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
SURFACE WATER AND SEDIMENT CONCENTRATION MAP (DECEMBER 2014)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
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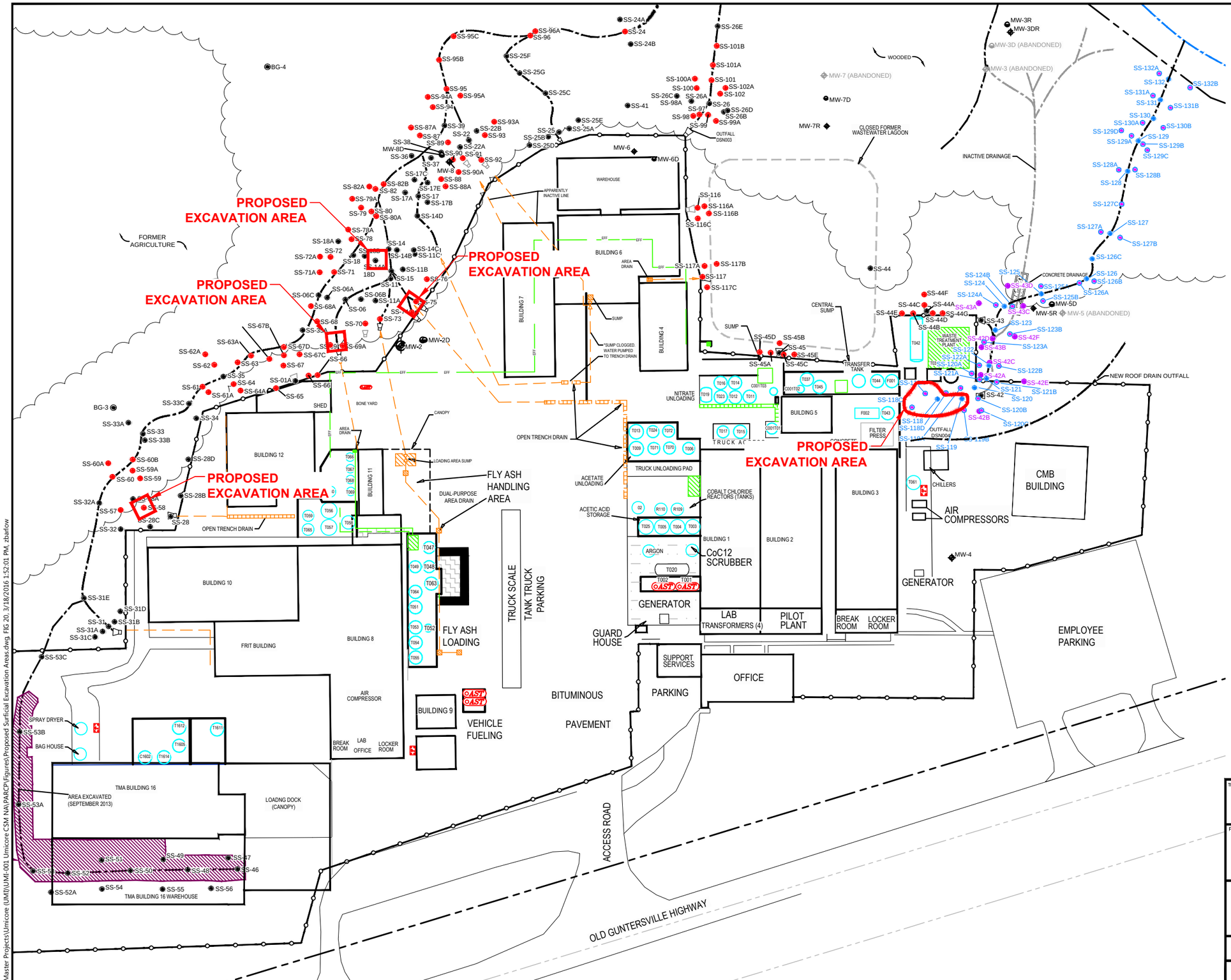
License # C-1269 / #C-245 Geology

DATE: 3-2-16 | REVISION NO. 0
JOB NO. UMI-001 | FIGURE NO. 19

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Constituent Concentration Figures East.dwg, SW & SED, 3/17/2016 3:49:51 PM, zbarlow



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- UMICORE SURFACE WATER OUTFALL SAMPLE LOCATION
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- ABANDONED MONITORING WELL (SHALLOW)
- MONITORING WELL NOT LOCATED (DEEP)
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (MAY 2015)
- PROVISIONAL SOIL SAMPLE LOCATIONS (MAY 2015)

NOTES:

1. MONITORING WELL AND SOIL BORINGS LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
PROPOSED SURFICIAL EXCAVATION AREAS

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
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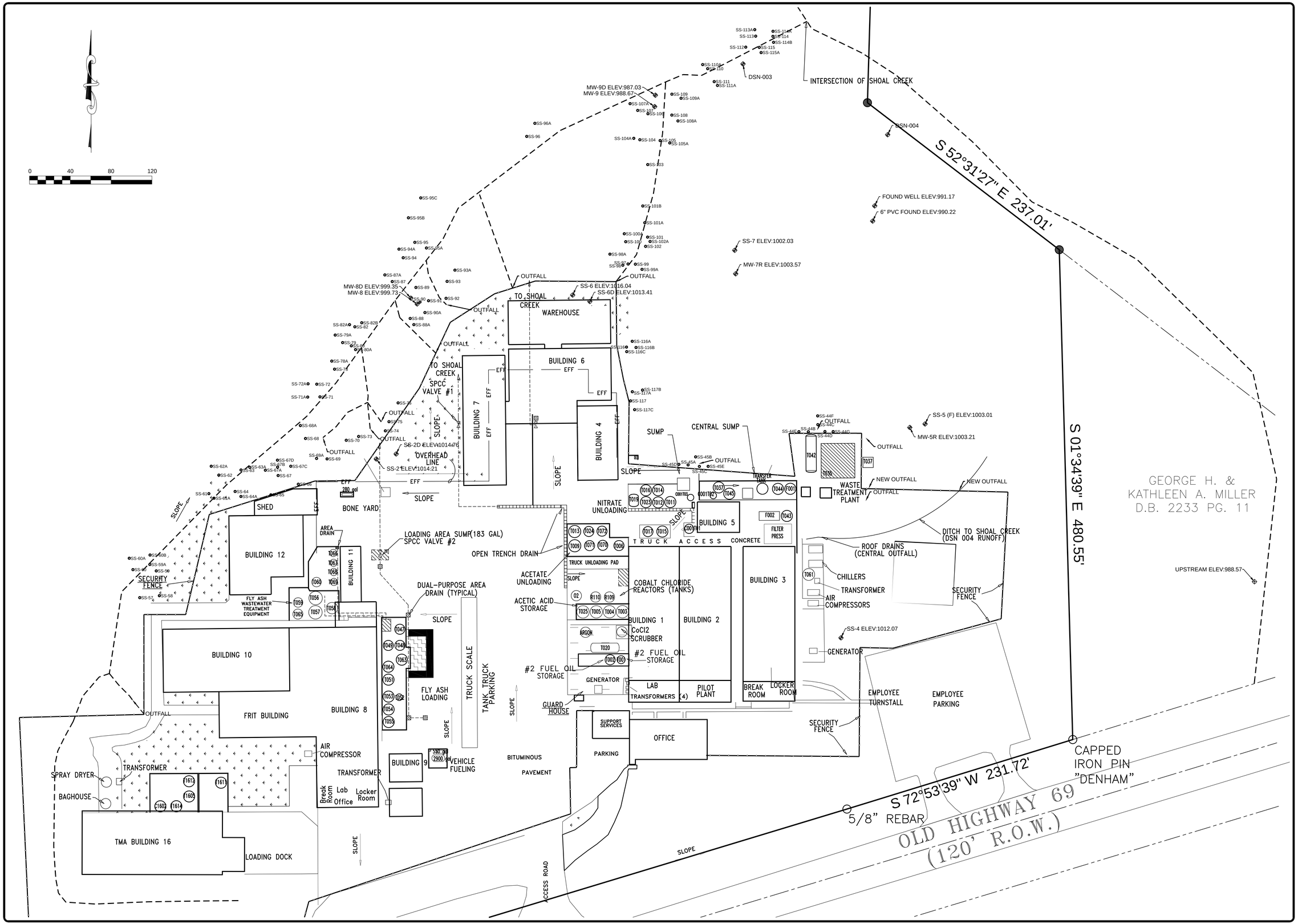
DATE: 3–18–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 20

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Figures\Proposed Surficial Excavation Areas.dwg, FIG 20, 3/18/2016 1:52:01 PM, zbarlow

Appendix A

Site Surveys



REVISIONS

OWNER:

SHEET 1 OF 2

CHECKED BY: WTM

DRAWN BY: WAD

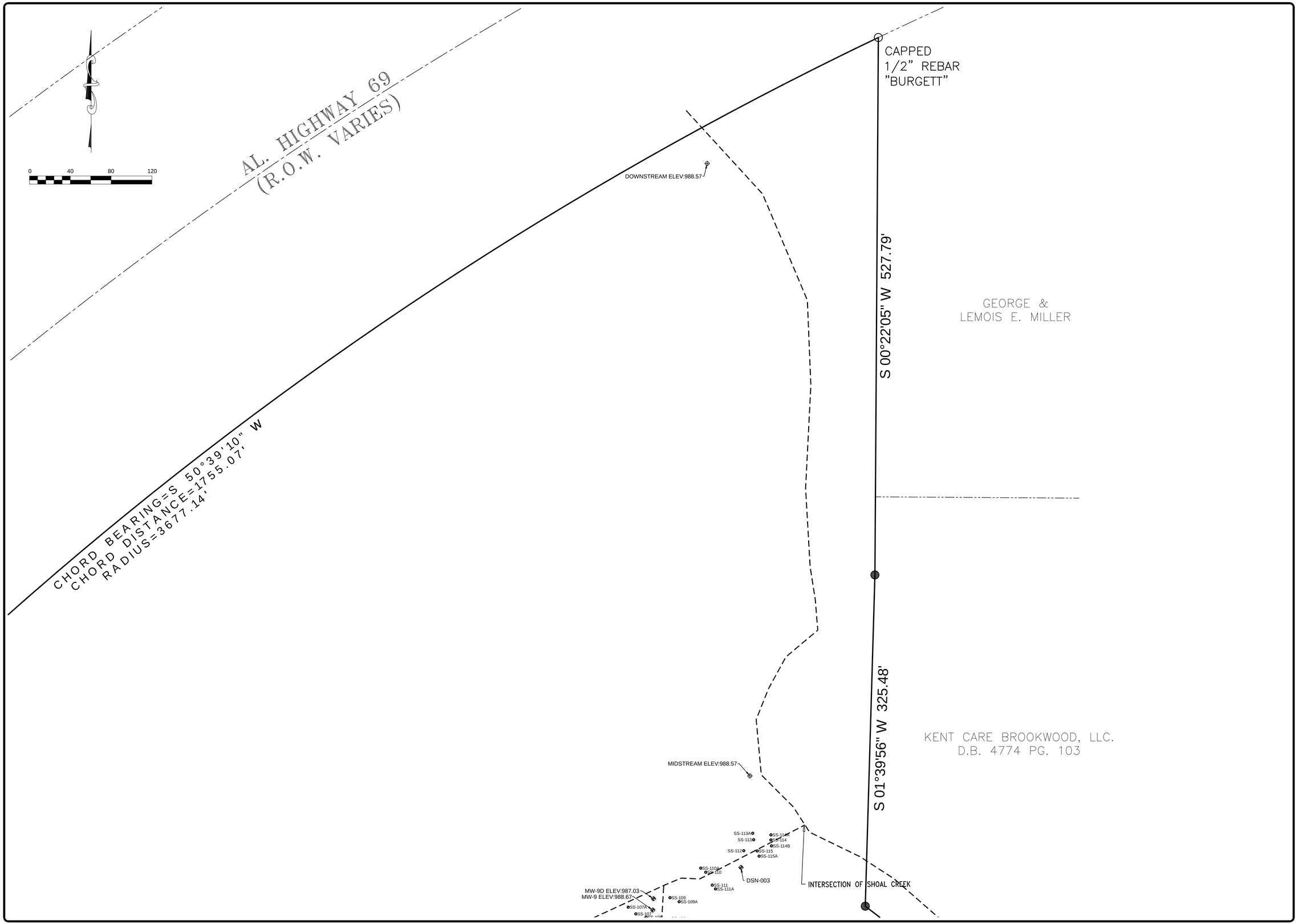
DATE: 12/19/2014

SCALE: 1"=40'

SOILS/WELLS for UMICORE FACILITY

MORELL ENGINEERING
112 N. MARION STREET ATHENS, ALABAMA 35611
PHONE (256) 867-4957 FAX (256) 867-1324
MORELL ENGINEERING, INC.

ALABAMA LICENSED PROFESSIONAL LAND SURVEYOR WILLIAM T. MORELL No. 21401



REVISIONS

OWNER:

SHEET 2 OF 2

CHECKED BY: WTM

DRAWN BY: WAD

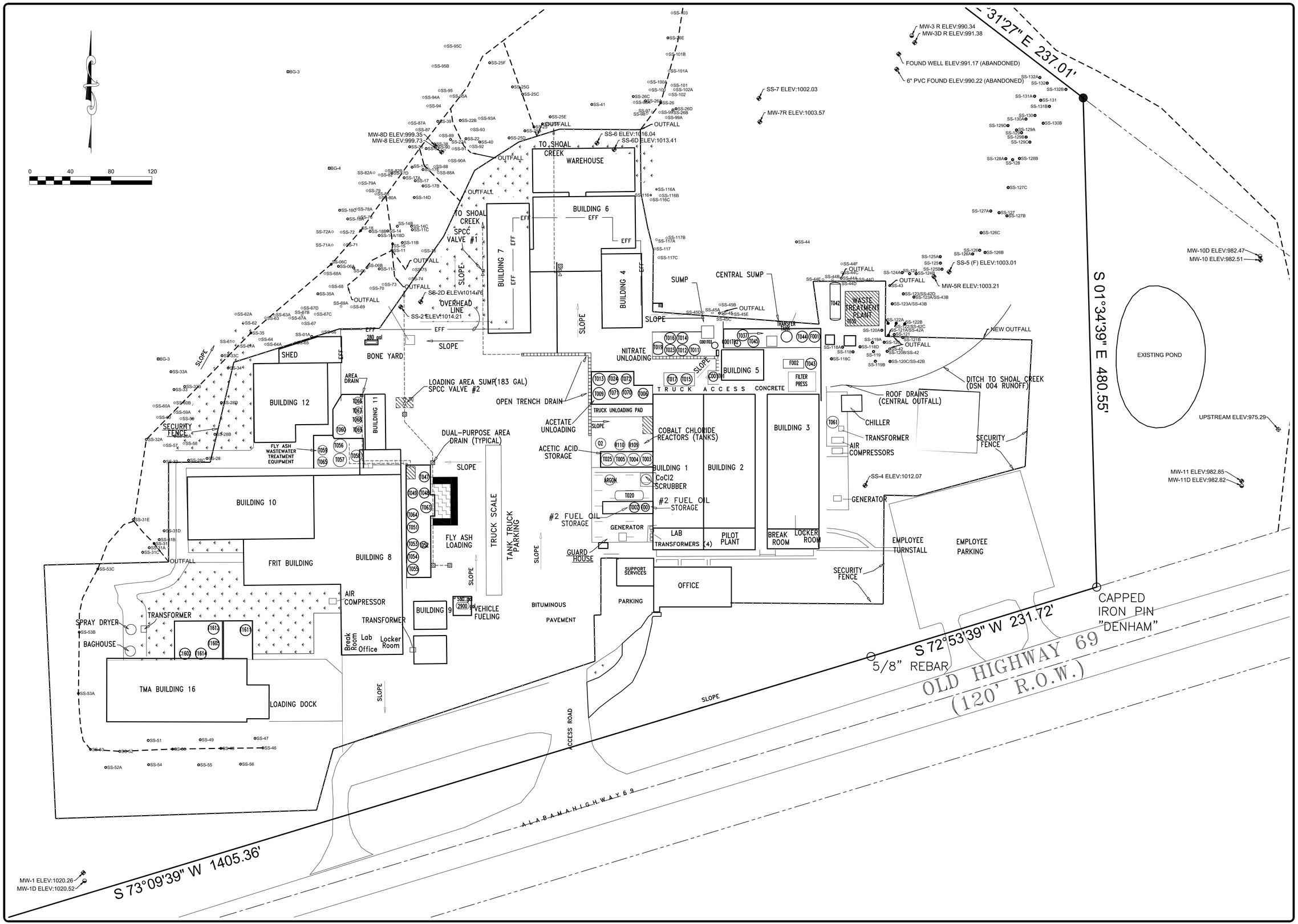
DATE: 12/19/2014

SCALE: 1"=40'

SOILS/WELLS
for
UMICORE
FACILITY

MORELL ENGINEERING
112 N. MARION STREET ATHENS, ALABAMA 35611
PHONE (256) 867-4957 FAX (256) 867-1324
MORELL ENGINEERING, INC.

ALABAMA LICENSED No. 11400 PROFESSIONAL LAND SURVEYOR WILLIAM T. MORELL



REVISIONS

OWNER:

SHEET 1 OF 1

CHECKED BY: WTM

DRAWN BY: WAD

DATE: 06/26/2015

SCALE: 1"=40'

SOILS/WELLS for UMICORE FACILITY

MORELL ENGINEERING
711 E. HOBBS STREET ATHENS, ALABAMA 35611
PHONE (256) 867-4957 FAX (256) 867-1324
MORELL ENGINEERING, INC.

ALABAMA LICENSED No. 21401 PROFESSIONAL LAND SURVEYOR WILLIAM T. MORELL

Appendix B

Laboratory Analytical Data

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-68705-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
12/22/2014 2:36:42 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary 3
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Definitions 5
Client Sample Results 6
QC Sample Results 12
QC Association 14
Chronicle 15
Method Summary 16
Certification Summary 17
Chain of Custody 19
Receipt Checklists 22

Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-68705-1	MW-8 (4-4.5')	Solid	12/04/14 09:30	12/13/14 08:30
490-68705-2	MW-8D (5-6')	Solid	12/03/14 08:30	12/13/14 08:30
490-68705-3	MW-9 (2.5-3')	Solid	12/07/14 12:00	12/13/14 08:30
490-68705-4	MW-9D (2.5-3')	Solid	12/07/14 12:15	12/13/14 08:30
490-68705-5	Rinse Blank-12022014	Water	12/02/14 15:00	12/13/14 08:30
490-68705-6	Rinse Blank-12092014	Water	12/09/14 10:30	12/13/14 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Job ID: 490-68705-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-68705-1

Comments
No additional comments.

Receipt
The samples were received on 12/13/2014 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 1.9º C and 2.4º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: MW-8 (4-4.5')

Lab Sample ID: 490-68705-1

Date Collected: 12/04/14 09:30

Matrix: Solid

Date Received: 12/13/14 08:30

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	4200		1000		mg/Kg			12/18/14 08:00	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: MW-8D (5-6')

Lab Sample ID: 490-68705-2

Date Collected: 12/03/14 08:30

Matrix: Solid

Date Received: 12/13/14 08:30

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	3400		1000		mg/Kg			12/18/14 08:00	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: MW-9 (2.5-3')

Lab Sample ID: 490-68705-3

Date Collected: 12/07/14 12:00

Matrix: Solid

Date Received: 12/13/14 08:30

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	9190		1000		mg/Kg			12/18/14 08:00	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: MW-9D (2.5-3')

Lab Sample ID: 490-68705-4

Date Collected: 12/07/14 12:15

Matrix: Solid

Date Received: 12/13/14 08:30

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	5310		1000		mg/Kg			12/18/14 08:00	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: Rinse Blank-12022014

Lab Sample ID: 490-68705-5

Date Collected: 12/02/14 15:00

Matrix: Water

Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 22:10	1
Cobalt	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 22:10	1
Manganese	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 22:10	1
Nickel	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 22:10	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: Rinse Blank-12092014

Lab Sample ID: 490-68705-6

Date Collected: 12/09/14 10:30

Matrix: Water

Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 22:14	1
Cobalt	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 22:14	1
Manganese	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 22:14	1
Nickel	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 22:14	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-240394/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240665 — **Prep Batch: 240394**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 20:44	1
Cobalt	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 20:44	1
Manganese	ND		0.0100		mg/L		12/17/14 13:48	12/18/14 20:44	1
Nickel	ND		0.00500		mg/L		12/17/14 13:48	12/18/14 20:44	1

Lab Sample ID: LCS 400-240394/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240665 — **Prep Batch: 240394**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.4913		mg/L		98	80 - 120
Cobalt	1.00	0.9913		mg/L		99	80 - 120
Manganese	1.00	1.028		mg/L		103	80 - 120
Nickel	1.00	0.9886		mg/L		99	80 - 120

Lab Sample ID: 400-99706-C-1-B MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240665 — **Prep Batch: 240394**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.500	0.4797		mg/L		96	75 - 125
Cobalt	ND		1.00	0.9679		mg/L		97	75 - 125
Manganese	0.131		1.00	1.120		mg/L		99	75 - 125
Nickel	ND		1.00	0.9656		mg/L		97	75 - 125

Lab Sample ID: 400-99706-C-1-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240665 — **Prep Batch: 240394**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		0.500	0.4924		mg/L		98	75 - 125	3	20
Cobalt	ND		1.00	0.9926		mg/L		99	75 - 125	3	20
Manganese	0.131		1.00	1.137		mg/L		101	75 - 125	2	20
Nickel	ND		1.00	0.9889		mg/L		99	75 - 125	2	20

Method: 9060A - Organic Carbon, Total (TOC)

Lab Sample ID: MB 490-215048/3 — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 215048

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Total Organic Carbon - Duplicates	ND		1000		mg/Kg			12/18/14 08:00	1

Method: 9060A - Organic Carbon, Total (TOC) (Continued)

Lab Sample ID: LCS 490-215048/2
Matrix: Solid
Analysis Batch: 215048

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Total Organic Carbon - Duplicates	29900	31890		mg/Kg		107	80 - 120

Lab Sample ID: 490-68815-C-1 DU
Matrix: Solid
Analysis Batch: 215048

Client Sample ID: Duplicate
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Total Organic Carbon - Duplicates	48200		41770		mg/Kg		14	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Metals

Prep Batch: 240394

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-99706-C-1-B MS	Matrix Spike	Total/NA	Water	3010A	
400-99706-C-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	
490-68705-5	Rinse Blank-12022014	Total/NA	Water	3010A	
490-68705-6	Rinse Blank-12092014	Total/NA	Water	3010A	
LCS 400-240394/2-A	Lab Control Sample	Total/NA	Water	3010A	
MB 400-240394/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 240665

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-99706-C-1-B MS	Matrix Spike	Total/NA	Water	6010B	240394
400-99706-C-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	6010B	240394
490-68705-5	Rinse Blank-12022014	Total/NA	Water	6010B	240394
490-68705-6	Rinse Blank-12092014	Total/NA	Water	6010B	240394
LCS 400-240394/2-A	Lab Control Sample	Total/NA	Water	6010B	240394
MB 400-240394/1-A	Method Blank	Total/NA	Water	6010B	240394

General Chemistry

Analysis Batch: 215048

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68705-1	MW-8 (4-4.5')	Total/NA	Solid	9060A	
490-68705-2	MW-8D (5-6')	Total/NA	Solid	9060A	
490-68705-3	MW-9 (2.5-3')	Total/NA	Solid	9060A	
490-68705-4	MW-9D (2.5-3')	Total/NA	Solid	9060A	
490-68815-C-1 DU	Duplicate	Total/NA	Solid	9060A	
LCS 490-215048/2	Lab Control Sample	Total/NA	Solid	9060A	
MB 490-215048/3	Method Blank	Total/NA	Solid	9060A	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Client Sample ID: MW-8 (4-4.5')

Lab Sample ID: 490-68705-1
Date Collected: 12/04/14 09:30
Matrix: Solid
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9060A		1			215048	12/18/14 08:00	CLJ	TAL NSH

Client Sample ID: MW-8D (5-6')

Lab Sample ID: 490-68705-2
Date Collected: 12/03/14 08:30
Matrix: Solid
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9060A		1			215048	12/18/14 08:00	CLJ	TAL NSH

Client Sample ID: MW-9 (2.5-3')

Lab Sample ID: 490-68705-3
Date Collected: 12/07/14 12:00
Matrix: Solid
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9060A		1			215048	12/18/14 08:00	CLJ	TAL NSH

Client Sample ID: MW-9D (2.5-3')

Lab Sample ID: 490-68705-4
Date Collected: 12/07/14 12:15
Matrix: Solid
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	9060A		1			215048	12/18/14 08:00	CLJ	TAL NSH

Client Sample ID: Rinse Blank-12022014

Lab Sample ID: 490-68705-5
Date Collected: 12/02/14 15:00
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240394	12/17/14 13:48	DN1	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240665	12/18/14 22:10	SLM	TAL PEN

Client Sample ID: Rinse Blank-12092014

Lab Sample ID: 490-68705-6
Date Collected: 12/09/14 10:30
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240394	12/17/14 13:48	DN1	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240665	12/18/14 22:14	SLM	TAL PEN

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN
9060A	Organic Carbon, Total (TOC)	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	01-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-14 *
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

Laboratory: TestAmerica Pensacola

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40150	06-30-15
Arizona	State Program	9	AZ0710	01-11-16
Arkansas DEQ	State Program	6	88-0689	09-01-15
Florida	NELAP	4	E81010	06-30-15

* Certification renewal pending - certification considered valid.

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68705-1
SDG: UMI-001

Laboratory: TestAmerica Pensacola (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Georgia	State Program	4	N/A	06-30-15
Illinois	NELAP	5	200041	10-09-15
Iowa	State Program	7	367	07-31-14 *
Kansas	NELAP	7	E-10253	01-31-15
Kentucky (UST)	State Program	4	53	06-30-15
Louisiana	NELAP	6	30976	06-30-15
Maryland	State Program	3	233	09-30-15
Massachusetts	State Program	1	M-FL094	06-30-15
Michigan	State Program	5	9912	06-30-15
New Jersey	NELAP	2	FL006	06-30-15
North Carolina (WW/SW)	State Program	4	314	12-31-15
Oklahoma	State Program	6	9810	08-31-15
Pennsylvania	NELAP	3	68-00467	01-31-15
Rhode Island	State Program	1	LAO00307	12-30-14
South Carolina	State Program	4	96026	06-30-15
Tennessee	State Program	4	TN02907	06-30-15
Texas	NELAP	6	T104704286-12-5	09-30-15
USDA	Federal		P330-13-00193	07-01-16
Virginia	NELAP	3	460166	06-14-15
West Virginia DEP	State Program	3	136	06-30-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-68705 Chain of Custody

Cooler Received/Opened On : 12/13/2014 @ 0830

1. Tracking # 9527 (last 4 digits, FedEx)

Courier: Fed-ex IR Gun: 97310166

2. Temperature of rep. sample or temp blank when opened: 2.4 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Loc: 490
68705

Cooler Received/Opened On 12/13/2014@ 0830

1. Tracking # 9722 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 12080142

2. Temperature of rep. sample or temp blank when opened: 1.9 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: one front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) DA

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) D

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) D

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) D

I certify that I attached a label with the unique LIMS number to each container (intial) D

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

soils

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
68705

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart + Hickman, PC	Shannon Cottrill	12/12/14	281321
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 South Tryon St	704 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Unicorp Arab, AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UNI-001

Analysis (Attach list if more space is needed): Total Org. Carbon; Total Metals 6010

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Other	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Total Org. Carbon	Total Metals 6010	Special Instructions/ Conditions of Receipt
MW-8 (4-4.5')	12/4/14	0930				X		X						X		
MW-8D (5-6')	12/3/14	0830				X		X						X		
MW-9 (2.5-3')	12/7/14	1200				X		X						X		
MW-9D (2.5-3')	12/7/14	1215				X		X						X		
Rinse Blank - 12022014	12/2/14	1500		X						X					X	* Co Mn Ni + Cd only
Rinse Blank - 12092014	12/9/14	1030		X						X					X	* Co Mn Ni + Cd only

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	12/12/14	1100	1. Received By: [signature] IRAN	12/13/14	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68705-1
SDG Number: UMI-001

Login Number: 68705
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68705-1
SDG Number: UMI-001

Login Number: 68705
List Number: 2
Creator: Akers, Stephanie C

List Source: TestAmerica Pensacola
List Creation: 12/17/14 11:26 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.7°C IR-2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-68704-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
12/22/2014 5:07:04 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-68704-1	MW-2	Water	12/09/14 11:35	12/13/14 08:30
490-68704-2	MW-2D	Water	12/09/14 11:40	12/13/14 08:30
490-68704-3	MW-3D	Water	12/08/14 14:50	12/13/14 08:30
490-68704-4	MW-4	Water	12/09/14 09:00	12/13/14 08:30
490-68704-5	MW-5R	Water	12/09/14 12:40	12/13/14 08:30
490-68704-6	MW-5D	Water	12/08/14 16:35	12/13/14 08:30
490-68704-7	MW-6	Water	12/09/14 13:25	12/13/14 08:30
490-68704-8	MW-6D	Water	12/11/14 10:00	12/13/14 08:30
490-68704-9	MW-7R	Water	12/09/14 12:35	12/13/14 08:30
490-68704-10	MW-7D	Water	12/09/14 09:55	12/13/14 08:30
490-68704-11	MW-8	Water	12/09/14 14:45	12/13/14 08:30
490-68704-12	MW-8D	Water	12/09/14 14:00	12/13/14 08:30
490-68704-13	MW-9	Water	12/09/14 13:40	12/13/14 08:30
490-68704-14	MW-9D	Water	12/09/14 14:05	12/13/14 08:30
490-68704-15	Dup-1	Water	12/09/14 01:01	12/13/14 08:30
490-68704-16	Sed-Rinse Blank	Water	12/11/14 13:00	12/13/14 08:30
490-68704-17	GW Train-Rinse Blank	Water	12/11/14 13:30	12/13/14 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Job ID: 490-68704-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-68704-1

Comments
No additional comments.

Receipt
The samples were received on 12/13/2014 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.4º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-2

Date Collected: 12/09/14 11:35
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-1

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:26	1
Cobalt	**0.0824**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:26	1
Manganese	**0.0260**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:26	1
Nickel	**0.00917**		0.00500		mg/L		12/18/14 09:59	12/18/14 23:26	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-2D

Lab Sample ID: 490-68704-2

Date Collected: 12/09/14 11:40
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:30	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:30	1
Manganese	**0.0159**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:30	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:30	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-3D

Lab Sample ID: 490-68704-3

Date Collected: 12/08/14 14:50
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:33	1
Cobalt	**0.0293**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:33	1
Manganese	**0.842**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:33	1
Nickel	**0.0106**		0.00500		mg/L		12/18/14 09:59	12/18/14 23:33	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-4

Lab Sample ID: 490-68704-4

Date Collected: 12/09/14 09:00
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.109		0.00500		mg/L		12/18/14 09:59	12/18/14 23:50	1
Cobalt	0.0454		0.0100		mg/L		12/18/14 09:59	12/18/14 23:50	1
Manganese	0.0941		0.0100		mg/L		12/18/14 09:59	12/18/14 23:50	1
Nickel	0.0966		0.00500		mg/L		12/18/14 09:59	12/18/14 23:50	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-5R

Date Collected: 12/09/14 12:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-5

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.643		0.00500		mg/L		12/18/14 09:59	12/18/14 23:53	1
Cobalt	0.872		0.0100		mg/L		12/18/14 09:59	12/18/14 23:53	1
Manganese	7.11		0.0100		mg/L		12/18/14 09:59	12/18/14 23:53	1
Nickel	1.16		0.00500		mg/L		12/18/14 09:59	12/18/14 23:53	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-5D

Lab Sample ID: 490-68704-6

Date Collected: 12/08/14 16:35
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:56	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:56	1
Manganese	**2.11**		0.0100		mg/L		12/18/14 09:59	12/18/14 23:56	1
Nickel	**0.0119**		0.00500		mg/L		12/18/14 09:59	12/18/14 23:56	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-6

Lab Sample ID: 490-68704-7

Date Collected: 12/09/14 13:25
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/19/14 10:15	12/19/14 18:11	1
Cobalt	**0.0129**		0.0100		mg/L		12/19/14 10:15	12/19/14 18:11	1
Manganese	**0.200**		0.0100		mg/L		12/19/14 10:15	12/19/14 18:11	1
Nickel	ND		0.00500		mg/L		12/19/14 10:15	12/19/14 18:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-6D

Lab Sample ID: 490-68704-8

Date Collected: 12/11/14 10:00

Matrix: Water

Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:10	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:10	1
Manganese	**1.25**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:10	1
Nickel	**0.00585**		0.00500		mg/L		12/18/14 09:59	12/19/14 00:10	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-7R

Date Collected: 12/09/14 12:35
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-9

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:13	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:13	1
Manganese	**1.16**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:13	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:13	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-7D

Date Collected: 12/09/14 09:55
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-10

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:16	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:16	1
Manganese	**0.779**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:16	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-8

Date Collected: 12/09/14 14:45
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-11

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:20	1
Cobalt	**0.0225**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:20	1
Manganese	**0.538**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:20	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:20	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-8D

Date Collected: 12/09/14 14:00
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-12

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:23	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:23	1
Manganese	**0.340**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:23	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:23	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-9

Date Collected: 12/09/14 13:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-13

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:26	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:26	1
Manganese	**0.398**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:26	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:26	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-9D

Date Collected: 12/09/14 14:05
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-14

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:30	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:30	1
Manganese	**0.281**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:30	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:30	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: Dup-1

Date Collected: 12/09/14 01:01
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-15

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:33	1
Cobalt	**0.0219**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:33	1
Manganese	**0.534**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:33	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:33	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: Sed-Rinse Blank

Lab Sample ID: 490-68704-16

Date Collected: 12/11/14 13:00
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:36	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:36	1
Manganese	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:36	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:36	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: GW Train-Rinse Blank

Lab Sample ID: 490-68704-17

Date Collected: 12/11/14 13:30
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:40	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:40	1
Manganese	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:40	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:40	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-240533/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:10	1
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:10	1
Manganese	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:10	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:10	1

Lab Sample ID: LCS 400-240533/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.4960		mg/L		99	80 - 120
Cobalt	1.00	1.002		mg/L		100	80 - 120
Manganese	1.00	1.048		mg/L		105	80 - 120
Nickel	1.00	0.9924		mg/L		99	80 - 120

Lab Sample ID: 490-68704-3 MS — **Client Sample ID: MW-3D**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.500	0.5002		mg/L		100	75 - 125
Cobalt	0.0293		1.00	1.064		mg/L		103	75 - 125
Manganese	0.842		1.00	1.851		mg/L		101	75 - 125
Nickel	0.0106		1.00	1.028		mg/L		102	75 - 125

Lab Sample ID: 490-68704-3 MSD — **Client Sample ID: MW-3D**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		0.500	0.5025		mg/L		101	75 - 125	0	20
Cobalt	0.0293		1.00	1.073		mg/L		104	75 - 125	1	20
Manganese	0.842		1.00	1.856		mg/L		101	75 - 125	0	20
Nickel	0.0106		1.00	1.035		mg/L		102	75 - 125	1	20

Lab Sample ID: MB 400-240680/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240680**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/19/14 10:15	12/19/14 18:04	1
Cobalt	ND		0.0100		mg/L		12/19/14 10:15	12/19/14 18:04	1
Manganese	ND		0.0100		mg/L		12/19/14 10:15	12/19/14 18:04	1
Nickel	ND		0.00500		mg/L		12/19/14 10:15	12/19/14 18:04	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 400-240680/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240680**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.5055		mg/L		101	80 - 120
Cobalt	1.00	1.030		mg/L		103	80 - 120
Manganese	1.00	1.062		mg/L		106	80 - 120
Nickel	1.00	1.025		mg/L		102	80 - 120

Lab Sample ID: 490-68704-7 MS — **Client Sample ID: MW-6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240680**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.500	0.5645		mg/L		113	75 - 125
Cobalt	0.0129		1.00	1.108		mg/L		110	75 - 125
Manganese	0.200		1.00	1.218		mg/L		102	75 - 125
Nickel	ND		1.00	1.071		mg/L		107	75 - 125

Lab Sample ID: 490-68704-7 MSD — **Client Sample ID: MW-6**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240680**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		0.500	0.5784		mg/L		116	75 - 125	2	20
Cobalt	0.0129		1.00	1.121		mg/L		111	75 - 125	1	20
Manganese	0.200		1.00	1.252		mg/L		105	75 - 125	3	20
Nickel	ND		1.00	1.085		mg/L		108	75 - 125	1	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Metals

Prep Batch: 240533

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-1	MW-2	Total/NA	Water	3010A	
490-68704-2	MW-2D	Total/NA	Water	3010A	
490-68704-3	MW-3D	Total/NA	Water	3010A	
490-68704-3 MS	MW-3D	Total/NA	Water	3010A	
490-68704-3 MSD	MW-3D	Total/NA	Water	3010A	
490-68704-4	MW-4	Total/NA	Water	3010A	
490-68704-5	MW-5R	Total/NA	Water	3010A	
490-68704-6	MW-5D	Total/NA	Water	3010A	
490-68704-8	MW-6D	Total/NA	Water	3010A	
490-68704-9	MW-7R	Total/NA	Water	3010A	
490-68704-10	MW-7D	Total/NA	Water	3010A	
490-68704-11	MW-8	Total/NA	Water	3010A	
490-68704-12	MW-8D	Total/NA	Water	3010A	
490-68704-13	MW-9	Total/NA	Water	3010A	
490-68704-14	MW-9D	Total/NA	Water	3010A	
490-68704-15	Dup-1	Total/NA	Water	3010A	
490-68704-16	Sed-Rinse Blank	Total/NA	Water	3010A	
490-68704-17	GW Train-Rinse Blank	Total/NA	Water	3010A	
LCS 400-240533/2-A	Lab Control Sample	Total/NA	Water	3010A	
MB 400-240533/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 240666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-1	MW-2	Total/NA	Water	6010B	240533
490-68704-2	MW-2D	Total/NA	Water	6010B	240533
490-68704-3	MW-3D	Total/NA	Water	6010B	240533
490-68704-3 MS	MW-3D	Total/NA	Water	6010B	240533
490-68704-3 MSD	MW-3D	Total/NA	Water	6010B	240533
490-68704-4	MW-4	Total/NA	Water	6010B	240533
490-68704-5	MW-5R	Total/NA	Water	6010B	240533
490-68704-6	MW-5D	Total/NA	Water	6010B	240533
490-68704-8	MW-6D	Total/NA	Water	6010B	240533
490-68704-9	MW-7R	Total/NA	Water	6010B	240533
490-68704-10	MW-7D	Total/NA	Water	6010B	240533
490-68704-11	MW-8	Total/NA	Water	6010B	240533
490-68704-12	MW-8D	Total/NA	Water	6010B	240533
490-68704-13	MW-9	Total/NA	Water	6010B	240533
490-68704-14	MW-9D	Total/NA	Water	6010B	240533
490-68704-15	Dup-1	Total/NA	Water	6010B	240533
490-68704-16	Sed-Rinse Blank	Total/NA	Water	6010B	240533
490-68704-17	GW Train-Rinse Blank	Total/NA	Water	6010B	240533
LCS 400-240533/2-A	Lab Control Sample	Total/NA	Water	6010B	240533
MB 400-240533/1-A	Method Blank	Total/NA	Water	6010B	240533

Prep Batch: 240680

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-7	MW-6	Total/NA	Water	3010A	
490-68704-7 MS	MW-6	Total/NA	Water	3010A	
490-68704-7 MSD	MW-6	Total/NA	Water	3010A	
LCS 400-240680/2-A	Lab Control Sample	Total/NA	Water	3010A	
MB 400-240680/1-A	Method Blank	Total/NA	Water	3010A	

Metals (Continued)

Analysis Batch: 240857

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-7	MW-6	Total/NA	Water	6010B	240680
490-68704-7 MS	MW-6	Total/NA	Water	6010B	240680
490-68704-7 MSD	MW-6	Total/NA	Water	6010B	240680
LCS 400-240680/2-A	Lab Control Sample	Total/NA	Water	6010B	240680
MB 400-240680/1-A	Method Blank	Total/NA	Water	6010B	240680

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-2
Date Collected: 12/09/14 11:35
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:26	SLM	TAL PEN

Client Sample ID: MW-2D
Date Collected: 12/09/14 11:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:30	SLM	TAL PEN

Client Sample ID: MW-3D
Date Collected: 12/08/14 14:50
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:33	SLM	TAL PEN

Client Sample ID: MW-4
Date Collected: 12/09/14 09:00
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:50	SLM	TAL PEN

Client Sample ID: MW-5R
Date Collected: 12/09/14 12:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:53	SLM	TAL PEN

Client Sample ID: MW-5D
Date Collected: 12/08/14 16:35
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68704-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:56	SLM	TAL PEN

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-6

Lab Sample ID: 490-68704-7
Date Collected: 12/09/14 13:25
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240680	12/19/14 10:15	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240857	12/19/14 18:11	SLM	TAL PEN

Client Sample ID: MW-6D

Lab Sample ID: 490-68704-8
Date Collected: 12/11/14 10:00
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:10	SLM	TAL PEN

Client Sample ID: MW-7R

Lab Sample ID: 490-68704-9
Date Collected: 12/09/14 12:35
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:13	SLM	TAL PEN

Client Sample ID: MW-7D

Lab Sample ID: 490-68704-10
Date Collected: 12/09/14 09:55
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:16	SLM	TAL PEN

Client Sample ID: MW-8

Lab Sample ID: 490-68704-11
Date Collected: 12/09/14 14:45
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:20	SLM	TAL PEN

Client Sample ID: MW-8D

Lab Sample ID: 490-68704-12
Date Collected: 12/09/14 14:00
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:23	SLM	TAL PEN

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Client Sample ID: MW-9

Lab Sample ID: 490-68704-13

Date Collected: 12/09/14 13:40
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:26	SLM	TAL PEN

Client Sample ID: MW-9D

Lab Sample ID: 490-68704-14

Date Collected: 12/09/14 14:05
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:30	SLM	TAL PEN

Client Sample ID: Dup-1

Lab Sample ID: 490-68704-15

Date Collected: 12/09/14 01:01
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:33	SLM	TAL PEN

Client Sample ID: Sed-Rinse Blank

Lab Sample ID: 490-68704-16

Date Collected: 12/11/14 13:00
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:36	SLM	TAL PEN

Client Sample ID: GW Train-Rinse Blank

Lab Sample ID: 490-68704-17

Date Collected: 12/11/14 13:30
Matrix: Water
Date Received: 12/13/14 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:40	SLM	TAL PEN

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68704-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	01-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-14 *
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

Laboratory: TestAmerica Pensacola

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40150	06-30-15
Arizona	State Program	9	AZ0710	01-11-16
Arkansas DEQ	State Program	6	88-0689	09-01-15
Florida	NELAP	4	E81010	06-30-15

* Certification renewal pending - certification considered valid.

Laboratory: TestAmerica Pensacola (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Georgia	State Program	4	N/A	06-30-15
Illinois	NELAP	5	200041	10-09-15
Iowa	State Program	7	367	07-31-14 *
Kansas	NELAP	7	E-10253	01-31-15
Kentucky (UST)	State Program	4	53	06-30-15
Louisiana	NELAP	6	30976	06-30-15
Maryland	State Program	3	233	09-30-15
Massachusetts	State Program	1	M-FL094	06-30-15
Michigan	State Program	5	9912	06-30-15
New Jersey	NELAP	2	FL006	06-30-15
North Carolina (WW/SW)	State Program	4	314	12-31-15
Oklahoma	State Program	6	9810	08-31-15
Pennsylvania	NELAP	3	68-00467	01-31-15
Rhode Island	State Program	1	LAO00307	12-30-14
South Carolina	State Program	4	96026	06-30-15
Tennessee	State Program	4	TN02907	06-30-15
Texas	NELAP	6	T104704286-12-5	09-30-15
USDA	Federal		P330-13-00193	07-01-16
Virginia	NELAP	3	460166	06-14-15
West Virginia DEP	State Program	3	136	06-30-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

490-68704 Chain of Custody

Cooler Received/Opened On : 12/13/2014 @ 0830

1. Tracking # 9527 (last 4 digits, FedEx)

Courier: Fed-ex IR Gun: 97310166

2. Temperature of rep. sample or temp blank when opened: 2.4 Degrees Celsius

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
68704

12/22/2014

Client: Hart & Hickman, PC	Project Manager: Shannon Cottrill	Date: 12/12/14	Chain of Custody Number: 281073
Address: 2923 South Tryon St. Ste. 100	Telephone Number (Area Code)/Fax Number: 704 586 0007	Lab Number	Page 1 of 2
City: Charlotte. State: NC Zip Code: 28203	Site Contact: Ralph Nichols	Lab Contact: Ken Hayes	
Project Name and Location (State): UMI-001 Alabama	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Analysis (Attach list if more space is needed)

Special Instructions/ Conditions of Receipt: * TOTALS FOR Co, Mn, Ni, + Cd ONLY — FOR ALL SAMPLES *

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH		* TOTALS 6010											Special Instructions
1	MW-2	12/9/14	1135		X						X					X											
2	MW-2D	12/9/14	1140		X						X					X											
3	MW-3D	12/8/14	1450		X						X					X											*MS/MSD
4	MW-4	12/9/14	0900		X						X					X											
5	MW-5R	12/9/14	1240		X						X					X											
6	MW-5D	12/8/14	1635		X						X					X											
7	MW-6	12/9/14	1325		X						X					X											
8	MW-6D	12/8/14	1000		X						X					X											
9	MW-7R	12/9/14	1235		X						X					X											
10	MW-7D	12/9/14	0955		X						X					X											
11	MW-8	12/9/14	1445		X						X					X											
12	MW-8D	12/9/14	1400		X						X					X											

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	12/12/14	1100	1. Received By: [signature] IAN	12/13/14	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart + Hickman, PC	Shannon Cottrill	12/12/14	281074
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 2**
2923 South Tryon St	704 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Unicore Arab, AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): * TOTALS Co Mo Ni + Cd ONLY *

Loc: 490
68704

Special Instructions/ Conditions of Receipt: * TOTALS FOR Co Mo Ni + Cd ONLY * — FOR ALL SAMPLES —

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	TOTALS Co10
13	MW-9	12/9/14	1340		X					X				X
14	MW-9D	12/9/14	1405		X					X				X
15	DUP-1	12/9/14	—		X					X				X
16	SED - Rinse Blank	12/11/14	1300		X					X				X
17	GW Train - Rinse Blank	12/11/14	1330		X					X				X

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: Kim A	12/12/14	1100	1. Received By: Y	12/13/14	0530
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68704-1
SDG Number: UMI-001

Login Number: 68704
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68704-1
SDG Number: UMI-001

Login Number: 68704
List Number: 2
Creator: Akers, Stephanie C

List Source: TestAmerica Pensacola
List Creation: 12/17/14 11:26 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.7°C IR-2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-68706-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
12/22/2014 5:10:19 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-68706-1	IDW Soil-12102014	Solid	12/10/14 12:15	12/13/14 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Job ID: 490-68706-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-68706-1

Comments
No additional comments.

Receipt
The sample was received on 12/13/2014 8:30 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.9º C.

Metals
Method(s) 7470A: The matrix spike / matrix spike duplicate (MS/MSD) recoveries for batch 240969 were outside control limits. Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample (LCS) recovery was within acceptance limits.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery exceeds the control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Client Sample ID: IDW Soil-12102014

Lab Sample ID: 490-68706-1

Date Collected: 12/10/14 12:15
Matrix: Solid
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**6.65**		1.00		mg/Kg		12/17/14 13:07	12/19/14 17:57	1
Manganese	**165**		1.00		mg/Kg		12/17/14 13:07	12/19/14 17:57	1
Nickel	**4.86**		0.502		mg/Kg		12/17/14 13:07	12/19/14 17:57	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 20:53	1
Barium	ND		5.00		mg/L		12/19/14 12:55	12/19/14 20:53	1
Cadmium	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 20:53	1
Chromium	ND		0.0500		mg/L		12/19/14 12:55	12/19/14 20:53	1
Lead	**0.0353**		0.0250		mg/L		12/19/14 12:55	12/19/14 20:53	1
Selenium	ND		0.0500		mg/L		12/19/14 12:55	12/19/14 20:53	1
Silver	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 20:53	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		1.60		ug/L		12/19/14 14:48	12/22/14 14:11	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-240383/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240383**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		1.05		mg/Kg		12/17/14 13:07	12/19/14 16:28	1
Manganese	ND		1.05		mg/Kg		12/17/14 13:07	12/19/14 16:28	1
Nickel	ND		0.526		mg/Kg		12/17/14 13:07	12/19/14 16:28	1

Lab Sample ID: LCS 400-240383/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240383**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	107	109.6		mg/Kg		102	80 - 120
Manganese	107	111.4		mg/Kg		104	80 - 120
Nickel	107	108.7		mg/Kg		101	80 - 120

Lab Sample ID: 400-99743-A-1-E MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240383**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	3.23		95.7	101.5		mg/Kg		103	75 - 125
Manganese	148		95.7	240.9		mg/Kg		97	75 - 125
Nickel	7.61		95.7	104.5		mg/Kg		101	75 - 125

Lab Sample ID: 400-99743-A-1-F MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240857 — **Prep Batch: 240383**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	3.23		95.2	100.3		mg/Kg		102	75 - 125	1	20
Manganese	148		95.2	256.8		mg/Kg		114	75 - 125	6	20
Nickel	7.61		95.2	103.4		mg/Kg		101	75 - 125	1	20

Lab Sample ID: LCS 400-240717/16-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240855 — **Prep Batch: 240717**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	5.00	5.302		mg/L		106	80 - 120
Barium	29.9	31.80		mg/L		106	80 - 120
Cadmium	2.50	2.552		mg/L		102	80 - 120
Chromium	5.00	5.256		mg/L		105	80 - 120
Lead	5.00	5.163		mg/L		103	80 - 120
Selenium	5.00	5.077		mg/L		102	80 - 120
Silver	2.50	2.676		mg/L		107	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LB 400-240584/1-C — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240855 — **Prep Batch: 240717**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 21:13	1
Barium	ND		5.00		mg/L		12/19/14 12:55	12/19/14 21:13	1
Cadmium	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 21:13	1
Chromium	ND		0.0500		mg/L		12/19/14 12:55	12/19/14 21:13	1
Lead	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 21:13	1
Selenium	ND		0.0500		mg/L		12/19/14 12:55	12/19/14 21:13	1
Silver	ND		0.0250		mg/L		12/19/14 12:55	12/19/14 21:13	1

Lab Sample ID: 490-68706-1 MS — **Client Sample ID: IDW Soil-12102014**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240855 — **Prep Batch: 240717**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	ND		5.00	5.304		mg/L		106	75 - 125
Barium	ND		29.9	31.94		mg/L		105	75 - 125
Cadmium	ND		2.50	2.557		mg/L		102	75 - 125
Chromium	ND		5.00	5.158		mg/L		103	75 - 125
Lead	0.0353		5.00	5.253		mg/L		104	75 - 125
Selenium	ND		5.00	5.114		mg/L		102	75 - 125
Silver	ND		2.50	2.647		mg/L		106	75 - 125

Lab Sample ID: 490-68706-1 MSD — **Client Sample ID: IDW Soil-12102014**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240855 — **Prep Batch: 240717**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	ND		5.00	5.278		mg/L		106	75 - 125	1	20
Barium	ND		29.9	31.90		mg/L		105	75 - 125	0	20
Cadmium	ND		2.50	2.544		mg/L		101	75 - 125	1	20
Chromium	ND		5.00	5.144		mg/L		102	75 - 125	0	20
Lead	0.0353		5.00	5.206		mg/L		103	75 - 125	1	20
Selenium	ND		5.00	5.103		mg/L		101	75 - 125	0	20
Silver	ND		2.50	2.662		mg/L		106	75 - 125	1	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: LCS 400-240752/14-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 240969 — **Prep Batch: 240752**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	8.00	8.662		ug/L		108	80 - 120

Lab Sample ID: LB 400-240584/1-D — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240969 — **Prep Batch: 240752**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		1.60		ug/L		12/19/14 14:48	12/22/14 14:08	1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 490-68706-1 MS — **Client Sample ID: IDW Soil-12102014**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240969 — **Prep Batch: 240752**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND		16.0	19.94	F1	ug/L		125	80 - 120		

Lab Sample ID: 490-68706-1 MSD — **Client Sample ID: IDW Soil-12102014**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 240969 — **Prep Batch: 240752**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		16.0	19.75	F1	ug/L		123	80 - 120	1	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Metals

Prep Batch: 240383

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-99743-A-1-E MS	Matrix Spike	Total/NA	Solid	3050B	
400-99743-A-1-F MSD	Matrix Spike Duplicate	Total/NA	Solid	3050B	
490-68706-1	IDW Soil-12102014	Total/NA	Solid	3050B	
LCS 400-240383/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 400-240383/1-A	Method Blank	Total/NA	Solid	3050B	

Leach Batch: 240584

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68706-1	IDW Soil-12102014	TCLP	Solid	1311	
490-68706-1 MS	IDW Soil-12102014	TCLP	Solid	1311	
490-68706-1 MSD	IDW Soil-12102014	TCLP	Solid	1311	
LB 400-240584/1-C	Method Blank	TCLP	Solid	1311	
LB 400-240584/1-D	Method Blank	TCLP	Solid	1311	

Prep Batch: 240717

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68706-1	IDW Soil-12102014	TCLP	Solid	3010A	240584
490-68706-1 MS	IDW Soil-12102014	TCLP	Solid	3010A	240584
490-68706-1 MSD	IDW Soil-12102014	TCLP	Solid	3010A	240584
LB 400-240584/1-C	Method Blank	TCLP	Solid	3010A	240584
LCS 400-240717/16-A	Lab Control Sample	Total/NA	Solid	3010A	

Prep Batch: 240752

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68706-1	IDW Soil-12102014	TCLP	Solid	7470A	240584
490-68706-1 MS	IDW Soil-12102014	TCLP	Solid	7470A	240584
490-68706-1 MSD	IDW Soil-12102014	TCLP	Solid	7470A	240584
LB 400-240584/1-D	Method Blank	TCLP	Solid	7470A	240584
LCS 400-240752/14-A	Lab Control Sample	Total/NA	Solid	7470A	

Analysis Batch: 240855

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68706-1	IDW Soil-12102014	TCLP	Solid	6010B	240717
490-68706-1 MS	IDW Soil-12102014	TCLP	Solid	6010B	240717
490-68706-1 MSD	IDW Soil-12102014	TCLP	Solid	6010B	240717
LB 400-240584/1-C	Method Blank	TCLP	Solid	6010B	240717
LCS 400-240717/16-A	Lab Control Sample	Total/NA	Solid	6010B	240717

Analysis Batch: 240857

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-99743-A-1-E MS	Matrix Spike	Total/NA	Solid	6010B	240383
400-99743-A-1-F MSD	Matrix Spike Duplicate	Total/NA	Solid	6010B	240383
490-68706-1	IDW Soil-12102014	Total/NA	Solid	6010B	240383
LCS 400-240383/2-A	Lab Control Sample	Total/NA	Solid	6010B	240383
MB 400-240383/1-A	Method Blank	Total/NA	Solid	6010B	240383

Analysis Batch: 240969

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68706-1	IDW Soil-12102014	TCLP	Solid	7470A	240752
490-68706-1 MS	IDW Soil-12102014	TCLP	Solid	7470A	240752
490-68706-1 MSD	IDW Soil-12102014	TCLP	Solid	7470A	240752

Metals (Continued)

Analysis Batch: 240969 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LB 400-240584/1-D	Method Blank	TCLP	Solid	7470A	240752
LCS 400-240752/14-A	Lab Control Sample	Total/NA	Solid	7470A	240752

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Client Sample ID: IDW Soil-12102014

Date Collected: 12/10/14 12:15
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68706-1

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			1.0 g	1.0 mL	240584	12/18/14 14:18	DAS	TAL PEN
TCLP	Prep	3010A			10 mL	50 mL	240717	12/19/14 12:55	KWN	TAL PEN
TCLP	Analysis	6010B		1	10 mL	50 mL	240855	12/19/14 20:53	SLM	TAL PEN
Total/NA	Prep	3050B			0000.498 g	50 mL	240383	12/17/14 13:07	KWN	TAL PEN
Total/NA	Analysis	6010B		1	0000.498 g	50 mL	240857	12/19/14 17:57	SLM	TAL PEN
TCLP	Leach	1311			1.0 g	1.0 mL	240584	12/18/14 14:18	DAS	TAL PEN
TCLP	Prep	7470A			5 mL	40 mL	240752	12/19/14 14:48	JAP	TAL PEN
TCLP	Analysis	7470A		1	5 mL	40 mL	240969	12/22/14 14:11	JAP	TAL PEN

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN
7470A	Mercury (CVAA)	SW846	TAL PEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	01-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-14 *
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

Laboratory: TestAmerica Pensacola

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40150	06-30-15
Arizona	State Program	9	AZ0710	01-11-16
Arkansas DEQ	State Program	6	88-0689	09-01-15
Florida	NELAP	4	E81010	06-30-15

* Certification renewal pending - certification considered valid.

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68706-1
SDG: UMI-001

Laboratory: TestAmerica Pensacola (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Georgia	State Program	4	N/A	06-30-15
Illinois	NELAP	5	200041	10-09-15
Iowa	State Program	7	367	07-31-14 *
Kansas	NELAP	7	E-10253	01-31-15
Kentucky (UST)	State Program	4	53	06-30-15
Louisiana	NELAP	6	30976	06-30-15
Maryland	State Program	3	233	09-30-15
Massachusetts	State Program	1	M-FL094	06-30-15
Michigan	State Program	5	9912	06-30-15
New Jersey	NELAP	2	FL006	06-30-15
North Carolina (WW/SW)	State Program	4	314	12-31-15
Oklahoma	State Program	6	9810	08-31-15
Pennsylvania	NELAP	3	68-00467	01-31-15
Rhode Island	State Program	1	LAO00307	12-30-14
South Carolina	State Program	4	96026	06-30-15
Tennessee	State Program	4	TN02907	06-30-15
Texas	NELAP	6	T104704286-12-5	09-30-15
USDA	Federal		P330-13-00193	07-01-16
Virginia	NELAP	3	460166	06-14-15
West Virginia DEP	State Program	3	136	06-30-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-68706 Chain of Custody

Cooler Received/Opened On 12/13/2014@ 0830

1. Tracking # 9722 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 12080142

2. Temperature of rep. sample or temp blank when opened: 1.9 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: one front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) DA

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) DA

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) D

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) M

I certify that I attached a label with the unique LIMS number to each container (intial) D

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

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Loc: 490
68706

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart + Hickman, PC	Shannon Cottrill	12/12/14	281319
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 South Tryon St.	704 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Unicore Arab, AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: TCLP 6010	Totals 6010	Special Instructions/ Conditions of Receipt
FDW Soil - 12102014	12/10/14	1215				X	X						X	X	* Totals for Co Mn + Ni only

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	12/12/14	1100	1. Received By: [signature] INAN 1.9	12/13/14	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68706-1
SDG Number: UMI-001

Login Number: 68706
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68706-1
SDG Number: UMI-001

Login Number: 68706
List Number: 2
Creator: Akers, Stephanie C

List Source: TestAmerica Pensacola
List Creation: 12/17/14 11:27 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.7°C IR-2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-68707-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
1/2/2015 12:59:19 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-68707-1	IDW Water-12102014	Water	12/10/14 11:40	12/13/14 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Job ID: 490-68707-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-68707-1

Comments
No additional comments.

Receipt
The sample was received on 12/13/2014 8:30 AM; the sample arrived in good condition, properly preserved and, where required, on ice.
The temperature of the cooler at receipt was 1.9º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Client Sample ID: IDW Water-12102014

Lab Sample ID: 490-68707-1

Date Collected: 12/10/14 11:40

Matrix: Water

Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/19/14 00:53	1
Manganese	**0.242**		0.0100		mg/L		12/18/14 09:59	12/19/14 00:53	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/19/14 00:53	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 16:38	1
Arsenic	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 16:38	1
Barium	ND		5.00		mg/L		12/30/14 09:59	12/31/14 16:38	1
Cadmium	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 16:38	1
Chromium	ND		0.0500		mg/L		12/30/14 09:59	12/31/14 16:38	1
Lead	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 16:38	1
Selenium	ND		0.0500		mg/L		12/30/14 09:59	12/31/14 16:38	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		1.60		ug/L		12/30/14 10:59	12/31/14 13:13	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-240533/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:10	1
Manganese	ND		0.0100		mg/L		12/18/14 09:59	12/18/14 23:10	1
Nickel	ND		0.00500		mg/L		12/18/14 09:59	12/18/14 23:10	1

Lab Sample ID: LCS 400-240533/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	1.00	1.002		mg/L		100	80 - 120
Manganese	1.00	1.048		mg/L		105	80 - 120
Nickel	1.00	0.9924		mg/L		99	80 - 120

Lab Sample ID: 490-68704-A-3-B MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	0.0293		1.00	1.064		mg/L		103	75 - 125
Manganese	0.842		1.00	1.851		mg/L		101	75 - 125
Nickel	0.0106		1.00	1.028		mg/L		102	75 - 125

Lab Sample ID: 490-68704-A-3-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240533**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	0.0293		1.00	1.073		mg/L		104	75 - 125	1	20
Manganese	0.842		1.00	1.856		mg/L		101	75 - 125	0	20
Nickel	0.0106		1.00	1.035		mg/L		102	75 - 125	1	20

Lab Sample ID: LCS 400-241602/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 241917 — **Prep Batch: 241602**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Silver	2.50	2.236		mg/L		89	80 - 120
Arsenic	5.00	5.179		mg/L		104	80 - 120
Barium	29.9	30.64		mg/L		102	80 - 120
Cadmium	2.50	2.488		mg/L		100	80 - 120
Chromium	5.00	5.192		mg/L		104	80 - 120
Lead	5.00	5.221		mg/L		104	80 - 120
Selenium	5.00	4.967		mg/L		99	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LB 400-241473/1-B — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241917 — **Prep Batch: 241602**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 15:16	1
Arsenic	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 15:16	1
Barium	ND		5.00		mg/L		12/30/14 09:59	12/31/14 15:16	1
Cadmium	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 15:16	1
Chromium	ND		0.0500		mg/L		12/30/14 09:59	12/31/14 15:16	1
Lead	ND		0.0250		mg/L		12/30/14 09:59	12/31/14 15:16	1
Selenium	ND		0.0500		mg/L		12/30/14 09:59	12/31/14 15:16	1

Lab Sample ID: 400-100100-B-1-C MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241917 — **Prep Batch: 241602**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Silver	ND		2.50	2.247		mg/L		90	75 - 125
Arsenic	ND		5.00	5.238		mg/L		105	75 - 125
Barium	ND		29.9	32.06		mg/L		104	75 - 125
Cadmium	ND		2.50	2.520		mg/L		100	75 - 125
Chromium	ND		5.00	5.194		mg/L		103	75 - 125
Lead	0.208		5.00	5.426		mg/L		104	75 - 125
Selenium	ND		5.00	5.018		mg/L		100	75 - 125

Lab Sample ID: 400-100100-B-1-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241917 — **Prep Batch: 241602**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Silver	ND		2.50	2.129		mg/L		85	75 - 125	5	20
Arsenic	ND		5.00	4.990		mg/L		100	75 - 125	5	20
Barium	ND		29.9	30.57		mg/L		99	75 - 125	5	20
Cadmium	ND		2.50	2.406		mg/L		96	75 - 125	5	20
Chromium	ND		5.00	4.928		mg/L		98	75 - 125	5	20
Lead	0.208		5.00	5.214		mg/L		100	75 - 125	4	20
Selenium	ND		5.00	4.772		mg/L		95	75 - 125	5	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: LCS 400-241618/14-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 241864 — **Prep Batch: 241618**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	8.00	8.474		ug/L		106	80 - 120

Lab Sample ID: LB 400-241473/1-D — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241864 — **Prep Batch: 241618**

Analyte	LB Result	LB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		1.60		ug/L		12/30/14 10:59	12/31/14 13:12	1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: 490-68707-1 MS — **Client Sample ID: IDW Water-12102014**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241864 — **Prep Batch: 241618**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND		16.0	16.40		ug/L		99	80 - 120		

Lab Sample ID: 490-68707-1 MSD — **Client Sample ID: IDW Water-12102014**
Matrix: Water — **Prep Type: TCLP**
Analysis Batch: 241864 — **Prep Batch: 241618**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		16.0	16.13		ug/L		97	80 - 120	2	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Metals

Prep Batch: 240533

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-A-3-B MS	Matrix Spike	Total/NA	Water	3010A	
490-68704-A-3-C MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	
490-68707-1	IDW Water-12102014	Total/NA	Water	3010A	
LCS 400-240533/2-A	Lab Control Sample	Total/NA	Water	3010A	
MB 400-240533/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 240666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68704-A-3-B MS	Matrix Spike	Total/NA	Water	6010B	240533
490-68704-A-3-C MSD	Matrix Spike Duplicate	Total/NA	Water	6010B	240533
490-68707-1	IDW Water-12102014	Total/NA	Water	6010B	240533
LCS 400-240533/2-A	Lab Control Sample	Total/NA	Water	6010B	240533
MB 400-240533/1-A	Method Blank	Total/NA	Water	6010B	240533

Leach Batch: 241473

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-100100-B-1-C MS	Matrix Spike	TCLP	Water	1311	
400-100100-B-1-D MSD	Matrix Spike Duplicate	TCLP	Water	1311	
490-68707-1	IDW Water-12102014	TCLP	Water	1311	
490-68707-1 MS	IDW Water-12102014	TCLP	Water	1311	
490-68707-1 MSD	IDW Water-12102014	TCLP	Water	1311	
LB 400-241473/1-B	Method Blank	TCLP	Water	1311	
LB 400-241473/1-D	Method Blank	TCLP	Water	1311	

Prep Batch: 241602

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-100100-B-1-C MS	Matrix Spike	TCLP	Water	3010A	241473
400-100100-B-1-D MSD	Matrix Spike Duplicate	TCLP	Water	3010A	241473
490-68707-1	IDW Water-12102014	TCLP	Water	3010A	241473
LB 400-241473/1-B	Method Blank	TCLP	Water	3010A	241473
LCS 400-241602/2-A	Lab Control Sample	Total/NA	Water	3010A	

Prep Batch: 241618

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68707-1	IDW Water-12102014	TCLP	Water	7470A	241473
490-68707-1 MS	IDW Water-12102014	TCLP	Water	7470A	241473
490-68707-1 MSD	IDW Water-12102014	TCLP	Water	7470A	241473
LB 400-241473/1-D	Method Blank	TCLP	Water	7470A	241473
LCS 400-241618/14-A	Lab Control Sample	Total/NA	Water	7470A	

Analysis Batch: 241864

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68707-1	IDW Water-12102014	TCLP	Water	7470A	241618
490-68707-1 MS	IDW Water-12102014	TCLP	Water	7470A	241618
490-68707-1 MSD	IDW Water-12102014	TCLP	Water	7470A	241618
LB 400-241473/1-D	Method Blank	TCLP	Water	7470A	241618
LCS 400-241618/14-A	Lab Control Sample	Total/NA	Water	7470A	241618

Analysis Batch: 241917

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-100100-B-1-C MS	Matrix Spike	TCLP	Water	6010B	241602

Metals (Continued)

Analysis Batch: 241917 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
400-100100-B-1-D MSD	Matrix Spike Duplicate	TCLP	Water	6010B	241602
490-68707-1	IDW Water-12102014	TCLP	Water	6010B	241602
LB 400-241473/1-B	Method Blank	TCLP	Water	6010B	241602
LCS 400-241602/2-A	Lab Control Sample	Total/NA	Water	6010B	241602

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Client Sample ID: IDW Water-12102014

Date Collected: 12/10/14 11:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68707-1

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			1.0 g	1.0 mL	241473	12/29/14 13:13	DAS	TAL PEN
TCLP	Prep	3010A			10 mL	50 mL	241602	12/30/14 09:59	KWN	TAL PEN
TCLP	Analysis	6010B		1	10 mL	50 mL	241917	12/31/14 16:38	SLM	TAL PEN
Total/NA	Prep	3010A			50 mL	50 mL	240533	12/18/14 09:59	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/19/14 00:53	SLM	TAL PEN
TCLP	Leach	1311			1.0 g	1.0 mL	241473	12/29/14 13:13	DAS	TAL PEN
TCLP	Prep	7470A			5 mL	40 mL	241618	12/30/14 10:59	JAP	TAL PEN
TCLP	Analysis	7470A		1	5 mL	40 mL	241864	12/31/14 13:13	JAP	TAL PEN

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN
7470A	Mercury (CVAA)	SW846	TAL PEN

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	01-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

Laboratory: TestAmerica Pensacola

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40150	06-30-15
Arizona	State Program	9	AZ0710	01-11-16
Arkansas DEQ	State Program	6	88-0689	09-01-15
Florida	NELAP	4	E81010	06-30-15

* Certification renewal pending - certification considered valid.

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68707-1
SDG: UMI-001

Laboratory: TestAmerica Pensacola (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Georgia	State Program	4	N/A	06-30-15
Illinois	NELAP	5	200041	10-09-15
Iowa	State Program	7	367	07-31-16
Kansas	NELAP	7	E-10253	01-31-15
Kentucky (UST)	State Program	4	53	06-30-15
Kentucky (WW)	State Program	4	98030	12-31-15
Louisiana	NELAP	6	30976	06-30-15
Maryland	State Program	3	233	09-30-15
Massachusetts	State Program	1	M-FL094	06-30-15
Michigan	State Program	5	9912	06-30-15
New Jersey	NELAP	2	FL006	06-30-15
North Carolina (WW/SW)	State Program	4	314	12-31-15
Oklahoma	State Program	6	9810	08-31-15
Pennsylvania	NELAP	3	68-00467	01-31-15
South Carolina	State Program	4	96026	06-30-15
Tennessee	State Program	4	TN02907	06-30-15
Texas	NELAP	6	T104704286-12-5	09-30-15
USDA	Federal		P330-13-00193	07-01-16
Virginia	NELAP	3	460166	06-14-15
West Virginia DEP	State Program	3	136	06-30-15

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-68707 Chain of Custody

Cooler Received/Opened On 12/13/2014@ 0830

1. Tracking # 9722 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 12080142

2. Temperature of rep. sample or temp blank when opened: 1.9 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: One front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) DA

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) P

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) P

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) P

I certify that I attached a label with the unique LIMS number to each container (intial) P

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
68707

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart + Hickman, PC	Shannon Cottrill	12/12/14	281320
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 South Tryon St	704 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Umicore Arab, AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		TCLP Co10	TOTALS Co10											Special Instructions/ Conditions of Receipt
IDW WATER - 12102014	12/10/14	1140		X				X		X					X	X											* TOTALS FOR Co Mn + Ni ONLY

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	12/12/14	1100	1. Received By: [signature] INAN 1.9	12/13/14	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68707-1
SDG Number: UMI-001

Login Number: 68707
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68707-1
SDG Number: UMI-001

Login Number: 68707
List Number: 2
Creator: Akers, Stephanie C

List Source: TestAmerica Pensacola
List Creation: 12/17/14 11:26 AM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.7°C IR-2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-68855-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore CSM NA
Revision: 1

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
1/13/2015 12:18:00 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-68855-1	SW-1	Water	12/10/14 13:20	12/13/14 08:30
490-68855-2	SW-2	Water	12/10/14 14:10	12/13/14 08:30
490-68855-3	SW-3	Water	12/10/14 14:40	12/13/14 08:30
490-68855-4	SED-1	Solid	12/10/14 13:30	12/13/14 08:30
490-68855-5	SED-2	Solid	12/10/14 14:20	12/13/14 08:30
490-68855-6	SED-3	Solid	12/10/14 14:45	12/13/14 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Job ID: 490-68855-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-68855-1

Revised Report: Revised to report Hardness on samples SW-1 (490-68855-1), SW-2 (490-68855-2) and SW-3 (490-68855-3) at the client's request. This report replaces the one generated on 12/23/14 @ 1152.

Comments
No additional comments.

Receipt
The samples were received on 12/13/2014 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.4º C.

Metals
Method(s) 6010B: The matrix spike / matrix spike duplicate (MS/MSD) recoveries and precision for batch 400-240699 were outside control limits for manganese (Mn). Sample matrix interference and/or non-homogeneity are suspected because the associated laboratory control sample was within acceptance limits.

Also, the post-digestion spike (PDS) recovered within limits for this target analyte.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Narrative

Job Narrative
490-68855-2

Comments
No additional comments.

Receipt
The samples were received on 12/13/2014 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.4º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery exceeds the control limits
F2	MS/MSD RPD exceeds control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SW-1

Date Collected: 12/10/14 13:20
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-1

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 22:47	1
Cobalt	ND		0.0100		mg/L		12/18/14 12:31	12/18/14 22:47	1
Manganese	**0.0897**		0.0100		mg/L		12/18/14 12:31	12/18/14 22:47	1
Nickel	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 22:47	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**24.2**		3.30		mg/L			01/13/15 09:45	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SW-2

Lab Sample ID: 490-68855-2

Date Collected: 12/10/14 14:10
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 23:03	1
Cobalt	ND		0.0100		mg/L		12/18/14 12:31	12/18/14 23:03	1
Manganese	**0.0898**		0.0100		mg/L		12/18/14 12:31	12/18/14 23:03	1
Nickel	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 23:03	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**25.2**		3.30		mg/L			01/13/15 09:45	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SW-3

Lab Sample ID: 490-68855-3

Date Collected: 12/10/14 14:40
Matrix: Water
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 23:06	1
Cobalt	ND		0.0100		mg/L		12/18/14 12:31	12/18/14 23:06	1
Manganese	**0.105**		0.0100		mg/L		12/18/14 12:31	12/18/14 23:06	1
Nickel	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 23:06	1

Method: SM 2340B - Total Hardness (as CaCO3) by calculation

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Hardness as calcium carbonate	**26.4**		3.30		mg/L			01/13/15 09:45	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SED-1

Lab Sample ID: 490-68855-4

Date Collected: 12/10/14 13:30
Matrix: Solid
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.459		mg/Kg		12/19/14 13:03	12/22/14 09:28	1
Cobalt	**4.82**		0.919		mg/Kg		12/19/14 13:03	12/22/14 09:28	1
Manganese	**97.6**		0.919		mg/Kg		12/19/14 13:03	12/22/14 09:28	1
Nickel	**2.99**		0.459		mg/Kg		12/19/14 13:03	12/22/14 09:28	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SED-2

Lab Sample ID: 490-68855-5

Date Collected: 12/10/14 14:20
Matrix: Solid
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.470		mg/Kg		12/19/14 13:03	12/22/14 09:54	1
Cobalt	**4.97**		0.941		mg/Kg		12/19/14 13:03	12/22/14 09:54	1
Manganese	**43.3**		0.941		mg/Kg		12/19/14 13:03	12/22/14 09:54	1
Nickel	**2.92**		0.470		mg/Kg		12/19/14 13:03	12/22/14 09:54	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SED-3

Lab Sample ID: 490-68855-6

Date Collected: 12/10/14 14:45
Matrix: Solid
Date Received: 12/13/14 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.545		0.483		mg/Kg		12/19/14 13:03	12/22/14 09:58	1
Cobalt	4.26		0.966		mg/Kg		12/19/14 13:03	12/22/14 09:58	1
Manganese	212		0.966		mg/Kg		12/19/14 13:03	12/22/14 09:58	1
Nickel	6.35		0.483		mg/Kg		12/19/14 13:03	12/22/14 09:58	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 400-240564/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240564**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 22:31	1
Cobalt	ND		0.0100		mg/L		12/18/14 12:31	12/18/14 22:31	1
Manganese	ND		0.0100		mg/L		12/18/14 12:31	12/18/14 22:31	1
Nickel	ND		0.00500		mg/L		12/18/14 12:31	12/18/14 22:31	1

Lab Sample ID: LCS 400-240564/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240564**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.4956		mg/L		99	80 - 120
Cobalt	1.00	0.9990		mg/L		100	80 - 120
Manganese	1.00	1.040		mg/L		104	80 - 120
Nickel	1.00	0.9908		mg/L		99	80 - 120

Lab Sample ID: 490-68855-1 MS — **Client Sample ID: SW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.500	0.4920		mg/L		98	75 - 125
Cobalt	ND		1.00	0.9975		mg/L		100	75 - 125
Manganese	0.0897		1.00	1.129		mg/L		104	75 - 125
Nickel	ND		1.00	0.9884		mg/L		99	75 - 125

Lab Sample ID: 490-68855-1 MSD — **Client Sample ID: SW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 240666 — **Prep Batch: 240564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		0.500	0.4983		mg/L		100	75 - 125	1	20
Cobalt	ND		1.00	1.007		mg/L		101	75 - 125	1	20
Manganese	0.0897		1.00	1.135		mg/L		105	75 - 125	1	20
Nickel	ND		1.00	0.9928		mg/L		99	75 - 125	0	20

Lab Sample ID: MB 400-240699/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 241032 — **Prep Batch: 240699**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.485		mg/Kg		12/19/14 13:03	12/22/14 09:22	1
Cobalt	ND		0.970		mg/Kg		12/19/14 13:03	12/22/14 09:22	1
Manganese	ND		0.970		mg/Kg		12/19/14 13:03	12/22/14 09:22	1
Nickel	ND		0.485		mg/Kg		12/19/14 13:03	12/22/14 09:22	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 400-240699/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 241032 — **Prep Batch: 240699**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	49.4	48.34		mg/Kg		98	80 - 120
Cobalt	98.8	97.76		mg/Kg		99	80 - 120
Manganese	98.8	104.0		mg/Kg		105	80 - 120
Nickel	98.8	97.87		mg/Kg		99	80 - 120

Lab Sample ID: 490-68855-4 MS — **Client Sample ID: SED-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 241032 — **Prep Batch: 240699**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		47.2	45.14		mg/Kg		95	75 - 125
Cobalt	4.82		94.3	98.80		mg/Kg		100	75 - 125
Manganese	97.6		94.3	216.9	F1	mg/Kg		126	75 - 125
Nickel	2.99		94.3	95.08		mg/Kg		98	75 - 125

Lab Sample ID: 490-68855-4 MSD — **Client Sample ID: SED-1**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 241032 — **Prep Batch: 240699**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		48.8	45.18		mg/Kg		92	75 - 125	0	20
Cobalt	4.82		97.6	100.1		mg/Kg		98	75 - 125	1	20
Manganese	97.6		97.6	272.4	F1 F2	mg/Kg		179	75 - 125	23	20
Nickel	2.99		97.6	101.0		mg/Kg		100	75 - 125	6	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Metals

Prep Batch: 240564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68855-1	SW-1	Total/NA	Water	3010A	
490-68855-1 MS	SW-1	Total/NA	Water	3010A	
490-68855-1 MSD	SW-1	Total/NA	Water	3010A	
490-68855-2	SW-2	Total/NA	Water	3010A	
490-68855-3	SW-3	Total/NA	Water	3010A	
LCS 400-240564/2-A	Lab Control Sample	Total/NA	Water	3010A	
MB 400-240564/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 240666

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68855-1	SW-1	Total/NA	Water	6010B	240564
490-68855-1 MS	SW-1	Total/NA	Water	6010B	240564
490-68855-1 MSD	SW-1	Total/NA	Water	6010B	240564
490-68855-2	SW-2	Total/NA	Water	6010B	240564
490-68855-3	SW-3	Total/NA	Water	6010B	240564
LCS 400-240564/2-A	Lab Control Sample	Total/NA	Water	6010B	240564
MB 400-240564/1-A	Method Blank	Total/NA	Water	6010B	240564

Prep Batch: 240699

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68855-4	SED-1	Total/NA	Solid	3050B	
490-68855-4 MS	SED-1	Total/NA	Solid	3050B	
490-68855-4 MSD	SED-1	Total/NA	Solid	3050B	
490-68855-5	SED-2	Total/NA	Solid	3050B	
490-68855-6	SED-3	Total/NA	Solid	3050B	
LCS 400-240699/2-A	Lab Control Sample	Total/NA	Solid	3050B	
MB 400-240699/1-A	Method Blank	Total/NA	Solid	3050B	

Analysis Batch: 241032

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68855-4	SED-1	Total/NA	Solid	6010B	240699
490-68855-4 MS	SED-1	Total/NA	Solid	6010B	240699
490-68855-4 MSD	SED-1	Total/NA	Solid	6010B	240699
490-68855-5	SED-2	Total/NA	Solid	6010B	240699
490-68855-6	SED-3	Total/NA	Solid	6010B	240699
LCS 400-240699/2-A	Lab Control Sample	Total/NA	Solid	6010B	240699
MB 400-240699/1-A	Method Blank	Total/NA	Solid	6010B	240699

Analysis Batch: 242860

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-68855-1	SW-1	Total/NA	Water	SM 2340B	
490-68855-2	SW-2	Total/NA	Water	SM 2340B	
490-68855-3	SW-3	Total/NA	Water	SM 2340B	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SW-1
Date Collected: 12/10/14 13:20
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240564	12/18/14 12:31	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 22:47	SLM	TAL PEN
Total/NA	Analysis	SM 2340B		1			242860	01/13/15 09:45	JMH	TAL PEN

Client Sample ID: SW-2
Date Collected: 12/10/14 14:10
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240564	12/18/14 12:31	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:03	SLM	TAL PEN
Total/NA	Analysis	SM 2340B		1			242860	01/13/15 09:45	JMH	TAL PEN

Client Sample ID: SW-3
Date Collected: 12/10/14 14:40
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	240564	12/18/14 12:31	KWN	TAL PEN
Total/NA	Analysis	6010B		1	50 mL	50 mL	240666	12/18/14 23:06	SLM	TAL PEN
Total/NA	Analysis	SM 2340B		1			242860	01/13/15 09:45	JMH	TAL PEN

Client Sample ID: SED-1
Date Collected: 12/10/14 13:30
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-4
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			0.5441 g	50 mL	240699	12/19/14 13:03	DN1	TAL PEN
Total/NA	Analysis	6010B		1	0.5441 g	50 mL	241032	12/22/14 09:28	GESP	TAL PEN

Client Sample ID: SED-2
Date Collected: 12/10/14 14:20
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-5
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			0.5314 g	50 mL	240699	12/19/14 13:03	DN1	TAL PEN
Total/NA	Analysis	6010B		1	0.5314 g	50 mL	241032	12/22/14 09:54	GESP	TAL PEN

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Client Sample ID: SED-3

Date Collected: 12/10/14 14:45
Date Received: 12/13/14 08:30

Lab Sample ID: 490-68855-6

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3050B			0.5177 g	50 mL	240699	12/19/14 13:03	DN1	TAL PEN
Total/NA	Analysis	6010B		1	0.5177 g	50 mL	241032	12/22/14 09:58	GESP	TAL PEN

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL PEN
SM 2340B	Total Hardness (as CaCO3) by calculation	SM	TAL PEN

Protocol References:

SM = "Standard Methods For The Examination Of Water And Wastewater",

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL PEN = TestAmerica Pensacola, 3355 McLemore Drive, Pensacola, FL 32514, TEL (850)474-1001

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-68855-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	03-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

Laboratory: TestAmerica Pensacola

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Alabama	State Program	4	40150	06-30-15
Arizona	State Program	9	AZ0710	01-11-16
Arkansas DEQ	State Program	6	88-0689	09-01-15
Florida	NELAP	4	E81010	06-30-15

* Certification renewal pending - certification considered valid.

Laboratory: TestAmerica Pensacola (Continued)

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
Georgia	State Program	4	N/A	06-30-15
Illinois	NELAP	5	200041	10-09-15
Iowa	State Program	7	367	07-31-16
Kansas	NELAP	7	E-10253	03-31-15
Kentucky (UST)	State Program	4	53	06-30-15
Kentucky (WW)	State Program	4	98030	12-31-15
Louisiana	NELAP	6	30976	06-30-15
Maryland	State Program	3	233	09-30-15
Massachusetts	State Program	1	M-FL094	06-30-15
Michigan	State Program	5	9912	06-30-15
New Jersey	NELAP	2	FL006	06-30-15
North Carolina (WW/SW)	State Program	4	314	12-31-15
Oklahoma	State Program	6	9810	08-31-15
Pennsylvania	NELAP	3	68-00467	01-31-15
Rhode Island	State Program	1	LAO00307	12-30-14
South Carolina	State Program	4	96026	06-30-15
Tennessee	State Program	4	TN02907	06-30-15
Texas	NELAP	6	T104704286-12-5	09-30-15
USDA	Federal		P330-13-00193	07-01-16
Virginia	NELAP	3	460166	06-14-15
West Virginia DEP	State Program	3	136	06-30-15

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FOR

490-68855 Chain of Custody

Cooler Received/Opened On : 12/13/2014 @ 0830

1. Tracking # 9527 (last 4 digits, FedEx)

Courier: Fed-ex IR Gun: 97310166

2. Temperature of rep. sample or temp blank when opened: 2.4 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial)

7. Were custody seals on containers: YES NO and Intact YES NO NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial)

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial)

I certify that I attached a label with the unique LIMS number to each container (intial)

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

0907

COC emailed 12/12/14 @ 1170

4400 4281 pres. email

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☒

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client: Hart & Hickman, PC	Project Manager: Shannon Cottrell	Date: 12/12/2014	Chain of Custody Number: 281075
Address: 2923 South Tryon St.	Telephone Number (Area Code)/Fax Number: 704 586 0007	Lab Number	Page 1 of 1
City: Charlotte; State: NC; Zip Code: 28203	Site Contact: Ralph McGee	Lab Contact: Ken Hayes	
Project Name and Location (State): Umicore Anam, AL	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.: UMI-001			

Analysis (Attach list if more space is needed): Loc: 490 68855

Special Instructions/ Conditions of Receipt: * Totals for Co, Mn, Ni, + Cd only

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	Totals Co10 *
SW-1	12/10/14	1320		X					X				X
SW-2	12/10/14	1410		X					X				X
SW-3	12/10/14	1440		X					X				X
SED-1	12/10/14	1330			X		X						X
SED-2	12/10/14	1420			X		X						X
SED-3	12/10/14	1445			X		X						X

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	12/12/14	1100	1. Received By: [signature] LAN 2-4	12/13/14	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68855-1
SDG Number: UMI-001

Login Number: 68855
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68855-1
SDG Number: UMI-001

Login Number: 68855
List Number: 2
Creator: Blackburn, Dominic S

List Source: TestAmerica Pensacola
List Creation: 12/18/14 12:02 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	11.5°C IR5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-68855-1
SDG Number: UMI-001

Login Number: 68855
List Number: 3
Creator: Blackburn, Dominic S

List Source: TestAmerica Pensacola
List Creation: 12/18/14 12:04 PM

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	N/A	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	False	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	11.5°C IR5
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	True	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-67374-1
TestAmerica Sample Delivery Group: UMI.001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
1/16/2015 10:18:32 AM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-67374-1	SS-65 (0-1)	Soil	11/24/14 09:10	11/26/14 10:40
490-67374-4	SS-66 (0-1)	Soil	11/24/14 09:25	11/26/14 10:40
490-67374-5	SS-66 (1-2)	Soil	11/24/14 09:30	11/26/14 10:40
490-67374-7	SS-67 (0-1)	Soil	11/24/14 09:40	11/26/14 10:40
490-67374-22	SS-63 (0-1)	Soil	11/24/14 10:55	11/26/14 10:40
490-67374-25	SS-63A (0-1)	Soil	11/24/14 11:10	11/26/14 10:40
490-67374-28	SS-61 (0-1)	Soil	11/24/14 11:25	11/26/14 10:40
490-67374-29	SS-61 (1-2)	Soil	11/24/14 11:30	11/26/14 10:40
490-67374-31	SS-61A (0-1)	Soil	11/24/14 11:40	11/26/14 10:40
490-67374-34	SS-62 (0-1)	Soil	11/24/14 11:55	11/26/14 10:40
490-67374-40	SS-64 (0-1)	Soil	11/24/14 12:25	11/26/14 10:40
490-67374-46	SS-57 (0-1)	Soil	11/24/14 13:20	11/26/14 10:40
490-67374-47	SS-57 (1-2)	Soil	11/24/14 13:25	11/26/14 10:40
490-67374-49	SS-58 (0-1)	Soil	11/24/14 13:35	11/26/14 10:40
490-67374-50	SS-58 (1-2)	Soil	11/24/14 13:40	11/26/14 10:40
490-67374-51	SS-58 (2-2.25)	Soil	11/24/14 13:45	11/26/14 10:40
490-67374-52	SS-59 (0-1)	Soil	11/24/14 13:50	11/26/14 10:40
490-67374-53	SS-59 (1-2)	Soil	11/24/14 13:55	11/26/14 10:40
490-67374-55	SS-59A (0-1)	Soil	11/24/14 14:05	11/26/14 10:40
490-67374-58	SS-60 (0-1)	Soil	11/24/14 14:25	11/26/14 10:40
490-67374-59	SS-60 (1-2)	Soil	11/24/14 14:30	11/26/14 10:40
490-67374-61	SS-60A (0-1)	Soil	11/24/14 14:40	11/26/14 10:40
490-67374-64	SS-60B (0-1)	Soil	11/24/14 14:55	11/26/14 10:40
490-67374-67	DUP-17	Soil	11/24/14 01:01	11/26/14 10:40

Job ID: 490-67374-1

Laboratory: TestAmerica Nashville

Narrative

Preliminary Report Job Narrative
490-67374-1

Comments
No additional comments.

Receipt
The samples were received on 11/26/2014 10:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 2 coolers at receipt time were 3.2º C and 3.6º C.

Metals
Method(s) 6020: The following sample(s) was diluted to bring the concentration of target analytes within the calibration range (Cobalt): SS-58 (0-1) (490-67374-49), SS-59 (0-1) (490-67374-52), SS-61 (0-1) (490-67374-28). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F1	MS and/or MSD Recovery exceeds the control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-65 (0-1)

Lab Sample ID: 490-67374-1

Date Collected: 11/24/14 09:10
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.24		0.598		mg/Kg	☼	12/02/14 13:04	12/03/14 20:38	1
Cobalt	53.9		0.598		mg/Kg	☼	12/02/14 13:04	12/03/14 20:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-66 (0-1)

Lab Sample ID: 490-67374-4

Date Collected: 11/24/14 09:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 78.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	16.1		0.626		mg/Kg	☼	12/02/14 13:04	12/03/14 20:44	1
Cobalt	125		0.626		mg/Kg	☼	12/02/14 13:04	12/03/14 20:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-66 (1-2)

Lab Sample ID: 490-67374-5

Date Collected: 11/24/14 09:30
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.92		0.584		mg/Kg	☼	01/02/15 10:55	01/07/15 22:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-67 (0-1)

Lab Sample ID: 490-67374-7

Date Collected: 11/24/14 09:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.982		0.605		mg/Kg	☼	12/02/14 13:04	12/03/14 21:01	1
Cobalt	28.7		0.605		mg/Kg	☼	12/02/14 13:04	12/03/14 21:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-63 (0-1)

Date Collected: 11/24/14 10:55
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-22

Matrix: Soil
Percent Solids: 81.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	115		0.604		mg/Kg	☼	12/02/14 13:04	12/03/14 21:06	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-63A (0-1)

Lab Sample ID: 490-67374-25

Date Collected: 11/24/14 11:10
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 79.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	22.6		0.608		mg/Kg	☼	12/31/14 08:18	12/31/14 16:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-61 (0-1)

Lab Sample ID: 490-67374-28

Date Collected: 11/24/14 11:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 68.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	576		1.41		mg/Kg	☼	12/02/14 13:04	12/04/14 14:13	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	69		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-61 (1-2)

Date Collected: 11/24/14 11:30
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-29

Matrix: Soil
Percent Solids: 80.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	47.2		0.595		mg/Kg	☼	12/31/14 08:18	12/31/14 16:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-61A (0-1)

Lab Sample ID: 490-67374-31

Date Collected: 11/24/14 11:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 81.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	52.6		0.617		mg/Kg	☼	12/31/14 08:18	12/31/14 16:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-62 (0-1)

Lab Sample ID: 490-67374-34

Date Collected: 11/24/14 11:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 78.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	16.6		0.625		mg/Kg	☼	12/02/14 13:04	12/03/14 20:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-64 (0-1)

Date Collected: 11/24/14 12:25
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-40

Matrix: Soil
Percent Solids: 80.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	105		0.624		mg/Kg	☼	12/02/14 13:04	12/03/14 21:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-57 (0-1)

Lab Sample ID: 490-67374-46

Date Collected: 11/24/14 13:20
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	414		0.658		mg/Kg	☼	12/02/14 13:04	12/03/14 21:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-57 (1-2)

Lab Sample ID: 490-67374-47

Date Collected: 11/24/14 13:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	24.0		0.653		mg/Kg	☼	12/31/14 08:18	12/31/14 16:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	76		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-58 (0-1)

Lab Sample ID: 490-67374-49

Date Collected: 11/24/14 13:35
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 72.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	4260		6.64		mg/Kg	☼	12/02/14 13:04	12/04/14 14:18	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	73		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-58 (1-2)

Date Collected: 11/24/14 13:40
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-50

Matrix: Soil
Percent Solids: 78.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	297		0.609		mg/Kg	☼	12/31/14 08:18	12/31/14 17:11	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-58 (2-2.25)

Lab Sample ID: 490-67374-51

Date Collected: 11/24/14 13:45
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	10.1		0.653		mg/Kg	☼	01/12/15 11:09	01/14/15 19:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.10		%			01/09/15 14:17	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-59 (0-1)

Date Collected: 11/24/14 13:50
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-52

Matrix: Soil
Percent Solids: 76.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	811		3.24		mg/Kg	☼	12/02/14 13:04	12/04/14 14:24	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-59 (1-2)

Date Collected: 11/24/14 13:55
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-53

Matrix: Soil
Percent Solids: 84.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	44.9		0.584		mg/Kg	☼	12/31/14 08:18	12/31/14 17:17	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-59A (0-1)

Lab Sample ID: 490-67374-55

Date Collected: 11/24/14 14:05
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 80.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	110		0.626		mg/Kg	☼	12/31/14 08:18	12/31/14 17:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-60 (0-1)

Date Collected: 11/24/14 14:25
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-58

Matrix: Soil
Percent Solids: 69.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	316		0.684		mg/Kg	☼	12/02/14 13:04	12/03/14 21:40	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	70		0.10		%			11/29/14 10:11	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-60 (1-2)

Lab Sample ID: 490-67374-59

Date Collected: 11/24/14 14:30
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	100		0.573		mg/Kg	☼	12/31/14 08:18	12/31/14 17:28	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-60A (0-1)

Lab Sample ID: 490-67374-61

Date Collected: 11/24/14 14:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	2.97		0.586		mg/Kg	☼	12/31/14 08:18	12/31/14 17:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-60B (0-1)

Lab Sample ID: 490-67374-64

Date Collected: 11/24/14 14:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 81.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	23.1		0.591		mg/Kg	☼	12/31/14 08:18	12/31/14 17:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			12/17/14 12:03	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: DUP-17

Date Collected: 11/24/14 01:01
Date Received: 11/26/14 10:40

Lab Sample ID: 490-67374-67

Matrix: Soil
Percent Solids: 68.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	329		0.700		mg/Kg	☼	12/02/14 13:04	12/03/14 21:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	68		0.10		%			11/29/14 10:11	1

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-210669/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 211175 — **Prep Batch: 210669**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.484		mg/Kg		12/02/14 13:04	12/03/14 19:54	1
Cobalt	ND		0.484		mg/Kg		12/02/14 13:04	12/03/14 19:54	1

Lab Sample ID: LCS 490-210669/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 211175 — **Prep Batch: 210669**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.6	15.98		mg/Kg		81	80 - 120
Cobalt	19.6	16.35		mg/Kg		83	80 - 120

Lab Sample ID: 490-67374-34 MS — **Client Sample ID: SS-62 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 211175 — **Prep Batch: 210669**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	16.6		25.8	35.26	F1	mg/Kg	☼	72	75 - 125

Lab Sample ID: 490-67374-34 MSD — **Client Sample ID: SS-62 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 211175 — **Prep Batch: 210669**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	16.6		25.2	36.34		mg/Kg	☼	78	75 - 125	3	20

Lab Sample ID: 490-67374-34 DU — **Client Sample ID: SS-62 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 211175 — **Prep Batch: 210669**

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Cobalt	16.6		15.16		mg/Kg	☼	9	20

Lab Sample ID: MB 490-217617/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 217909 — **Prep Batch: 217617**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.491		mg/Kg		12/31/14 08:18	12/31/14 16:05	1

Lab Sample ID: LCS 490-217617/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 217909 — **Prep Batch: 217617**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.1	19.84		mg/Kg		99	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-67374-25 MS — **Client Sample ID: SS-63A (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 217909 — **Prep Batch: 217617**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	22.6		24.9	46.94		mg/Kg	☼	98	75 - 125

Lab Sample ID: 490-67374-25 MSD — **Client Sample ID: SS-63A (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 217909 — **Prep Batch: 217617**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	22.6		24.0	41.98		mg/Kg	☼	81	75 - 125	11	20

Lab Sample ID: MB 490-217939/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.498		mg/Kg		01/02/15 10:55	01/07/15 21:36	1

Lab Sample ID: LCS 490-217939/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.2	19.58		mg/Kg		97	80 - 120

Lab Sample ID: LCSD 490-217939/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	20.2	19.69		mg/Kg		98	80 - 120	1	20

Lab Sample ID: 490-68214-A-1-V MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		20.1	23.90		mg/Kg	☼	101	75 - 125

Lab Sample ID: 490-68214-A-1-W MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		20.0	24.34		mg/Kg	☼	104	75 - 125	2	20

Lab Sample ID: MB 490-219798/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 13:54	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Lab Sample ID: MB 490-219798/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.479		mg/Kg		01/12/15 11:09	01/14/15 17:41	1

Lab Sample ID: LCS 490-219798/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.1	16.86		mg/Kg		84	80 - 120

Lab Sample ID: LCS 490-219798/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.1	18.33		mg/Kg		91	80 - 120

Lab Sample ID: 490-67181-A-41-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	263		27.6	289.7	4	mg/Kg	☼	98	75 - 125

Lab Sample ID: 490-67181-A-41-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	257		27.6	259.6	4	mg/Kg	☼	8	75 - 125

Lab Sample ID: 490-67181-A-41-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	263		27.6	281.8	4	mg/Kg	☼	69	75 - 125	3	20

Lab Sample ID: 490-67181-A-41-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	257		27.6	277.9	4	mg/Kg	☼	74	75 - 125	7	20

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Method: Moisture - Percent Moisture

Lab Sample ID: 490-67374-34 DU — **Client Sample ID: SS-62 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209972

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	78			79		%				0.9	20

Lab Sample ID: 180-39805-I-1 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214746

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	77			77		%				0	20

Lab Sample ID: 490-70099-D-1 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219520

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	77			78		%				1	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Metals

Prep Batch: 210669

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-1	SS-65 (0-1)	Total/NA	Soil	3051A	
490-67374-4	SS-66 (0-1)	Total/NA	Soil	3051A	
490-67374-7	SS-67 (0-1)	Total/NA	Soil	3051A	
490-67374-22	SS-63 (0-1)	Total/NA	Soil	3051A	
490-67374-28	SS-61 (0-1)	Total/NA	Soil	3051A	
490-67374-34	SS-62 (0-1)	Total/NA	Soil	3051A	
490-67374-34 DU	SS-62 (0-1)	Total/NA	Soil	3051A	
490-67374-34 MS	SS-62 (0-1)	Total/NA	Soil	3051A	
490-67374-34 MSD	SS-62 (0-1)	Total/NA	Soil	3051A	
490-67374-40	SS-64 (0-1)	Total/NA	Soil	3051A	
490-67374-46	SS-57 (0-1)	Total/NA	Soil	3051A	
490-67374-49	SS-58 (0-1)	Total/NA	Soil	3051A	
490-67374-52	SS-59 (0-1)	Total/NA	Soil	3051A	
490-67374-58	SS-60 (0-1)	Total/NA	Soil	3051A	
490-67374-67	DUP-17	Total/NA	Soil	3051A	
LCS 490-210669/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-210669/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 211175

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-1	SS-65 (0-1)	Total/NA	Soil	6020	210669
490-67374-4	SS-66 (0-1)	Total/NA	Soil	6020	210669
490-67374-7	SS-67 (0-1)	Total/NA	Soil	6020	210669
490-67374-22	SS-63 (0-1)	Total/NA	Soil	6020	210669
490-67374-34	SS-62 (0-1)	Total/NA	Soil	6020	210669
490-67374-34 DU	SS-62 (0-1)	Total/NA	Soil	6020	210669
490-67374-34 MS	SS-62 (0-1)	Total/NA	Soil	6020	210669
490-67374-34 MSD	SS-62 (0-1)	Total/NA	Soil	6020	210669
490-67374-40	SS-64 (0-1)	Total/NA	Soil	6020	210669
490-67374-46	SS-57 (0-1)	Total/NA	Soil	6020	210669
490-67374-58	SS-60 (0-1)	Total/NA	Soil	6020	210669
490-67374-67	DUP-17	Total/NA	Soil	6020	210669
LCS 490-210669/2-A	Lab Control Sample	Total/NA	Solid	6020	210669
MB 490-210669/1-A	Method Blank	Total/NA	Solid	6020	210669

Analysis Batch: 211393

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-28	SS-61 (0-1)	Total/NA	Soil	6020	210669
490-67374-49	SS-58 (0-1)	Total/NA	Soil	6020	210669
490-67374-52	SS-59 (0-1)	Total/NA	Soil	6020	210669

Prep Batch: 217617

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-25	SS-63A (0-1)	Total/NA	Soil	3051A	
490-67374-25 MS	SS-63A (0-1)	Total/NA	Soil	3051A	
490-67374-25 MSD	SS-63A (0-1)	Total/NA	Soil	3051A	
490-67374-29	SS-61 (1-2)	Total/NA	Soil	3051A	
490-67374-31	SS-61A (0-1)	Total/NA	Soil	3051A	
490-67374-47	SS-57 (1-2)	Total/NA	Soil	3051A	
490-67374-50	SS-58 (1-2)	Total/NA	Soil	3051A	
490-67374-53	SS-59 (1-2)	Total/NA	Soil	3051A	

Metals (Continued)

Prep Batch: 217617 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-55	SS-59A (0-1)	Total/NA	Soil	3051A	
490-67374-59	SS-60 (1-2)	Total/NA	Soil	3051A	
490-67374-61	SS-60A (0-1)	Total/NA	Soil	3051A	
490-67374-64	SS-60B (0-1)	Total/NA	Soil	3051A	
LCS 490-217617/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-217617/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 217909

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-25	SS-63A (0-1)	Total/NA	Soil	6020	217617
490-67374-25 MS	SS-63A (0-1)	Total/NA	Soil	6020	217617
490-67374-25 MSD	SS-63A (0-1)	Total/NA	Soil	6020	217617
490-67374-29	SS-61 (1-2)	Total/NA	Soil	6020	217617
490-67374-31	SS-61A (0-1)	Total/NA	Soil	6020	217617
490-67374-47	SS-57 (1-2)	Total/NA	Soil	6020	217617
490-67374-50	SS-58 (1-2)	Total/NA	Soil	6020	217617
490-67374-53	SS-59 (1-2)	Total/NA	Soil	6020	217617
490-67374-55	SS-59A (0-1)	Total/NA	Soil	6020	217617
490-67374-59	SS-60 (1-2)	Total/NA	Soil	6020	217617
490-67374-61	SS-60A (0-1)	Total/NA	Soil	6020	217617
490-67374-64	SS-60B (0-1)	Total/NA	Soil	6020	217617
LCS 490-217617/2-A	Lab Control Sample	Total/NA	Solid	6020	217617
MB 490-217617/1-A	Method Blank	Total/NA	Solid	6020	217617

Prep Batch: 217939

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-5	SS-66 (1-2)	Total/NA	Soil	3051A	
490-68214-A-1-V MS	Matrix Spike	Total/NA	Solid	3051A	
490-68214-A-1-W MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-217939/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-217939/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-217939/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 218992

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-5	SS-66 (1-2)	Total/NA	Soil	6020	217939
490-68214-A-1-V MS	Matrix Spike	Total/NA	Solid	6020	217939
490-68214-A-1-W MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	217939
LCS 490-217939/2-A	Lab Control Sample	Total/NA	Solid	6020	217939
LCSD 490-217939/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	217939
MB 490-217939/1-A	Method Blank	Total/NA	Solid	6020	217939

Prep Batch: 219798

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-A-41-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-67181-A-41-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-67374-51	SS-58 (2-2.25)	Total/NA	Soil	3051A	
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-219798/1-A	Method Blank	Total/NA	Solid	3051A	

Metals (Continued)

Analysis Batch: 220169

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-A-41-B MS	Matrix Spike	Total/NA	Solid	6020	219798
490-67181-A-41-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	219798
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	6020	219798
MB 490-219798/1-A	Method Blank	Total/NA	Solid	6020	219798

Analysis Batch: 220475

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-A-41-B MS	Matrix Spike	Total/NA	Solid	6020	219798
490-67181-A-41-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	219798
490-67374-51	SS-58 (2-2.25)	Total/NA	Soil	6020	219798
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	6020	219798
MB 490-219798/1-A	Method Blank	Total/NA	Solid	6020	219798

General Chemistry

Analysis Batch: 209972

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-1	SS-65 (0-1)	Total/NA	Soil	Moisture	
490-67374-4	SS-66 (0-1)	Total/NA	Soil	Moisture	
490-67374-7	SS-67 (0-1)	Total/NA	Soil	Moisture	
490-67374-22	SS-63 (0-1)	Total/NA	Soil	Moisture	
490-67374-28	SS-61 (0-1)	Total/NA	Soil	Moisture	
490-67374-34	SS-62 (0-1)	Total/NA	Soil	Moisture	
490-67374-34 DU	SS-62 (0-1)	Total/NA	Soil	Moisture	
490-67374-34 MS	SS-62 (0-1)	Total/NA	Soil	Moisture	
490-67374-34 MSD	SS-62 (0-1)	Total/NA	Soil	Moisture	
490-67374-40	SS-64 (0-1)	Total/NA	Soil	Moisture	
490-67374-46	SS-57 (0-1)	Total/NA	Soil	Moisture	
490-67374-49	SS-58 (0-1)	Total/NA	Soil	Moisture	
490-67374-52	SS-59 (0-1)	Total/NA	Soil	Moisture	
490-67374-58	SS-60 (0-1)	Total/NA	Soil	Moisture	
490-67374-67	DUP-17	Total/NA	Soil	Moisture	

Analysis Batch: 214746

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
180-39805-I-1 DU	Duplicate	Total/NA	Solid	Moisture	
490-67374-5	SS-66 (1-2)	Total/NA	Soil	Moisture	
490-67374-25	SS-63A (0-1)	Total/NA	Soil	Moisture	
490-67374-29	SS-61 (1-2)	Total/NA	Soil	Moisture	
490-67374-31	SS-61A (0-1)	Total/NA	Soil	Moisture	
490-67374-47	SS-57 (1-2)	Total/NA	Soil	Moisture	
490-67374-50	SS-58 (1-2)	Total/NA	Soil	Moisture	
490-67374-53	SS-59 (1-2)	Total/NA	Soil	Moisture	
490-67374-55	SS-59A (0-1)	Total/NA	Soil	Moisture	
490-67374-59	SS-60 (1-2)	Total/NA	Soil	Moisture	
490-67374-61	SS-60A (0-1)	Total/NA	Soil	Moisture	
490-67374-64	SS-60B (0-1)	Total/NA	Soil	Moisture	

General Chemistry (Continued)

Analysis Batch: 219520

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67374-51	SS-58 (2-2.25)	Total/NA	Soil	Moisture	
490-70099-D-1 DU	Duplicate	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-65 (0-1)

Lab Sample ID: 490-67374-1
Date Collected: 11/24/14 09:10
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	211175	12/03/14 20:38	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-66 (0-1)

Lab Sample ID: 490-67374-4
Date Collected: 11/24/14 09:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 78.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	211175	12/03/14 20:44	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-66 (1-2)

Lab Sample ID: 490-67374-5
Date Collected: 11/24/14 09:30
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	217939	01/02/15 10:55	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	218992	01/07/15 22:53	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-67 (0-1)

Lab Sample ID: 490-67374-7
Date Collected: 11/24/14 09:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	211175	12/03/14 21:01	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-63 (0-1)

Lab Sample ID: 490-67374-22
Date Collected: 11/24/14 10:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 81.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	211175	12/03/14 21:06	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-63A (0-1)

Lab Sample ID: 490-67374-25
Date Collected: 11/24/14 11:10
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 79.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.517 g	100 mL	217909	12/31/14 16:16	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-61 (0-1)

Lab Sample ID: 490-67374-28
Date Collected: 11/24/14 11:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 68.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		2	0.517 g	100 mL	211393	12/04/14 14:13	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-61 (1-2)

Lab Sample ID: 490-67374-29
Date Collected: 11/24/14 11:30
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 80.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.522 g	100 mL	217909	12/31/14 16:43	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-61A (0-1)

Lab Sample ID: 490-67374-31
Date Collected: 11/24/14 11:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 81.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	217909	12/31/14 16:49	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-62 (0-1)

Lab Sample ID: 490-67374-34
Date Collected: 11/24/14 11:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 78.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	211175	12/03/14 20:05	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-64 (0-1)

Lab Sample ID: 490-67374-40
Date Collected: 11/24/14 12:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 80.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	211175	12/03/14 21:17	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-57 (0-1)

Lab Sample ID: 490-67374-46
Date Collected: 11/24/14 13:20
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.505 g	100 mL	211175	12/03/14 21:23	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-57 (1-2)

Lab Sample ID: 490-67374-47
Date Collected: 11/24/14 13:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	217909	12/31/14 16:55	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-58 (0-1)

Lab Sample ID: 490-67374-49
Date Collected: 11/24/14 13:35
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 72.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.519 g	100 mL	211393	12/04/14 14:18	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-58 (1-2)

Lab Sample ID: 490-67374-50
Date Collected: 11/24/14 13:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 78.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.522 g	100 mL	217909	12/31/14 17:11	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-58 (2-2.25)

Lab Sample ID: 490-67374-51
Date Collected: 11/24/14 13:45
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 75.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	220475	01/14/15 19:13	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219520	01/09/15 14:17	RRS	TAL NSH

Client Sample ID: SS-59 (0-1)

Lab Sample ID: 490-67374-52
Date Collected: 11/24/14 13:50
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 76.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.504 g	100 mL	211393	12/04/14 14:24	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Client Sample ID: SS-59 (1-2)

Lab Sample ID: 490-67374-53
Date Collected: 11/24/14 13:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 84.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	217909	12/31/14 17:17	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-59A (0-1)

Lab Sample ID: 490-67374-55
Date Collected: 11/24/14 14:05
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 80.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.499 g	100 mL	217909	12/31/14 17:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-60 (0-1)

Lab Sample ID: 490-67374-58
Date Collected: 11/24/14 14:25
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 69.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.523 g	100 mL	211175	12/03/14 21:40	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Client Sample ID: SS-60 (1-2)

Lab Sample ID: 490-67374-59
Date Collected: 11/24/14 14:30
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.523 g	100 mL	217909	12/31/14 17:28	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-60A (0-1)

Lab Sample ID: 490-67374-61
Date Collected: 11/24/14 14:40
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 83.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	217909	12/31/14 17:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: SS-60B (0-1)

Lab Sample ID: 490-67374-64
Date Collected: 11/24/14 14:55
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 81.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	217617	12/31/14 08:18	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.517 g	100 mL	217909	12/31/14 17:39	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214746	12/17/14 12:03	RRS	TAL NSH

Client Sample ID: DUP-17

Lab Sample ID: 490-67374-67
Date Collected: 11/24/14 01:01
Matrix: Soil
Date Received: 11/26/14 10:40
Percent Solids: 68.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	210669	12/02/14 13:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	211175	12/03/14 21:45	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209972	11/29/14 10:11	JLP	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Method	Method Description	Protocol	Laboratory
6020	Metals (ICP/MS)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67374-1
SDG: UMI.001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	03-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-67374-01 Chain of Custody

Cooler Received/Opened On 11/26/2014 @ 1040

1. Tracking # N/A

Courier: Off-Street IR Gun ID Raynger

2. Temperature of rep. sample or temp blank when opened: 3.2 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

   If yes, how many and where: 1 front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

   Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

   b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) MDM

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO...NA

   b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) MDM

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) MDM

I certify that I attached a label with the unique LIMS number to each container (intial) MDM

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
67374

COOLER RECEIPT FORM

Cooler Received/Opened On 11/26/2014 @ 1040

1. Tracking # N/A

Courier: Off-Street IR Gun ID Raynger

2. Temperature of rep. sample or temp blank when opened: 3.6 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

   If yes, how many and where: 1 front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) M

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

   Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

   b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mam

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

   b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mam

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mam

I certify that I attached a label with the unique LIMS number to each container (intial) mam

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
67374

TAL-4124 (1007)

Client: Hart + Hickman	Project Manager: Shannon Cottrill	Date	Chain of Custody Number: 281084
Address: 2923 S Tryon St. Suite 100	Telephone Number (Area Code)/Fax Number: 704-586-0007	Lab Number	Page 1 of 6
City: Charlotte; State: NC; Zip Code: 28203	Site Contact: Ralph McGee; Lab Contact: Ken Hayes		
Project Name and Location (State): UMI-001 Unicoi, Arab AL	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis (Attach list if more space is needed): Co	Cd										Special Instructions/ Conditions of Receipt
SS-65(0-1)	11/24/14	9:10				X	X						X	X									-1	
SS-65(1-2)		9:15																					2	HOLD
SS-65(2-3)		9:20																					3	HOLD
SS-66(0-1)		9:25																					4	✓
SS-66(1-2)		9:30																					5	HOLD
SS-66(2-3)		9:35																					6	HOLD
SS-67(0-1)		9:40																					7	
SS-67(1-2)		9:45																					8	HOLD
SS-67(2-3)		9:50																					9	HOLD
SS-67A(0-1)		9:55																					10	HOLD
SS-67A(1-2)		10:00																					11	HOLD
SS-67A(2-3)		10:05																					12	HOLD

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

	Date	Time		Date	Time
1. Relinquished By: Kolm A	11/26/14	0800	1. Received By: Tony Clark	11-26-14	800 AM
2. Relinquished By: Tony Clark	11-26-14	1040	2. Received By: TAN	11/26/14	11/26/14 PM ~~1105~~ 1040
3. Relinquished By			3. Received By: TAN	11-26-14	1040

Comments

3.6/3.2c

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
67374

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart+Hickman	Shannon Cottrill		281077
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 6**
2923 S Tryon St Suite 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McBee	Ken Hayes

Project Name and Location (State): UMI-001, Uniontown, Arab AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.:

Analysis (Attach list if more space is needed): Co, Cd

Special Instructions/ Conditions of Receipt

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/ NaOH	Co	Cd		Special Instructions/ Conditions of Receipt
SS-67B (0-1)	11/24/14	10:10				X	X						X	X	13	HOLD
SS-67B (1-2)		10:15													14	HOLD
SS-67B (2-3)		10:20													15	HOLD
SS-67C (0-1)		10:25													16	HOLD
SS-67C (1-2)		10:30													17	HOLD
SS-67C (2-3)		10:35													18	HOLD
SS-67D (0-1)		10:40													19	HOLD
SS-67D (1-2)		10:45													20	HOLD
SS-67D (2-3)		10:50													21	HOLD
SS-63 (0-1)		10:55											X		22	
SS-63 (1-2)		11:00											X		23	HOLD
SS-63 (2-3)		11:05											X		24	HOLD

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

	Date	Time		Date	Time
1. Relinquished By: [signature]	11/26/14	0800	1. Received By		
2. Relinquished By			2. Received By: Larry Clark	11-26-14	
3. Relinquished By: Larry Clark	11-26-14	10:40	3. Received By: [signature]	11/26/14	1040

Comments: [signature] 11-26-14 @ 1040 3.0/3.2 c

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
67374

TAL-4124 (1007)

Client: Hent Hickman	Project Manager: Shannon Cottrill	Date:	Chain of Custody Number: 281078
Address: 2923 S Tryon St. Suite 100	Telephone Number (Area Code)/Fax Number: 704-586-0007	Lab Number:	Page 3 of 6
City: Charlotte; State: NC; Zip Code: 28203	Site Contact: Ralph McBee	Lab Contact: Ken Hayes	
Project Name and Location (State): UMI-001, Umicore, Arab AL	Carrier/Waybill Number:		
Contract/Purchase Order/Quote No.:			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis (Attach list if more space is needed): CO											Special Instructions/ Conditions of Receipt
SS-63A (0-1)	11/24/14	11:10				X	X						X										25	HOLD
SS-63A (1-2)		11:15																					26	HOLD
SS-63A (2-3)		11:20																					27	HOLD
SS-61 (0-1)		11:25																					28	
SS-61 (1-2)		11:30																					29	HOLD
SS-61 (2-3)		11:35																					30	HOLD
SS-61A (0-1)		11:40																					31	HOLD ✓
SS-61A (1-2)		11:45																					32	HOLD
SS-61A (2-3)		11:50																					33	HOLD
SS-62 (0-1)		11:55																					34	MS/MSD
SS-62 (1-2)		12:00																					35	HOLD
SS-62 (2-3)		12:05																					36	HOLD

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Return for 6 months

	Date	Time		Date	Time
1. Relinquished By: Ralph McBee	11/26/14	0800	1. Received By: Lacy Clark	11-26-14	
2. Relinquished By: Lacy Clark	11-26-14	1040	2. Received By: TPW	11/26/14	1040
3. Relinquished By:			3. Received By: TPW	11.26.14	1040

Comments: 3.6/3.2

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67374

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph Moore	Date:	COC No:
Hart Hickman	Tel/Fax: 704-586-0007	Lab Contact: Ken Hayes	Carrier:	4 of 6 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI-001	☒ 1 week			
Site: Umicore, Arab AL	☐ 2 days			Job / SDG No.:
PO# UMI-001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS/MSD (Y/N)	Cobalt		Sample Specific Notes:
SS-62A (0-1)	11/24/14	12:10		S	1			X	37	HOLD
SS-62A (1-2)		12:15							38	HOLD
SS-62A (2-3)		12:20							39	HOLD
SS-64 (0-1)		12:25							40	
SS-64 (1-2)		12:30							41	HOLD
SS-64 (2-3)		12:35							42	HOLD
SS-64A (0-1)		12:40							43	HOLD
SS-64A (1-2)		12:45							44	HOLD
SS-64A (2-3)		12:50							45	HOLD
SS-57 (0-1)		13:20							46	
SS-57 (1-2)		13:25							47	HOLD
SS-57 (2-3)		13:30							48	HOLD

Preservation Used: 1=Ice 2= HCl; 3= H_2SO_4; 4=HNO_3; 5=NaOH; 6= Other 1

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☐ Archive for 6 Months

Special Instructions/QC Requirements & Comments:
Retain for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Kyle M	HZH	11/26/14 0800	Larry Clark	FSI	11-26-14
Relinquished by: Larry Clark	Company: FSI	Date/Time: 11-26-14 1030	Received by: 1100	Company:	Date/Time: 11/26/14 1040
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time: 11-26-14 @ 1040 3.4/3.2

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67374

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cothrell	Site Contact: Ralph McBee	Date:	COC No:
Hart Hickman	Tel/Fax: 704-586-0007	Lab Contact: Ken Hayes	Carrier:	5 of 6 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☒ 1 week			
Site: Uniroyal, Opelika AL	☐ 2 days			Job / SDG No.:
PO# UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Cobalt		Sample Specific Notes:
SS-58 (0-1)	11/24/14	13:35		S				X	49	
SS-58 (1-2)		13:40							50	HOLD
SS-58 (2-2.25)		13:45							51	HOLD
SS-59 (0-1)		13:50							52	
SS-59 (1-2)		13:55							53	HOLD
SS-59 (2-3)		14:00							54	HOLD
SS-59A (0-1)		14:05							55	HOLD
SS-59A (1-2)		14:15							56	HOLD
SS-59A (2-3)		14:20							57	HOLD
SS-60 (0-1)		14:25							58	
SS-60 (1-2)		14:30							59	HOLD
SS-60 (2-3)		14:35							60	HOLD

Preservation Used: 1=Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☒ Disposal by Lab ☒ Archive for 6 Months

Special Instructions/QC Requirements & Comments:
Retain for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HHH	11/26/14 0800	Larry Clark	FSI	11-26-14
Relinquished by: Larry Clark	Company: FSI	Date/Time: 1240 11/26/14	Received by: [signature]	Company: TAN	Date/Time: 11/26/14 1040
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TAN	Date/Time: 11-26-14@1040 3.6/3.2

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67374

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrell	Site Contact: Ralph McGee	Date:	COC No:
Hunt Hickman	Tel/Fax: 704-586-0007	Lab Contact: Ken Hayes	Carrier:	6 of 6 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI 001	☒ 1 week			
Site: Unicoi, Crab Al	☐ 2 days			Job / SDG No.:
PO# UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Cobalt		Sample Specific Notes:
SS-60A(0-1)	11/24/14	14:40		S				↓	61	HOLD
SS-60A (1-2)	↓	14:45		↓				↓	62	HOLD
SS-60A (2-2.5)		14:50							63	HOLD
SS-60B (0-1)		14:55							64	HOLD
SS-60B (1-2)		15:00							65	HOLD
SS-60B(2-3)		15:05							66	HOLD
DUP-17	↓	NA		↓				↓	67	

Preservation Used: 1=(Ice) 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☒ Disposal by Lab ☒ Archive for 6 Months

Special Instructions/QC Requirements & Comments:
Retain for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	H&H	11/26/14 0800	Lacy Clark	F.S.I.	11-26-14
Relinquished by: Lacy Clark	Company: F.S.I.	Date/Time: 11-26-14	Received by: [signature]	Company:	Date/Time: 11/26/14 1040
Relinquished by:	Company:	Date/Time:	Received in Laboratory by: [signature]	Company: TAN	Date/Time: 11-26-14 @ 1040 3.0/3.2

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-67374-1
SDG Number: UMI.001

Login Number: 67374
List Number: 1
Creator: McBride, Mike

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	3.6/3.2
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-67181-1
TestAmerica Sample Delivery Group: UMI.001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
1/21/2015 11:42:52 AM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

Review your project results through TotalAccess

Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-67181-1	SS-71 (0-1)	Soil	11/21/14 17:30	11/24/14 15:25
490-67181-7	SS-72 (0-1)	Soil	11/21/14 17:42	11/24/14 15:25
490-67181-13	SS-76 (0-1)	Soil	11/21/14 17:54	11/24/14 15:25
490-67181-15	SS-78 (0-1)	Soil	11/21/14 17:58	11/24/14 15:25
490-67181-23	SS-79 (0-1)	Soil	11/21/14 18:20	11/24/14 15:25
490-67181-32	SS-80 (0-1)	Soil	11/22/14 09:10	11/24/14 15:25
490-67181-40	SS-88 (0-1)	Soil	11/22/14 09:50	11/24/14 15:25
490-67181-41	SS-88 (1-2)	Soil	11/22/14 09:55	11/24/14 15:25
490-67181-42	SS-88 (2-3)	Soil	11/22/14 10:00	11/24/14 15:25
490-67181-43	SS-82 (0-1)	Soil	11/22/14 10:05	11/24/14 15:25
490-67181-45	SS-88A (0-1)	Soil	11/22/14 10:15	11/24/14 15:25
490-67181-48	SS-90 (0-1)	Soil	11/22/14 10:30	11/24/14 15:25
490-67181-49	SS-90 (1-2)	Soil	11/22/14 10:35	11/24/14 15:25
490-67181-51	SS-90A (0-1)	Soil	11/22/14 10:45	11/24/14 15:25
490-67181-52	SS-90A (1-2)	Soil	11/22/14 10:50	11/24/14 15:25
490-67181-54	SS-89 (0-1)	Soil	11/22/14 11:00	11/24/14 15:25
490-67181-55	SS-89 (1-2)	Soil	11/22/14 11:05	11/24/14 15:25
490-67181-57	SS-91 (0-1)	Soil	11/22/14 11:15	11/24/14 15:25
490-67181-58	SS-91 (1-2)	Soil	11/22/14 11:20	11/24/14 15:25
490-67181-59	SS-91 (2-3)	Soil	11/22/14 11:25	11/24/14 15:25
490-67181-60	SS-92 (0-1)	Soil	11/22/14 11:30	11/24/14 15:25
490-67181-61	SS-93 (0-1)	Soil	11/22/14 11:35	11/24/14 15:25
490-67181-67	SS-95 (0-1)	Soil	11/22/14 12:30	11/24/14 15:25
490-67181-68	SS-95 (1-2)	Soil	11/22/14 12:35	11/24/14 15:25
490-67181-70	SS-95A (0-1)	Soil	11/22/14 12:40	11/24/14 15:25
490-67181-71	SS-95A (1-2)	Soil	11/22/14 12:45	11/24/14 15:25
490-67181-72	SS-94 (0-1)	Soil	11/22/14 12:55	11/24/14 15:25
490-67181-78	SS-87 (0-1)	Soil	11/22/14 13:25	11/24/14 15:25
490-67181-79	SS-87 (1-2)	Soil	11/22/14 13:30	11/24/14 15:25
490-67181-80	SS-87 (2-3)	Soil	11/22/14 13:35	11/24/14 15:25
490-67181-81	SS-87A (0-1)	Soil	11/22/14 13:40	11/24/14 15:25
490-67181-84	SS-95B (0-1)	Soil	11/22/14 13:55	11/24/14 15:25
490-67181-89	SS-96 (0-1)	Soil	11/22/14 14:20	11/24/14 15:25
490-67181-90	SS-96 (1-2)	Soil	11/22/14 14:25	11/24/14 15:25
490-67181-92	SS-96A (0-1)	Soil	11/22/14 14:35	11/24/14 15:25
490-67181-95	SS-24 (0-1)	Soil	11/22/14 14:50	11/24/14 15:25
490-67181-96	SS-24 (1-2)	Soil	11/22/14 14:55	11/24/14 15:25
490-67181-97	SS-24 (2-3)	Soil	11/22/14 15:00	11/24/14 15:25
490-67181-98	SS-112 (0-1)	Soil	11/22/14 15:45	11/24/14 15:25
490-67181-99	SS-112 (1-1.5)	Soil	11/22/14 15:50	11/24/14 15:25
490-67181-100	SS-114 (0-1)	Soil	11/22/14 15:55	11/24/14 15:25
490-67181-101	SS-114 (1-1.5)	Soil	11/22/14 16:00	11/24/14 15:25
490-67181-102	SS-113 (0-1)	Soil	11/22/14 16:05	11/24/14 15:25
490-67181-108	SS-115 (0-1)	Soil	11/22/14 16:35	11/24/14 15:25
490-67181-114	SS-114B (0-1)	Soil	11/22/14 17:05	11/24/14 15:25
490-67181-117	SS-114A (0-1)	Soil	11/22/14 17:20	11/24/14 15:25
490-67181-120	SS-44B (0-1)	Soil	11/23/14 09:05	11/24/14 15:25
490-67181-121	SS-44B (1-2)	Soil	11/23/14 09:10	11/24/14 15:25
490-67181-123	SS-44C (0-1)	Soil	11/23/14 09:20	11/24/14 15:25
490-67181-124	SS-44C (1-2)	Soil	11/23/14 09:25	11/24/14 15:25
490-67181-126	SS-44D (0-1)	Soil	11/23/14 09:35	11/24/14 15:25
490-67181-127	SS-44D (1-2)	Soil	11/23/14 09:40	11/24/14 15:25
490-67181-128	SS-44D (2-3)	Soil	11/23/14 09:45	11/24/14 15:25

Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-67181-129	SS-44E (0-1)	Soil	11/23/14 09:50	11/24/14 15:25
490-67181-132	DUP-16	Soil	11/23/14 01:01	11/24/14 15:25
490-67181-133	SS-44G (0-1)	Soil	11/23/14 10:05	11/24/14 15:25
490-67181-136	SS-45A (0-1)	Soil	11/23/14 10:20	11/24/14 15:25
490-67181-139	SS-45B (0-1)	Soil	11/23/14 10:35	11/24/14 15:25
490-67181-142	SS-45C (0-1)	Soil	11/23/14 10:50	11/24/14 15:25
490-67181-143	SS-45C (1-2)	Soil	11/23/14 10:55	11/24/14 15:25
490-67181-148	SS-45E (0-1)	Soil	11/23/14 11:20	11/24/14 15:25
490-67181-151	SS-117 (0-1)	Soil	11/23/14 11:35	11/24/14 15:25
490-67181-163	SS-116 (0-1)	Soil	11/23/14 12:35	11/24/14 15:25
490-67181-164	SS-116 (1-2)	Soil	11/23/14 12:40	11/24/14 15:25
490-67181-165	SS-116 (2-3)	Soil	11/23/14 12:45	11/24/14 15:25
490-67181-166	SS-116A (0-1)	Soil	11/23/14 12:50	11/24/14 15:25
490-67181-169	SS-116B (0-1)	Soil	11/23/14 13:05	11/24/14 15:25
490-67181-172	SS-116C (0-1)	Soil	11/23/14 13:20	11/24/14 15:25
490-67181-175	SS-44F (0-1)	Soil	11/23/14 13:35	11/24/14 15:25

Job ID: 490-67181-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-67181-1

Comments
No additional comments.

Receipt
The samples were received on 11/24/2014 3:25 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 3.1º C, 3.7º C, 4.2º C and 8.1º C.

Metals
Method(s) 6020: The following sample(s) was diluted to bring the concentration of target analytes within the calibration range (Cobalt): SS-24 (0-1) (490-67181-95), SS-87 (0-1) (490-67181-78), SS-88 (0-1) (490-67181-40), SS-89 (0-1) (490-67181-54), SS-90 (0-1) (490-67181-48), SS-95 (0-1) (490-67181-67). Elevated reporting limits (RLs) are provided.

Method(s) 6020: The following sample(s) was diluted to bring the concentration of target analytes within the calibration range (Manganese): SS-116 (0-1) (490-67181-163). Elevated reporting limits (RLs) are provided.

Method(s) 6020: The following sample(s) was diluted to bring the concentration of target analytes within the calibration range (Cobalt, Nickel): SS-45C (0-1) (490-67181-142). Elevated reporting limits (RLs) are provided.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery exceeds the control limits
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
E	Result exceeded calibration range.
F2	MS/MSD RPD exceeds control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-71 (0-1)

Lab Sample ID: 490-67181-1

Date Collected: 11/21/14 17:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 73.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.05		1.36		mg/Kg	☼	12/01/14 15:56	12/02/14 16:05	1
Cobalt	73.6		2.73		mg/Kg	☼	12/01/14 15:56	12/02/14 16:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	74		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-72 (0-1)

Lab Sample ID: 490-67181-7

Date Collected: 11/21/14 17:42
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 73.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	8.90		0.650		mg/Kg	☼	12/01/14 15:56	12/02/14 16:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	73		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-76 (0-1)

Date Collected: 11/21/14 17:54
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-13

Matrix: Soil
Percent Solids: 84.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.17		mg/Kg	☼	12/01/14 15:56	12/02/14 16:35	1
Cobalt	**19.4**		2.34		mg/Kg	☼	12/01/14 15:56	12/02/14 16:35	1
Nickel	**16.4**		2.34		mg/Kg	☼	12/01/14 15:56	12/02/14 16:35	1
Manganese	**115**		3.51		mg/Kg	☼	12/01/14 15:56	12/02/14 16:35	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**84**		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-78 (0-1)

Date Collected: 11/21/14 17:58
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-15

Matrix: Soil
Percent Solids: 74.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.35		mg/Kg	☼	12/01/14 15:56	12/02/14 16:40	1
Cobalt	**7.92**		2.70		mg/Kg	☼	12/01/14 15:56	12/02/14 16:40	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**75**		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-79 (0-1)

Date Collected: 11/21/14 18:20
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-23

Matrix: Soil
Percent Solids: 74.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.34		mg/Kg	☼	12/01/14 15:56	12/02/14 17:01	1
Cobalt	**11.8**		2.67		mg/Kg	☼	12/01/14 15:56	12/02/14 17:01	1
Nickel	**6.06**		2.67		mg/Kg	☼	12/01/14 15:56	12/02/14 17:01	1
Manganese	**274**		4.01		mg/Kg	☼	12/01/14 15:56	12/02/14 17:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**75**		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-80 (0-1)

Date Collected: 11/22/14 09:10
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-32

Matrix: Soil
Percent Solids: 72.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		6.55		mg/Kg	☼	12/01/14 15:56	12/02/14 17:06	5
Cobalt	**14.1**		13.1		mg/Kg	☼	12/01/14 15:56	12/02/14 17:06	5
Nickel	ND		13.1		mg/Kg	☼	12/01/14 15:56	12/02/14 17:06	5
Manganese	**221**		19.7		mg/Kg	☼	12/01/14 15:56	12/02/14 17:06	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**73**		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-88 (0-1)

Date Collected: 11/22/14 09:50
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-40

Matrix: Soil
Percent Solids: 77.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	568		3.22		mg/Kg	☼	12/01/14 15:56	12/03/14 11:08	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-88 (1-2)

Lab Sample ID: 490-67181-41

Date Collected: 11/22/14 09:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 72.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	263		0.685		mg/Kg	☼	01/12/15 11:09	01/13/15 14:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	72		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-88 (2-3)

Date Collected: 11/22/14 10:00
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-42

Matrix: Soil
Percent Solids: 81.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	45.7		0.608		mg/Kg	☼	01/19/15 15:26	01/20/15 12:26	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			01/19/15 13:53	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-82 (0-1)

Date Collected: 11/22/14 10:05
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-43

Matrix: Soil
Percent Solids: 76.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.29		mg/Kg	☼	12/01/14 15:56	12/02/14 17:47	1
Cobalt	**7.22**		2.58		mg/Kg	☼	12/01/14 15:56	12/02/14 17:47	1
Nickel	**4.17**		2.58		mg/Kg	☼	12/01/14 15:56	12/02/14 17:47	1
Manganese	**159**		3.87		mg/Kg	☼	12/01/14 15:56	12/02/14 17:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**76**		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-88A (0-1)

Lab Sample ID: 490-67181-45

Date Collected: 11/22/14 10:15
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	173		0.574		mg/Kg	☼	01/12/15 11:09	01/13/15 14:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-90 (0-1)

Lab Sample ID: 490-67181-48

Date Collected: 11/22/14 10:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1740		5.99		mg/Kg	☼	12/01/14 15:56	12/03/14 11:13	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-90 (1-2)

Date Collected: 11/22/14 10:35
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-49

Matrix: Soil
Percent Solids: 76.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	146		0.635		mg/Kg	☼	01/12/15 11:09	01/13/15 14:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-90A (0-1)

Lab Sample ID: 490-67181-51

Date Collected: 11/22/14 10:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	519		1.26		mg/Kg	☼	01/12/15 11:09	01/14/15 18:17	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-90A (1-2)

Lab Sample ID: 490-67181-52

Date Collected: 11/22/14 10:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	126		0.646		mg/Kg	☼	01/19/15 15:26	01/20/15 12:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			01/19/15 13:53	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-89 (0-1)

Lab Sample ID: 490-67181-54

Date Collected: 11/22/14 11:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1310		6.29		mg/Kg	☼	12/01/14 15:56	12/03/14 11:18	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-89 (1-2)

Date Collected: 11/22/14 11:05
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-55

Matrix: Soil
Percent Solids: 78.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	213		0.633		mg/Kg	☼	01/12/15 11:09	01/14/15 18:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-91 (0-1)

Date Collected: 11/22/14 11:15
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-57

Matrix: Soil
Percent Solids: 80.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	379		0.629		mg/Kg	☼	12/01/14 15:56	12/02/14 18:02	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-91 (1-2)

Lab Sample ID: 490-67181-58

Date Collected: 11/22/14 11:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 71.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	280		0.688		mg/Kg	☼	01/12/15 11:09	01/14/15 18:27	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	71		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-91 (2-3)

Date Collected: 11/22/14 11:25
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-59

Matrix: Soil
Percent Solids: 76.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	241		0.643		mg/Kg	☼	01/19/15 15:26	01/20/15 12:47	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			01/19/15 13:53	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-92 (0-1)
Date Collected: 11/22/14 11:30
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-60
Matrix: Soil
Percent Solids: 85.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	445		0.592		mg/Kg	☼	12/01/14 15:56	12/02/14 18:07	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-93 (0-1)

Date Collected: 11/22/14 11:35
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-61

Matrix: Soil
Percent Solids: 83.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	181		0.595		mg/Kg	☼	12/01/14 15:56	12/02/14 18:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95 (0-1)

Lab Sample ID: 490-67181-67

Date Collected: 11/22/14 12:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	696		3.12		mg/Kg	☼	12/01/14 15:56	12/03/14 11:23	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95 (1-2)

Date Collected: 11/22/14 12:35
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-68

Matrix: Soil
Percent Solids: 73.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	174		0.676		mg/Kg	☼	01/12/15 11:09	01/14/15 18:42	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	73		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95A (0-1)

Lab Sample ID: 490-67181-70

Date Collected: 11/22/14 12:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1300		2.88		mg/Kg	☼	01/12/15 11:09	01/14/15 18:47	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95A (1-2)

Lab Sample ID: 490-67181-71

Date Collected: 11/22/14 12:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 71.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	74.9		0.689		mg/Kg	☼	01/19/15 15:26	01/20/15 12:52	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	71		0.10		%			01/19/15 13:53	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-94 (0-1)

Date Collected: 11/22/14 12:55
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-72

Matrix: Soil
Percent Solids: 84.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	28.6		0.597		mg/Kg	☼	12/01/14 15:56	12/02/14 18:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-87 (0-1)

Date Collected: 11/22/14 13:25
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-78

Matrix: Soil
Percent Solids: 71.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1360		6.74		mg/Kg	☼	12/01/14 15:56	12/03/14 11:28	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	72		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-87 (1-2)

Date Collected: 11/22/14 13:30
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-79

Matrix: Soil
Percent Solids: 79.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	329		0.630		mg/Kg	☼	12/29/14 10:17	12/30/14 14:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-87 (2-3)

Date Collected: 11/22/14 13:35
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-80

Matrix: Soil
Percent Solids: 76.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	204		0.630		mg/Kg	☼	01/12/15 11:09	01/14/15 18:52	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-87A (0-1)

Lab Sample ID: 490-67181-81

Date Collected: 11/22/14 13:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	169		0.622		mg/Kg	☼	12/29/14 10:17	12/30/14 14:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95B (0-1)

Lab Sample ID: 490-67181-84

Date Collected: 11/22/14 13:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	244		0.620		mg/Kg	☼	01/12/15 11:09	01/14/15 18:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-96 (0-1)

Date Collected: 11/22/14 14:20
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-89

Matrix: Soil
Percent Solids: 74.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	401		0.664		mg/Kg	☼	12/01/14 15:56	12/02/14 18:43	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	74		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-96 (1-2)

Date Collected: 11/22/14 14:25
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-90

Matrix: Soil
Percent Solids: 70.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	138		0.683		mg/Kg	☼	12/29/14 10:17	12/30/14 14:55	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	71		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-96A (0-1)

Lab Sample ID: 490-67181-92

Date Collected: 11/22/14 14:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	116		0.621		mg/Kg	☼	12/29/14 10:17	12/30/14 15:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-24 (0-1)

Date Collected: 11/22/14 14:50
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-95

Matrix: Soil
Percent Solids: 77.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.76		1.26		mg/Kg	☼	12/01/14 15:56	12/02/14 18:48	1
Cobalt	499		12.6		mg/Kg	☼	12/01/14 15:56	12/03/14 11:33	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-24 (1-2)

Date Collected: 11/22/14 14:55
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-96

Matrix: Soil
Percent Solids: 77.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	517		1.30		mg/Kg	☼	12/29/14 10:17	12/30/14 15:17	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-24 (2-3)

Date Collected: 11/22/14 15:00
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-97

Matrix: Soil
Percent Solids: 78.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	616		4.91		mg/Kg	☼	01/12/15 11:09	01/14/15 19:03	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-112 (0-1)

Lab Sample ID: 490-67181-98

Date Collected: 11/22/14 15:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 72.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	458		0.665		mg/Kg	☼	12/02/14 07:43	12/02/14 22:27	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	72		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-112 (1-1.5)

Lab Sample ID: 490-67181-99

Date Collected: 11/22/14 15:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 67.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	560		0.746		mg/Kg	☼	12/29/14 10:17	12/30/14 15:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	67		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114 (0-1)
Date Collected: 11/22/14 15:55
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-100
Matrix: Soil
Percent Solids: 65.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	496		0.774		mg/Kg	☼	12/02/14 07:43	12/02/14 22:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	65		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114 (1-1.5)

Lab Sample ID: 490-67181-101

Date Collected: 11/22/14 16:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 75.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	453		0.662		mg/Kg	☼	12/29/14 10:17	12/30/14 15:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-113 (0-1)

Lab Sample ID: 490-67181-102

Date Collected: 11/22/14 16:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	33.4		0.550		mg/Kg	☼	12/02/14 07:43	12/02/14 22:37	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			11/25/14 17:05	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-115 (0-1)

Lab Sample ID: 490-67181-108

Date Collected: 11/22/14 16:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 81.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	84.1		0.588		mg/Kg	☼	12/02/14 07:43	12/02/14 22:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114B (0-1)

Lab Sample ID: 490-67181-114

Date Collected: 11/22/14 17:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	26.6		0.623		mg/Kg	☼	12/29/14 10:17	12/30/14 15:34	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114A (0-1)

Lab Sample ID: 490-67181-117

Date Collected: 11/22/14 17:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	8.56		0.608		mg/Kg	☼	12/29/14 10:17	12/30/14 15:40	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44B (0-1)

Lab Sample ID: 490-67181-120

Date Collected: 11/23/14 09:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	356		2.33		mg/Kg	☼	12/02/14 07:43	12/02/14 22:58	1
Nickel	295		2.33		mg/Kg	☼	12/02/14 07:43	12/02/14 22:58	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44B (1-2)
Date Collected: 11/23/14 09:10
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-121
Matrix: Soil
Percent Solids: 88.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	5.97		0.543		mg/Kg	☼	12/29/14 10:17	12/30/14 15:45	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44C (0-1)

Lab Sample ID: 490-67181-123

Date Collected: 11/23/14 09:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	294		2.28		mg/Kg	☼	12/02/14 07:43	12/02/14 23:03	1
Nickel	418		2.28		mg/Kg	☼	12/02/14 07:43	12/02/14 23:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44C (1-2)

Lab Sample ID: 490-67181-124

Date Collected: 11/23/14 09:25
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	25.8		0.548		mg/Kg	☼	01/02/15 10:55	01/07/15 22:58	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44D (0-1)

Lab Sample ID: 490-67181-126

Date Collected: 11/23/14 09:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	368		2.34		mg/Kg	☼	12/02/14 07:43	12/02/14 23:08	1
Nickel	355		2.34		mg/Kg	☼	12/02/14 07:43	12/02/14 23:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44D (1-2)
Date Collected: 11/23/14 09:40
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-127
Matrix: Soil
Percent Solids: 83.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	52.5		0.602		mg/Kg	☼	12/29/14 10:17	12/30/14 15:51	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44D (2-3)

Lab Sample ID: 490-67181-128

Date Collected: 11/23/14 09:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	9.04		2.24		mg/Kg	☼	01/15/15 10:40	01/15/15 19:22	1
Nickel	11.4		2.24		mg/Kg	☼	01/15/15 10:40	01/15/15 19:22	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44E (0-1)
Date Collected: 11/23/14 09:50
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-129
Matrix: Soil
Percent Solids: 84.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	7.26		0.580		mg/Kg	☼	12/29/14 10:17	12/30/14 15:56	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: DUP-16

Lab Sample ID: 490-67181-132

Date Collected: 11/23/14 01:01
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	14.0		2.18		mg/Kg	☼	12/02/14 07:43	12/02/14 23:13	1
Nickel	13.8		2.18		mg/Kg	☼	12/02/14 07:43	12/02/14 23:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44G (0-1)

Lab Sample ID: 490-67181-133

Date Collected: 11/23/14 10:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 85.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	235		0.565		mg/Kg	☼	12/29/14 10:17	12/30/14 16:02	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45A (0-1)

Lab Sample ID: 490-67181-136

Date Collected: 11/23/14 10:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 79.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	97.7		2.47		mg/Kg	☼	12/02/14 07:43	12/02/14 23:18	1
Nickel	58.1		2.47		mg/Kg	☼	12/02/14 07:43	12/02/14 23:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45B (0-1)

Lab Sample ID: 490-67181-139

Date Collected: 11/23/14 10:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	4.99		2.39		mg/Kg	☼	12/02/14 07:43	12/02/14 23:23	1
Nickel	6.24		2.39		mg/Kg	☼	12/02/14 07:43	12/02/14 23:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45C (0-1)

Lab Sample ID: 490-67181-142

Date Collected: 11/23/14 10:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 79.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	619		12.4		mg/Kg	☼	12/02/14 07:43	12/03/14 11:44	5
Nickel	568		12.4		mg/Kg	☼	12/02/14 07:43	12/03/14 11:44	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	80		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45C (1-2)

Lab Sample ID: 490-67181-143

Date Collected: 11/23/14 10:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 81.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	70.1		0.610		mg/Kg	☼	12/29/14 10:17	12/30/14 16:08	1
Nickel	49.3		0.610		mg/Kg	☼	12/29/14 10:17	12/30/14 16:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45E (0-1)

Lab Sample ID: 490-67181-148

Date Collected: 11/23/14 11:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	41.5		0.608		mg/Kg	☼	12/29/14 10:17	12/30/14 16:41	1
Nickel	22.2		0.608		mg/Kg	☼	12/29/14 10:17	12/30/14 16:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-117 (0-1)

Lab Sample ID: 490-67181-151

Date Collected: 11/23/14 11:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	149		2.40		mg/Kg	☼	12/02/14 07:43	12/02/14 23:33	1
Nickel	44.3		2.40		mg/Kg	☼	12/02/14 07:43	12/02/14 23:33	1
Manganese	210		3.60		mg/Kg	☼	12/02/14 07:43	12/02/14 23:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116 (0-1)

Lab Sample ID: 490-67181-163

Date Collected: 11/23/14 12:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	148		2.39		mg/Kg	☼	12/02/14 07:43	12/02/14 22:02	1
Nickel	17.6		2.39		mg/Kg	☼	12/02/14 07:43	12/02/14 22:02	1
Manganese	4010		71.7		mg/Kg	☼	12/02/14 07:43	12/03/14 11:38	20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/25/14 17:44	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116 (1-2)

Lab Sample ID: 490-67181-164

Date Collected: 11/23/14 12:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	4450		68.8		mg/Kg	☼	12/29/14 10:17	12/30/14 16:47	20

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116 (2-3)

Lab Sample ID: 490-67181-165

Date Collected: 11/23/14 12:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	110		3.39		mg/Kg	☼	01/12/15 11:09	01/13/15 23:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			01/12/15 12:40	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116A (0-1)
Date Collected: 11/23/14 12:50
Date Received: 11/24/14 15:25

Lab Sample ID: 490-67181-166
Matrix: Soil
Percent Solids: 83.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	217		3.52		mg/Kg	☼	12/29/14 10:17	12/30/14 17:04	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116B (0-1)

Lab Sample ID: 490-67181-169

Date Collected: 11/23/14 13:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	1080		16.8		mg/Kg	☼	12/29/14 10:17	12/30/14 17:10	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116C (0-1)

Lab Sample ID: 490-67181-172

Date Collected: 11/23/14 13:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	641		16.7		mg/Kg	☼	01/02/15 10:55	01/07/15 23:03	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			12/17/14 11:16	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44F (0-1)

Lab Sample ID: 490-67181-175

Date Collected: 11/23/14 13:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	77.2		0.556		mg/Kg	☼	01/02/15 10:55	01/07/15 23:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			12/17/14 11:16	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-210452/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210452**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.996		mg/Kg		12/01/14 15:56	12/02/14 15:54	1
Cobalt	ND		1.99		mg/Kg		12/01/14 15:56	12/02/14 15:54	1
Manganese	ND		0.498		mg/Kg		12/01/14 15:56	12/02/14 15:54	1
Nickel	ND		0.498		mg/Kg		12/01/14 15:56	12/02/14 15:54	1

Lab Sample ID: LCS 490-210452/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210452**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.8	18.74		mg/Kg		94	80 - 120
Cobalt	19.8	18.90		mg/Kg		95	80 - 120
Manganese	19.8	19.32		mg/Kg		97	80 - 120
Nickel	19.8	17.36		mg/Kg		88	80 - 120

Lab Sample ID: 490-67181-1 MS — **Client Sample ID: SS-71 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210452**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	2.05		26.9	26.47		mg/Kg	☼	91	75 - 125
Cobalt	73.6		26.9	89.11	F1	mg/Kg	☼	58	75 - 125

Lab Sample ID: 490-67181-1 MSD — **Client Sample ID: SS-71 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210452**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	2.05		25.8	26.19		mg/Kg	☼	94	75 - 125	1	20
Cobalt	73.6		25.8	86.66	F1	mg/Kg	☼	51	75 - 125	3	20

Lab Sample ID: MB 490-210518/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210518**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		2.00		mg/Kg		12/02/14 07:43	12/02/14 21:52	1
Manganese	ND		3.00		mg/Kg		12/02/14 07:43	12/02/14 21:52	1
Nickel	ND		2.00		mg/Kg		12/02/14 07:43	12/02/14 21:52	1

Lab Sample ID: LCS 490-210518/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210518**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	19.5	20.25		mg/Kg		104	80 - 120
Manganese	19.5	20.23		mg/Kg		104	80 - 120
Nickel	19.5	18.87		mg/Kg		97	80 - 120

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-67181-163 MS — **Client Sample ID: SS-116 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210518**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	148		24.1	143.5	4	mg/Kg	☼	-18	75 - 125
Nickel	17.6		24.1	36.09		mg/Kg	☼	77	75 - 125
Manganese	3400	E	24.1	3520	E 4	mg/Kg	☼	491	75 - 125

Lab Sample ID: 490-67181-163 MSD — **Client Sample ID: SS-116 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210850 — **Prep Batch: 210518**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	148		23.5	191.5	4 F2	mg/Kg	☼	186	75 - 125	29	20
Nickel	17.6		23.5	40.91		mg/Kg	☼	99	75 - 125	13	20
Manganese	3400	E	23.5	4127	E 4	mg/Kg	☼	3087	75 - 125	16	20

Lab Sample ID: MB 490-217145/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 217661 — **Prep Batch: 217145**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.495		mg/Kg		12/29/14 10:17	12/30/14 14:11	1
Manganese	ND		0.495		mg/Kg		12/29/14 10:17	12/30/14 14:11	1
Nickel	ND		0.495		mg/Kg		12/29/14 10:17	12/30/14 14:11	1

Lab Sample ID: LCS 490-217145/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 217661 — **Prep Batch: 217145**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	19.5	17.19		mg/Kg		88	80 - 120
Manganese	19.5	17.77		mg/Kg		91	80 - 120
Nickel	19.5	17.07		mg/Kg		88	80 - 120

Lab Sample ID: 490-67181-79 MS — **Client Sample ID: SS-87 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 217661 — **Prep Batch: 217145**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	329		24.4	377.6	4	mg/Kg	☼	199	75 - 125
Nickel	18.5		24.4	42.38		mg/Kg	☼	98	75 - 125

Lab Sample ID: 490-67181-79 MSD — **Client Sample ID: SS-87 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 217661 — **Prep Batch: 217145**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	329		25.4	364.8	4	mg/Kg	☼	141	75 - 125	3	20
Nickel	18.5		25.4	42.05		mg/Kg	☼	92	75 - 125	1	20

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-217939/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.498		mg/Kg		01/02/15 10:55	01/07/15 21:36	1
Manganese	ND		0.498		mg/Kg		01/02/15 10:55	01/07/15 21:36	1
Nickel	ND		0.498		mg/Kg		01/02/15 10:55	01/07/15 21:36	1

Lab Sample ID: LCS 490-217939/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.2	21.55		mg/Kg		107	80 - 120
Manganese	20.2	22.50		mg/Kg		112	80 - 120
Nickel	20.2	21.39		mg/Kg		106	80 - 120

Lab Sample ID: LCSD 490-217939/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	20.2	21.71		mg/Kg		108	80 - 120	1	20
Manganese	20.2	22.54		mg/Kg		112	80 - 120	0	20
Nickel	20.2	20.67		mg/Kg		103	80 - 120	3	20

Lab Sample ID: 490-68214-A-1-V MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	ND		20.1	26.09		mg/Kg	☼	108	75 - 125
Manganese	133		20.1	146.0	4	mg/Kg	☼	63	75 - 125
Nickel	12.6		20.1	32.00		mg/Kg	☼	97	75 - 125

Lab Sample ID: 490-68214-A-1-W MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 218992 — **Prep Batch: 217939**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	ND		20.0	26.58		mg/Kg	☼	111	75 - 125	2	20
Manganese	133		20.0	155.2	4	mg/Kg	☼	109	75 - 125	6	20
Nickel	12.6		20.0	34.10		mg/Kg	☼	107	75 - 125	6	20

Lab Sample ID: MB 490-219798/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 13:54	1
Cobalt	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 13:54	1

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-219798/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220168 — **Prep Batch: 219798**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 22:33	1
Manganese	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 22:33	1
Nickel	ND		0.479		mg/Kg		01/12/15 11:09	01/13/15 22:33	1

Lab Sample ID: MB 490-219798/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.479		mg/Kg		01/12/15 11:09	01/14/15 17:41	1
Cobalt	ND		0.479		mg/Kg		01/12/15 11:09	01/14/15 17:41	1
Nickel	ND		0.479		mg/Kg		01/12/15 11:09	01/14/15 17:41	1

Lab Sample ID: LCS 490-219798/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	16.55		mg/Kg		82	80 - 120
Cobalt	20.1	16.86		mg/Kg		84	80 - 120
Manganese	20.1	17.91		mg/Kg		89	80 - 120

Lab Sample ID: LCS 490-219798/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220168 — **Prep Batch: 219798**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	20.1	15.97		mg/Kg		80	80 - 120

Lab Sample ID: LCS 490-219798/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	19.66		mg/Kg		98	80 - 120
Cobalt	20.1	18.33		mg/Kg		91	80 - 120
Nickel	20.1	18.49		mg/Kg		92	80 - 120

Lab Sample ID: 490-67181-41 MS — **Client Sample ID: SS-88 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	1.88		27.6	29.06		mg/Kg	☼	99	75 - 125
Cobalt	263		27.6	289.7	4	mg/Kg	☼	98	75 - 125
Manganese	204	B	27.6	221.1	4	mg/Kg	☼	63	75 - 125

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-67181-41 MS — **Client Sample ID: SS-88 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	257		27.6	259.6	4	mg/Kg	☼	8	75 - 125

Lab Sample ID: 490-67181-41 MSD — **Client Sample ID: SS-88 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 220169 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	1.88		27.6	24.30		mg/Kg	☼	81	75 - 125	18	20
Cobalt	263		27.6	281.8	4	mg/Kg	☼	69	75 - 125	3	20
Manganese	204	B	27.6	202.7	4	mg/Kg	☼	-4	75 - 125	9	20

Lab Sample ID: 490-67181-41 MSD — **Client Sample ID: SS-88 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 220475 — **Prep Batch: 219798**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	257		27.6	277.9	4	mg/Kg	☼	74	75 - 125	7	20

Lab Sample ID: MB 490-220541/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220736 — **Prep Batch: 220541**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		1.98		mg/Kg		01/15/15 10:40	01/15/15 18:11	1
Nickel	ND		1.98		mg/Kg		01/15/15 10:40	01/15/15 18:11	1

Lab Sample ID: LCS 490-220541/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220736 — **Prep Batch: 220541**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.0	18.43		mg/Kg		92	80 - 120
Nickel	20.0	18.64		mg/Kg		93	80 - 120

Lab Sample ID: 490-70396-C-1-G MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220736 — **Prep Batch: 220541**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	5.25		21.1	24.81		mg/Kg	☼	93	75 - 125
Nickel	12.2		21.1	31.14		mg/Kg	☼	90	75 - 125

Lab Sample ID: 490-70396-C-1-H MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 220736 — **Prep Batch: 220541**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	5.25		21.5	25.52		mg/Kg	☼	94	75 - 125	3	20
Nickel	12.2		21.5	31.49		mg/Kg	☼	90	75 - 125	1	20

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: LCS 490-221370/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 221703 — **Prep Batch: 221370**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cobalt			20.2	21.17		mg/Kg		105	80 - 120		

Lab Sample ID: 490-70603-B-1-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 221703 — **Prep Batch: 221370**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cobalt	7.03		22.1	26.93		mg/Kg	☼	90	75 - 125		

Lab Sample ID: 490-70603-B-1-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 221703 — **Prep Batch: 221370**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	7.03		22.5	25.77		mg/Kg	☼	83	75 - 125	4	20

Method: Moisture - Percent Moisture

Lab Sample ID: 490-67181-1 DU — **Client Sample ID: SS-71 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209159

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	74			72		%				2	20

Lab Sample ID: 490-67181-163 DU — **Client Sample ID: SS-116 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210425

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	83			82		%				0.6	20

Lab Sample ID: 490-67181-79 DU — **Client Sample ID: SS-87 (1-2)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 214707

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	79			79		%				0.1	20

Lab Sample ID: 490-70214-G-1 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219829

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	86			87		%				1	20

Method: Moisture - Percent Moisture (Continued)

Lab Sample ID: 490-67181-42 DU
Matrix: Soil
Analysis Batch: 221355

Client Sample ID: SS-88 (2-3)
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	81			81		%				0	20

Metals

Prep Batch: 210452

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-1	SS-71 (0-1)	Total/NA	Soil	3051A	
490-67181-1 MS	SS-71 (0-1)	Total/NA	Soil	3051A	
490-67181-1 MSD	SS-71 (0-1)	Total/NA	Soil	3051A	
490-67181-7	SS-72 (0-1)	Total/NA	Soil	3051A	
490-67181-13	SS-76 (0-1)	Total/NA	Soil	3051A	
490-67181-15	SS-78 (0-1)	Total/NA	Soil	3051A	
490-67181-23	SS-79 (0-1)	Total/NA	Soil	3051A	
490-67181-32	SS-80 (0-1)	Total/NA	Soil	3051A	
490-67181-40	SS-88 (0-1)	Total/NA	Soil	3051A	
490-67181-43	SS-82 (0-1)	Total/NA	Soil	3051A	
490-67181-48	SS-90 (0-1)	Total/NA	Soil	3051A	
490-67181-54	SS-89 (0-1)	Total/NA	Soil	3051A	
490-67181-57	SS-91 (0-1)	Total/NA	Soil	3051A	
490-67181-60	SS-92 (0-1)	Total/NA	Soil	3051A	
490-67181-61	SS-93 (0-1)	Total/NA	Soil	3051A	
490-67181-67	SS-95 (0-1)	Total/NA	Soil	3051A	
490-67181-72	SS-94 (0-1)	Total/NA	Soil	3051A	
490-67181-78	SS-87 (0-1)	Total/NA	Soil	3051A	
490-67181-89	SS-96 (0-1)	Total/NA	Soil	3051A	
490-67181-95	SS-24 (0-1)	Total/NA	Soil	3051A	
LCS 490-210452/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-210452/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 210518

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-98	SS-112 (0-1)	Total/NA	Soil	3051A	
490-67181-100	SS-114 (0-1)	Total/NA	Soil	3051A	
490-67181-102	SS-113 (0-1)	Total/NA	Soil	3051A	
490-67181-108	SS-115 (0-1)	Total/NA	Soil	3051A	
490-67181-120	SS-44B (0-1)	Total/NA	Soil	3051A	
490-67181-123	SS-44C (0-1)	Total/NA	Soil	3051A	
490-67181-126	SS-44D (0-1)	Total/NA	Soil	3051A	
490-67181-132	DUP-16	Total/NA	Soil	3051A	
490-67181-136	SS-45A (0-1)	Total/NA	Soil	3051A	
490-67181-139	SS-45B (0-1)	Total/NA	Soil	3051A	
490-67181-142	SS-45C (0-1)	Total/NA	Soil	3051A	
490-67181-151	SS-117 (0-1)	Total/NA	Soil	3051A	
490-67181-163	SS-116 (0-1)	Total/NA	Soil	3051A	
490-67181-163 MS	SS-116 (0-1)	Total/NA	Soil	3051A	
490-67181-163 MSD	SS-116 (0-1)	Total/NA	Soil	3051A	
LCS 490-210518/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-210518/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 210850

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-1	SS-71 (0-1)	Total/NA	Soil	6020	210452
490-67181-1 MS	SS-71 (0-1)	Total/NA	Soil	6020	210452
490-67181-1 MSD	SS-71 (0-1)	Total/NA	Soil	6020	210452
490-67181-7	SS-72 (0-1)	Total/NA	Soil	6020	210452
490-67181-13	SS-76 (0-1)	Total/NA	Soil	6020	210452
490-67181-15	SS-78 (0-1)	Total/NA	Soil	6020	210452

Metals (Continued)

Analysis Batch: 210850 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-23	SS-79 (0-1)	Total/NA	Soil	6020	210452
490-67181-32	SS-80 (0-1)	Total/NA	Soil	6020	210452
490-67181-43	SS-82 (0-1)	Total/NA	Soil	6020	210452
490-67181-57	SS-91 (0-1)	Total/NA	Soil	6020	210452
490-67181-60	SS-92 (0-1)	Total/NA	Soil	6020	210452
490-67181-61	SS-93 (0-1)	Total/NA	Soil	6020	210452
490-67181-72	SS-94 (0-1)	Total/NA	Soil	6020	210452
490-67181-89	SS-96 (0-1)	Total/NA	Soil	6020	210452
490-67181-95	SS-24 (0-1)	Total/NA	Soil	6020	210452
490-67181-98	SS-112 (0-1)	Total/NA	Soil	6020	210518
490-67181-100	SS-114 (0-1)	Total/NA	Soil	6020	210518
490-67181-102	SS-113 (0-1)	Total/NA	Soil	6020	210518
490-67181-108	SS-115 (0-1)	Total/NA	Soil	6020	210518
490-67181-120	SS-44B (0-1)	Total/NA	Soil	6020	210518
490-67181-123	SS-44C (0-1)	Total/NA	Soil	6020	210518
490-67181-126	SS-44D (0-1)	Total/NA	Soil	6020	210518
490-67181-132	DUP-16	Total/NA	Soil	6020	210518
490-67181-136	SS-45A (0-1)	Total/NA	Soil	6020	210518
490-67181-139	SS-45B (0-1)	Total/NA	Soil	6020	210518
490-67181-151	SS-117 (0-1)	Total/NA	Soil	6020	210518
490-67181-163	SS-116 (0-1)	Total/NA	Soil	6020	210518
490-67181-163 MS	SS-116 (0-1)	Total/NA	Soil	6020	210518
490-67181-163 MSD	SS-116 (0-1)	Total/NA	Soil	6020	210518
LCS 490-210452/2-A	Lab Control Sample	Total/NA	Solid	6020	210452
LCS 490-210518/2-A	Lab Control Sample	Total/NA	Solid	6020	210518
MB 490-210452/1-A	Method Blank	Total/NA	Solid	6020	210452
MB 490-210518/1-A	Method Blank	Total/NA	Solid	6020	210518

Analysis Batch: 211063

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-40	SS-88 (0-1)	Total/NA	Soil	6020	210452
490-67181-48	SS-90 (0-1)	Total/NA	Soil	6020	210452
490-67181-54	SS-89 (0-1)	Total/NA	Soil	6020	210452
490-67181-67	SS-95 (0-1)	Total/NA	Soil	6020	210452
490-67181-78	SS-87 (0-1)	Total/NA	Soil	6020	210452
490-67181-95	SS-24 (0-1)	Total/NA	Soil	6020	210452
490-67181-142	SS-45C (0-1)	Total/NA	Soil	6020	210518
490-67181-163	SS-116 (0-1)	Total/NA	Soil	6020	210518

Prep Batch: 217145

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-79	SS-87 (1-2)	Total/NA	Soil	3051A	
490-67181-79 MS	SS-87 (1-2)	Total/NA	Soil	3051A	
490-67181-79 MSD	SS-87 (1-2)	Total/NA	Soil	3051A	
490-67181-81	SS-87A (0-1)	Total/NA	Soil	3051A	
490-67181-90	SS-96 (1-2)	Total/NA	Soil	3051A	
490-67181-92	SS-96A (0-1)	Total/NA	Soil	3051A	
490-67181-96	SS-24 (1-2)	Total/NA	Soil	3051A	
490-67181-99	SS-112 (1-1.5)	Total/NA	Soil	3051A	
490-67181-101	SS-114 (1-1.5)	Total/NA	Soil	3051A	
490-67181-114	SS-114B (0-1)	Total/NA	Soil	3051A	

Metals (Continued)

Prep Batch: 217145 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-117	SS-114A (0-1)	Total/NA	Soil	3051A	
490-67181-121	SS-44B (1-2)	Total/NA	Soil	3051A	
490-67181-127	SS-44D (1-2)	Total/NA	Soil	3051A	
490-67181-129	SS-44E (0-1)	Total/NA	Soil	3051A	
490-67181-133	SS-44G (0-1)	Total/NA	Soil	3051A	
490-67181-143	SS-45C (1-2)	Total/NA	Soil	3051A	
490-67181-148	SS-45E (0-1)	Total/NA	Soil	3051A	
490-67181-164	SS-116 (1-2)	Total/NA	Soil	3051A	
490-67181-166	SS-116A (0-1)	Total/NA	Soil	3051A	
490-67181-169	SS-116B (0-1)	Total/NA	Soil	3051A	
LCS 490-217145/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-217145/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 217661

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-79	SS-87 (1-2)	Total/NA	Soil	6020	217145
490-67181-79 MS	SS-87 (1-2)	Total/NA	Soil	6020	217145
490-67181-79 MSD	SS-87 (1-2)	Total/NA	Soil	6020	217145
490-67181-81	SS-87A (0-1)	Total/NA	Soil	6020	217145
490-67181-90	SS-96 (1-2)	Total/NA	Soil	6020	217145
490-67181-92	SS-96A (0-1)	Total/NA	Soil	6020	217145
490-67181-96	SS-24 (1-2)	Total/NA	Soil	6020	217145
490-67181-99	SS-112 (1-1.5)	Total/NA	Soil	6020	217145
490-67181-101	SS-114 (1-1.5)	Total/NA	Soil	6020	217145
490-67181-114	SS-114B (0-1)	Total/NA	Soil	6020	217145
490-67181-117	SS-114A (0-1)	Total/NA	Soil	6020	217145
490-67181-121	SS-44B (1-2)	Total/NA	Soil	6020	217145
490-67181-127	SS-44D (1-2)	Total/NA	Soil	6020	217145
490-67181-129	SS-44E (0-1)	Total/NA	Soil	6020	217145
490-67181-133	SS-44G (0-1)	Total/NA	Soil	6020	217145
490-67181-143	SS-45C (1-2)	Total/NA	Soil	6020	217145
490-67181-148	SS-45E (0-1)	Total/NA	Soil	6020	217145
490-67181-164	SS-116 (1-2)	Total/NA	Soil	6020	217145
490-67181-166	SS-116A (0-1)	Total/NA	Soil	6020	217145
490-67181-169	SS-116B (0-1)	Total/NA	Soil	6020	217145
LCS 490-217145/2-A	Lab Control Sample	Total/NA	Solid	6020	217145
MB 490-217145/1-A	Method Blank	Total/NA	Solid	6020	217145

Prep Batch: 217939

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-124	SS-44C (1-2)	Total/NA	Soil	3051A	
490-67181-172	SS-116C (0-1)	Total/NA	Soil	3051A	
490-67181-175	SS-44F (0-1)	Total/NA	Soil	3051A	
490-68214-A-1-V MS	Matrix Spike	Total/NA	Solid	3051A	
490-68214-A-1-W MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-217939/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-217939/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-217939/1-A	Method Blank	Total/NA	Solid	3051A	

Metals (Continued)

Analysis Batch: 218992

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-124	SS-44C (1-2)	Total/NA	Soil	6020	217939
490-67181-172	SS-116C (0-1)	Total/NA	Soil	6020	217939
490-67181-175	SS-44F (0-1)	Total/NA	Soil	6020	217939
490-68214-A-1-V MS	Matrix Spike	Total/NA	Solid	6020	217939
490-68214-A-1-W MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	217939
LCS 490-217939/2-A	Lab Control Sample	Total/NA	Solid	6020	217939
LCSD 490-217939/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	217939
MB 490-217939/1-A	Method Blank	Total/NA	Solid	6020	217939

Prep Batch: 219798

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-41	SS-88 (1-2)	Total/NA	Soil	3051A	
490-67181-41 MS	SS-88 (1-2)	Total/NA	Soil	3051A	
490-67181-41 MSD	SS-88 (1-2)	Total/NA	Soil	3051A	
490-67181-45	SS-88A (0-1)	Total/NA	Soil	3051A	
490-67181-49	SS-90 (1-2)	Total/NA	Soil	3051A	
490-67181-51	SS-90A (0-1)	Total/NA	Soil	3051A	
490-67181-55	SS-89 (1-2)	Total/NA	Soil	3051A	
490-67181-58	SS-91 (1-2)	Total/NA	Soil	3051A	
490-67181-68	SS-95 (1-2)	Total/NA	Soil	3051A	
490-67181-70	SS-95A (0-1)	Total/NA	Soil	3051A	
490-67181-80	SS-87 (2-3)	Total/NA	Soil	3051A	
490-67181-84	SS-95B (0-1)	Total/NA	Soil	3051A	
490-67181-97	SS-24 (2-3)	Total/NA	Soil	3051A	
490-67181-165	SS-116 (2-3)	Total/NA	Soil	3051A	
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-219798/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 220168

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-165	SS-116 (2-3)	Total/NA	Soil	6020	219798
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	6020	219798
MB 490-219798/1-A	Method Blank	Total/NA	Solid	6020	219798

Analysis Batch: 220169

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-41	SS-88 (1-2)	Total/NA	Soil	6020	219798
490-67181-41 MS	SS-88 (1-2)	Total/NA	Soil	6020	219798
490-67181-41 MSD	SS-88 (1-2)	Total/NA	Soil	6020	219798
490-67181-45	SS-88A (0-1)	Total/NA	Soil	6020	219798
490-67181-49	SS-90 (1-2)	Total/NA	Soil	6020	219798
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	6020	219798
MB 490-219798/1-A	Method Blank	Total/NA	Solid	6020	219798

Analysis Batch: 220475

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-41 MS	SS-88 (1-2)	Total/NA	Soil	6020	219798
490-67181-41 MSD	SS-88 (1-2)	Total/NA	Soil	6020	219798
490-67181-51	SS-90A (0-1)	Total/NA	Soil	6020	219798
490-67181-55	SS-89 (1-2)	Total/NA	Soil	6020	219798
490-67181-58	SS-91 (1-2)	Total/NA	Soil	6020	219798

Metals (Continued)

Analysis Batch: 220475 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-68	SS-95 (1-2)	Total/NA	Soil	6020	219798
490-67181-70	SS-95A (0-1)	Total/NA	Soil	6020	219798
490-67181-80	SS-87 (2-3)	Total/NA	Soil	6020	219798
490-67181-84	SS-95B (0-1)	Total/NA	Soil	6020	219798
490-67181-97	SS-24 (2-3)	Total/NA	Soil	6020	219798
LCS 490-219798/2-A	Lab Control Sample	Total/NA	Solid	6020	219798
MB 490-219798/1-A	Method Blank	Total/NA	Solid	6020	219798

Prep Batch: 220541

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-128	SS-44D (2-3)	Total/NA	Soil	3051A	
490-70396-C-1-G MS	Matrix Spike	Total/NA	Solid	3051A	
490-70396-C-1-H MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-220541/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-220541/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 220736

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-128	SS-44D (2-3)	Total/NA	Soil	6020	220541
490-70396-C-1-G MS	Matrix Spike	Total/NA	Solid	6020	220541
490-70396-C-1-H MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	220541
LCS 490-220541/2-A	Lab Control Sample	Total/NA	Solid	6020	220541
MB 490-220541/1-A	Method Blank	Total/NA	Solid	6020	220541

Prep Batch: 221370

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-42	SS-88 (2-3)	Total/NA	Soil	3051A	
490-67181-52	SS-90A (1-2)	Total/NA	Soil	3051A	
490-67181-59	SS-91 (2-3)	Total/NA	Soil	3051A	
490-67181-71	SS-95A (1-2)	Total/NA	Soil	3051A	
490-70603-B-1-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-70603-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-221370/2-A	Lab Control Sample	Total/NA	Solid	3051A	

Analysis Batch: 221703

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-42	SS-88 (2-3)	Total/NA	Soil	6020	221370
490-67181-52	SS-90A (1-2)	Total/NA	Soil	6020	221370
490-67181-59	SS-91 (2-3)	Total/NA	Soil	6020	221370
490-67181-71	SS-95A (1-2)	Total/NA	Soil	6020	221370
490-70603-B-1-B MS	Matrix Spike	Total/NA	Solid	6020	221370
490-70603-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	221370
LCS 490-221370/2-A	Lab Control Sample	Total/NA	Solid	6020	221370

General Chemistry

Analysis Batch: 209159

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-1	SS-71 (0-1)	Total/NA	Soil	Moisture	
490-67181-1 DU	SS-71 (0-1)	Total/NA	Soil	Moisture	

General Chemistry (Continued)

Analysis Batch: 209159 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-7	SS-72 (0-1)	Total/NA	Soil	Moisture	
490-67181-13	SS-76 (0-1)	Total/NA	Soil	Moisture	
490-67181-15	SS-78 (0-1)	Total/NA	Soil	Moisture	
490-67181-23	SS-79 (0-1)	Total/NA	Soil	Moisture	
490-67181-32	SS-80 (0-1)	Total/NA	Soil	Moisture	
490-67181-40	SS-88 (0-1)	Total/NA	Soil	Moisture	
490-67181-43	SS-82 (0-1)	Total/NA	Soil	Moisture	
490-67181-48	SS-90 (0-1)	Total/NA	Soil	Moisture	
490-67181-54	SS-89 (0-1)	Total/NA	Soil	Moisture	
490-67181-57	SS-91 (0-1)	Total/NA	Soil	Moisture	
490-67181-60	SS-92 (0-1)	Total/NA	Soil	Moisture	
490-67181-61	SS-93 (0-1)	Total/NA	Soil	Moisture	
490-67181-67	SS-95 (0-1)	Total/NA	Soil	Moisture	
490-67181-72	SS-94 (0-1)	Total/NA	Soil	Moisture	
490-67181-78	SS-87 (0-1)	Total/NA	Soil	Moisture	
490-67181-89	SS-96 (0-1)	Total/NA	Soil	Moisture	
490-67181-95	SS-24 (0-1)	Total/NA	Soil	Moisture	
490-67181-98	SS-112 (0-1)	Total/NA	Soil	Moisture	
490-67181-100	SS-114 (0-1)	Total/NA	Soil	Moisture	
490-67181-102	SS-113 (0-1)	Total/NA	Soil	Moisture	
490-67181-108	SS-115 (0-1)	Total/NA	Soil	Moisture	
490-67181-120	SS-44B (0-1)	Total/NA	Soil	Moisture	
490-67181-123	SS-44C (0-1)	Total/NA	Soil	Moisture	
490-67181-126	SS-44D (0-1)	Total/NA	Soil	Moisture	
490-67181-132	DUP-16	Total/NA	Soil	Moisture	
490-67181-136	SS-45A (0-1)	Total/NA	Soil	Moisture	
490-67181-139	SS-45B (0-1)	Total/NA	Soil	Moisture	
490-67181-142	SS-45C (0-1)	Total/NA	Soil	Moisture	
490-67181-151	SS-117 (0-1)	Total/NA	Soil	Moisture	
490-67181-163	SS-116 (0-1)	Total/NA	Soil	Moisture	

Analysis Batch: 210425

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-163 DU	SS-116 (0-1)	Total/NA	Soil	Moisture	

Analysis Batch: 214707

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-79	SS-87 (1-2)	Total/NA	Soil	Moisture	
490-67181-79 DU	SS-87 (1-2)	Total/NA	Soil	Moisture	
490-67181-81	SS-87A (0-1)	Total/NA	Soil	Moisture	
490-67181-90	SS-96 (1-2)	Total/NA	Soil	Moisture	
490-67181-92	SS-96A (0-1)	Total/NA	Soil	Moisture	
490-67181-96	SS-24 (1-2)	Total/NA	Soil	Moisture	
490-67181-99	SS-112 (1-1.5)	Total/NA	Soil	Moisture	
490-67181-101	SS-114 (1-1.5)	Total/NA	Soil	Moisture	
490-67181-114	SS-114B (0-1)	Total/NA	Soil	Moisture	
490-67181-117	SS-114A (0-1)	Total/NA	Soil	Moisture	
490-67181-121	SS-44B (1-2)	Total/NA	Soil	Moisture	
490-67181-124	SS-44C (1-2)	Total/NA	Soil	Moisture	
490-67181-127	SS-44D (1-2)	Total/NA	Soil	Moisture	
490-67181-129	SS-44E (0-1)	Total/NA	Soil	Moisture	

General Chemistry (Continued)

Analysis Batch: 214707 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-133	SS-44G (0-1)	Total/NA	Soil	Moisture	
490-67181-143	SS-45C (1-2)	Total/NA	Soil	Moisture	
490-67181-148	SS-45E (0-1)	Total/NA	Soil	Moisture	
490-67181-164	SS-116 (1-2)	Total/NA	Soil	Moisture	
490-67181-166	SS-116A (0-1)	Total/NA	Soil	Moisture	
490-67181-169	SS-116B (0-1)	Total/NA	Soil	Moisture	
490-67181-172	SS-116C (0-1)	Total/NA	Soil	Moisture	
490-67181-175	SS-44F (0-1)	Total/NA	Soil	Moisture	

Analysis Batch: 219829

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-41	SS-88 (1-2)	Total/NA	Soil	Moisture	
490-67181-45	SS-88A (0-1)	Total/NA	Soil	Moisture	
490-67181-49	SS-90 (1-2)	Total/NA	Soil	Moisture	
490-67181-51	SS-90A (0-1)	Total/NA	Soil	Moisture	
490-67181-55	SS-89 (1-2)	Total/NA	Soil	Moisture	
490-67181-58	SS-91 (1-2)	Total/NA	Soil	Moisture	
490-67181-68	SS-95 (1-2)	Total/NA	Soil	Moisture	
490-67181-70	SS-95A (0-1)	Total/NA	Soil	Moisture	
490-67181-80	SS-87 (2-3)	Total/NA	Soil	Moisture	
490-67181-84	SS-95B (0-1)	Total/NA	Soil	Moisture	
490-67181-97	SS-24 (2-3)	Total/NA	Soil	Moisture	
490-67181-128	SS-44D (2-3)	Total/NA	Soil	Moisture	
490-67181-165	SS-116 (2-3)	Total/NA	Soil	Moisture	
490-70214-G-1 DU	Duplicate	Total/NA	Solid	Moisture	

Analysis Batch: 221355

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-67181-42	SS-88 (2-3)	Total/NA	Soil	Moisture	
490-67181-42 DU	SS-88 (2-3)	Total/NA	Soil	Moisture	
490-67181-52	SS-90A (1-2)	Total/NA	Soil	Moisture	
490-67181-59	SS-91 (2-3)	Total/NA	Soil	Moisture	
490-67181-71	SS-95A (1-2)	Total/NA	Soil	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-71 (0-1)

Lab Sample ID: 490-67181-1
Date Collected: 11/21/14 17:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 73.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	210850	12/02/14 16:05	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-72 (0-1)

Lab Sample ID: 490-67181-7
Date Collected: 11/21/14 17:42
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 73.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	210850	12/02/14 16:30	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-76 (0-1)

Lab Sample ID: 490-67181-13
Date Collected: 11/21/14 17:54
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	210850	12/02/14 16:35	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-78 (0-1)

Lab Sample ID: 490-67181-15
Date Collected: 11/21/14 17:58
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 74.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.496 g	100 mL	210850	12/02/14 16:40	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-79 (0-1)

Lab Sample ID: 490-67181-23
Date Collected: 11/21/14 18:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 74.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	210850	12/02/14 17:01	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-80 (0-1)

Lab Sample ID: 490-67181-32
Date Collected: 11/22/14 09:10
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 72.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		5	0.523 g	100 mL	210850	12/02/14 17:06	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-88 (0-1)

Lab Sample ID: 490-67181-40
Date Collected: 11/22/14 09:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		5	0.503 g	100 mL	211063	12/03/14 11:08	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-88 (1-2)

Lab Sample ID: 490-67181-41
Date Collected: 11/22/14 09:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 72.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	220169	01/13/15 14:05	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-88 (2-3)

Lab Sample ID: 490-67181-42
Date Collected: 11/22/14 10:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 81.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	221370	01/19/15 15:26	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.507 g	100 mL	221703	01/20/15 12:26	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			221355	01/19/15 13:53	RRS	TAL NSH

Client Sample ID: SS-82 (0-1)

Lab Sample ID: 490-67181-43
Date Collected: 11/22/14 10:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	210850	12/02/14 17:47	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-88A (0-1)

Lab Sample ID: 490-67181-45
Date Collected: 11/22/14 10:15
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	220169	01/13/15 14:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-90 (0-1)

Lab Sample ID: 490-67181-48
Date Collected: 11/22/14 10:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		10	0.503 g	100 mL	211063	12/03/14 11:13	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-90 (1-2)

Lab Sample ID: 490-67181-49
Date Collected: 11/22/14 10:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.514 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.514 g	100 mL	220169	01/13/15 14:39	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-90A (0-1)

Lab Sample ID: 490-67181-51
Date Collected: 11/22/14 10:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		2	0.505 g	100 mL	220475	01/14/15 18:17	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-90A (1-2)

Lab Sample ID: 490-67181-52
Date Collected: 11/22/14 10:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	221370	01/19/15 15:26	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.499 g	100 mL	221703	01/20/15 12:31	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			221355	01/19/15 13:53	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-89 (0-1)

Lab Sample ID: 490-67181-54
Date Collected: 11/22/14 11:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		10	0.505 g	100 mL	211063	12/03/14 11:18	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-89 (1-2)

Lab Sample ID: 490-67181-55
Date Collected: 11/22/14 11:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	220475	01/14/15 18:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-91 (0-1)

Lab Sample ID: 490-67181-57
Date Collected: 11/22/14 11:15
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 80.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.495 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.495 g	100 mL	210850	12/02/14 18:02	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-91 (1-2)

Lab Sample ID: 490-67181-58
Date Collected: 11/22/14 11:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 71.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	220475	01/14/15 18:27	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-91 (2-3)

Lab Sample ID: 490-67181-59
Date Collected: 11/22/14 11:25
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	221370	01/19/15 15:26	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.507 g	100 mL	221703	01/20/15 12:47	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			221355	01/19/15 13:53	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-92 (0-1)

Lab Sample ID: 490-67181-60
Date Collected: 11/22/14 11:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 85.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	210850	12/02/14 18:07	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-93 (0-1)

Lab Sample ID: 490-67181-61
Date Collected: 11/22/14 11:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.504 g	100 mL	210850	12/02/14 18:12	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-95 (0-1)

Lab Sample ID: 490-67181-67
Date Collected: 11/22/14 12:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		5	0.510 g	100 mL	211063	12/03/14 11:23	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-95 (1-2)

Lab Sample ID: 490-67181-68
Date Collected: 11/22/14 12:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 73.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.504 g	100 mL	220475	01/14/15 18:42	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-95A (0-1)

Lab Sample ID: 490-67181-70
Date Collected: 11/22/14 12:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.516 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.516 g	100 mL	220475	01/14/15 18:47	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-95A (1-2)

Lab Sample ID: 490-67181-71
Date Collected: 11/22/14 12:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 71.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	221370	01/19/15 15:26	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	221703	01/20/15 12:52	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			221355	01/19/15 13:53	RRS	TAL NSH

Client Sample ID: SS-94 (0-1)

Lab Sample ID: 490-67181-72
Date Collected: 11/22/14 12:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.495 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.495 g	100 mL	210850	12/02/14 18:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-87 (0-1)

Lab Sample ID: 490-67181-78
Date Collected: 11/22/14 13:25
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 71.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		10	0.517 g	100 mL	211063	12/03/14 11:28	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-87 (1-2)

Lab Sample ID: 490-67181-79
Date Collected: 11/22/14 13:30
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 79.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.502 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.502 g	100 mL	217661	12/30/14 14:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-87 (2-3)

Lab Sample ID: 490-67181-80
Date Collected: 11/22/14 13:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.519 g	100 mL	220475	01/14/15 18:52	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-87A (0-1)

Lab Sample ID: 490-67181-81
Date Collected: 11/22/14 13:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.513 g	100 mL	217661	12/30/14 14:50	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-95B (0-1)

Lab Sample ID: 490-67181-84
Date Collected: 11/22/14 13:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.522 g	100 mL	220475	01/14/15 18:57	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-96 (0-1)

Lab Sample ID: 490-67181-89
Date Collected: 11/22/14 14:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 74.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	210850	12/02/14 18:43	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-96 (1-2)

Lab Sample ID: 490-67181-90
Date Collected: 11/22/14 14:25
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 70.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.516 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.516 g	100 mL	217661	12/30/14 14:55	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-96A (0-1)

Lab Sample ID: 490-67181-92
Date Collected: 11/22/14 14:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 76.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.525 g	100 mL	217661	12/30/14 15:01	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-24 (0-1)

Lab Sample ID: 490-67181-95
Date Collected: 11/22/14 14:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	210850	12/02/14 18:48	JBD	TAL NSH
Total/NA	Prep	3051A			0.511 g	100 mL	210452	12/01/14 15:56	AAS	TAL NSH
Total/NA	Analysis	6020		5	0.511 g	100 mL	211063	12/03/14 11:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-24 (1-2)

Lab Sample ID: 490-67181-96
Date Collected: 11/22/14 14:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		2	0.496 g	100 mL	217661	12/30/14 15:17	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-24 (2-3)

Lab Sample ID: 490-67181-97
Date Collected: 11/22/14 15:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 78.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		2	0.522 g	100 mL	220475	01/14/15 19:03	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-112 (0-1)

Lab Sample ID: 490-67181-98
Date Collected: 11/22/14 15:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 72.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.519 g	100 mL	210850	12/02/14 22:27	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-112 (1-1.5)

Lab Sample ID: 490-67181-99
Date Collected: 11/22/14 15:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 67.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.499 g	100 mL	217661	12/30/14 15:23	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114 (0-1)

Lab Sample ID: 490-67181-100
Date Collected: 11/22/14 15:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 65.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.497 g	100 mL	210850	12/02/14 22:32	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-114 (1-1.5)

Lab Sample ID: 490-67181-101
Date Collected: 11/22/14 16:00
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 75.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.503 g	100 mL	217661	12/30/14 15:29	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-113 (0-1)

Lab Sample ID: 490-67181-102
Date Collected: 11/22/14 16:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.525 g	100 mL	210850	12/02/14 22:37	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:05	AJK	TAL NSH

Client Sample ID: SS-115 (0-1)

Lab Sample ID: 490-67181-108
Date Collected: 11/22/14 16:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 81.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	210850	12/02/14 22:53	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-114B (0-1)

Lab Sample ID: 490-67181-114
Date Collected: 11/22/14 17:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 77.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.521 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.521 g	100 mL	217661	12/30/14 15:34	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-114A (0-1)

Lab Sample ID: 490-67181-117
Date Collected: 11/22/14 17:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	217661	12/30/14 15:40	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-44B (0-1)

Lab Sample ID: 490-67181-120
Date Collected: 11/23/14 09:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	210850	12/02/14 22:58	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-44B (1-2)

Lab Sample ID: 490-67181-121
Date Collected: 11/23/14 09:10
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.522 g	100 mL	217661	12/30/14 15:45	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-44C (0-1)

Lab Sample ID: 490-67181-123
Date Collected: 11/23/14 09:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.517 g	100 mL	210850	12/02/14 23:03	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-44C (1-2)

Lab Sample ID: 490-67181-124
Date Collected: 11/23/14 09:25
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.521 g	100 mL	217939	01/02/15 10:55	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.521 g	100 mL	218992	01/07/15 22:58	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44D (0-1)

Lab Sample ID: 490-67181-126
Date Collected: 11/23/14 09:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.512 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.512 g	100 mL	210850	12/02/14 23:08	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-44D (1-2)

Lab Sample ID: 490-67181-127
Date Collected: 11/23/14 09:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.496 g	100 mL	217661	12/30/14 15:51	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-44D (2-3)

Lab Sample ID: 490-67181-128
Date Collected: 11/23/14 09:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	220541	01/15/15 10:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.503 g	100 mL	220736	01/15/15 19:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Client Sample ID: SS-44E (0-1)

Lab Sample ID: 490-67181-129
Date Collected: 11/23/14 09:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 84.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.511 g	100 mL	217661	12/30/14 15:56	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: DUP-16

Lab Sample ID: 490-67181-132
Date Collected: 11/23/14 01:01
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 87.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	210850	12/02/14 23:13	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-44G (0-1)

Lab Sample ID: 490-67181-133
Date Collected: 11/23/14 10:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.519 g	100 mL	217661	12/30/14 16:02	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-45A (0-1)

Lab Sample ID: 490-67181-136
Date Collected: 11/23/14 10:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 79.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	210850	12/02/14 23:18	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-45B (0-1)

Lab Sample ID: 490-67181-139
Date Collected: 11/23/14 10:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	210850	12/02/14 23:23	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-45C (0-1)

Lab Sample ID: 490-67181-142
Date Collected: 11/23/14 10:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 79.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.507 g	100 mL	211063	12/03/14 11:44	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-45C (1-2)

Lab Sample ID: 490-67181-143
Date Collected: 11/23/14 10:55
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 81.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.500 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.500 g	100 mL	217661	12/30/14 16:08	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-45E (0-1)

Lab Sample ID: 490-67181-148
Date Collected: 11/23/14 11:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	217661	12/30/14 16:41	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-117 (0-1)

Lab Sample ID: 490-67181-151
Date Collected: 11/23/14 11:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.499 g	100 mL	210850	12/02/14 23:33	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-116 (0-1)

Lab Sample ID: 490-67181-163
Date Collected: 11/23/14 12:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 82.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.506 g	100 mL	210850	12/02/14 22:02	JBD	TAL NSH
Total/NA	Prep	3051A			0.506 g	100 mL	210518	12/02/14 07:43	NJB	TAL NSH
Total/NA	Analysis	6020		20	0.506 g	100 mL	211063	12/03/14 11:38	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			209159	11/25/14 17:44	AJK	TAL NSH

Client Sample ID: SS-116 (1-2)

Lab Sample ID: 490-67181-164
Date Collected: 11/23/14 12:40
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		20	0.503 g	100 mL	217661	12/30/14 16:47	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-116 (2-3)

Lab Sample ID: 490-67181-165
Date Collected: 11/23/14 12:45
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	219798	01/12/15 11:09	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	220168	01/13/15 23:09	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			219829	01/12/15 12:40	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Client Sample ID: SS-116A (0-1)

Lab Sample ID: 490-67181-166
Date Collected: 11/23/14 12:50
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 83.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	217661	12/30/14 17:04	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-116B (0-1)

Lab Sample ID: 490-67181-169
Date Collected: 11/23/14 13:05
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 86.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.515 g	100 mL	217145	12/29/14 10:17	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.515 g	100 mL	217661	12/30/14 17:10	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-116C (0-1)

Lab Sample ID: 490-67181-172
Date Collected: 11/23/14 13:20
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	217939	01/02/15 10:55	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.507 g	100 mL	218992	01/07/15 23:03	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Client Sample ID: SS-44F (0-1)

Lab Sample ID: 490-67181-175
Date Collected: 11/23/14 13:35
Matrix: Soil
Date Received: 11/24/14 15:25
Percent Solids: 88.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	217939	01/02/15 10:55	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	218992	01/07/15 23:08	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			214707	12/17/14 11:16	RRS	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Method	Method Description	Protocol	Laboratory
6020	Metals (ICP/MS)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-67181-1
SDG: UMI.001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	03-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-15
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-14 *
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

490-67181 Chain of Custody

Cooler Received/Opened On 11.24.14 @

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 3.7 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO. NA

4. Were custody seals on outside of cooler? YES..NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES..NO...NA

6. Were custody papers inside cooler? YES..NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mdm

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES..NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES..NO...NA

12. Did all container labels and tags agree with custody papers? YES..NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mdm

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mdm

17. Were custody papers properly filled out (ink, signed, etc)? YES..NO...NA

18. Did you sign the custody papers in the appropriate place? YES..NO...NA

19. Were correct containers used for the analysis requested? YES..NO...NA

20. Was sufficient amount of sample sent in each container? YES..NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mdm

I certify that I attached a label with the unique LIMS number to each container (intial) mdm

21. Were there Non-Conformance issues at login? YES..NO Was a NCM generated? YES..NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Cooler Received/Opened On 11.24.14 @

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 3.1 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mdm

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mdm

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mdm

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mdm

I certify that I attached a label with the unique LIMS number to each container (intial) mdm

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
67181

COOLER RECEIPT FORM

Cooler Received/Opened On 11.24.14 @

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 8.1 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO. NA

4. Were custody seals on outside of cooler? YES..NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES..NO...NA

6. Were custody papers inside cooler? YES..NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mdm

7. Were custody seals on containers: YES NO and Intact YES...NO..NA

Were these signed and dated correctly? YES...NO..NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES..NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES..NO...NA

12. Did all container labels and tags agree with custody papers? YES..NO...NA

13a. Were VOA vials received? YES..NO..NA

b. Was there any observable headspace present in any VOA vial? YES...NO..NA

14. Was there a Trip Blank in this cooler? YES...NO..NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mdm

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO..NA

16. Was residual chlorine present? YES...NO..NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mdm

17. Were custody papers properly filled out (ink, signed, etc)? YES..NO...NA

18. Did you sign the custody papers in the appropriate place? YES..NO...NA

19. Were correct containers used for the analysis requested? YES..NO...NA

20. Was sufficient amount of sample sent in each container? YES..NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mdm

I certify that I attached a label with the unique LIMS number to each container (intial) mdm

21. Were there Non-Conformance issues at login? YES..NO Was a NCM generated? YES..NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

1/21/2015

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Loc: 490
67181

Cooler Received/Opened On 11.24.14 @

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 4.2 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mdm

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) mdm

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mdm

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mdm

I certify that I attached a label with the unique LIMS number to each container (intial) mdm

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

1/21/2015

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	1 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Sample Specific Notes:
SS-71 (0-1)	11/21/2014	17:30		S			X	X	X	MS/MSD -1
SS-71 (1-2)		17:32						X	X	HOLD 2
SS-71 (2-3)		17:34						X	X	HOLD 3
SS-71A (0-1)		17:36						X	X	HOLD 4
SS-71A (1-2)		17:38						X	X	HOLD 5
SS-71A (2-3)		17:40						X	X	HOLD 6
SS-72 (0-1)		17:42						X		7
SS-72 (1-2)		17:44						X		HOLD 8
SS-72 (2-3)		17:46						X		HOLD 9
SS-72 A (0-1)		17:48						X		HOLD 10
SS-72 A (1-2)		17:50						X		HOLD 11
SS-72 A (2-3)		17:52						X		HOLD 12

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: 12125 | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	Hart Hickm	11/24/14	[signature]	TAN	11/24/14 1525
Larry Clark	FSI	11-24-14	[signature]	Tan	11-24-14@1525
Larry Clark	Kwt	11/24/14	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	2 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-76 (0-1)	11/21/2014	17:54		S				X	X	X	X	13
SS-76 (1-2)		17:56						X	X	X	X	HOLD 14
SS-78 (0-1)		17:58						X	X			~~HOLD~~ KMH 11/24/14 15
SS-78 (1-2)		18:00						X	X			HOLD 16
SS-78 (2-3)		18:08						X	X			HOLD 17
SS-78 (3-4)		18:10						X	X			HOLD 18
SS-78 (4-5)		18:12						X	X			HOLD 19
SS-78A (0-1)		18:14						X	X			HOLD 20
SS-78A (1-2)		18:16						X	X			HOLD 21
SS-78 A (2-3)		18:18						X	X			HOLD 22
SS-79 (0-1)		18:20						X	X	X	X	23 ✓
SS-79 (1-2)		18:22						X	X	X	X	HOLD 24

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH	11/24/14 1525	[signature]	TMW	11/24/14 1525
Larry Clark	FSI	11-24-14 1525	[signature]	Tan	11-24-14 @ 1525
Larry Clark	KMH	11/24/14	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

1/21/2015

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	3 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-79 (2-3)	11/21/2014	18:24		S				X	X	X	X	HOLD 25
SS-79A (0-1)		18:26						X	X	X	X	HOLD 26
SS-79A (1-2)		18:28						X	X	X	X	HOLD 27
SS-79 A (2-3)		18:30						X	X	X	X	HOLD 28
SS-80A (0-1)		18:32						X	X	X	X	HOLD 29
SS-80A (1-2)		18:34						X	X	X	X	HOLD 30
SS-80 A (2-3)		18:36						X	X	X	X	HOLD 31
SS-80 (0-1)	11/22/14	9:10						X	X	X	X	32
SS-80 (1-2)		9:15						X	X	X	X	HOLD 33
SS-82A (0-1)		9:20						X	X	X	X	HOLD 34
SS-82A (1-2)		9:25						X	X	X	X	HOLD 35
SS-82 A (2-2.5)		9:30						X	X	X	X	HOLD 36

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HAH	11/24/14 12:25	[signature]		11/24/14 1525
Larry Clark	Larry Clark	11-24-14 1225	[signature]	TAN	11-24-14 1525
Relinquished by: Larry Clark	Company: E.S.I.	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	4 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-82B (0-1)	11/22/2014	9:35		S				X	X	X	X	HOLD 37
SS-82B (1-2)		9:40						X	X	X	X	HOLD 38
SS-82 B (2-3)		9:45						X	X	X	X	HOLD 39
SS-88 (0-1)		9:50						X				40
SS-88 (1-2)		9:55						X				HOLD 41
SS-88 (2-3)		10:00						X				HOLD 42
SS-82 (0-1)		10:05						X	X	X	X	43
SS-82 (1-2)		10:10						X	X	X	X	HOLD 44
SS-88A (0-1)		10:15						X				HOLD 45
SS-88A (1-2)		10:20						X				HOLD 46
SS-88A (2-3)		10:25						X				HOLD 47
SS-90 (0-1)		10:30						X				48

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HAI	11/24/14 12:25	[signature]	TAN	11/24/14 1525
Larry Clark	KMH	11/24/14	[signature]	TAN	11/24/14 @ 1525
Larry Clark	F.S.I.	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	5 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
PO# UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-90 (1-2)	11/22/2014	10:35		S				X				HOLD 49
SS-90 (2-3)		10:40						X				HOLD 50 ✓
SS-90A (0-1)		10:45						X				HOLD 51
SS-90A (1-2)		10:50						X				HOLD 52
SS-90A (2-3)		10:55						X				HOLD 53
SS-89 (0-1)		11:00						X				54
SS-89 (1-2)		11:05						X				HOLD 55
SS-89 (2-2.5) KMH 11/24/14		11:10						X				HOLD 56
SS-91 (0-1)		11:15						X				57
SS-91 (1-2)		11:20						X				HOLD 58
SS-91 (2-3)		11:25						X				HOLD 59
SS-92 (0-1)		11:30						X				60

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH KMH 11/24/14	11/24/14 1225	[signature] TMW		11/24/14 1545
Lauge Clark	KMH 11/24/14	11-24-14 1225	[signature]	TMW	11-24-14@1525
Lauge Clark	K.S.2.		Received in Laboratory by:	Company:	Date/Time:

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Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Log: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	6 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:	
SS-93 (0-1)	11/22/2014	11:35		S				X					61
SS-93 (1-2)		11:40						X				HOLD	62
SS-93 (2-3)		11:45						X				HOLD	63
SS-93A (0-1)		11:50						X				HOLD	64
SS-93A (1-2)		11:55						X				HOLD	65
SS-93A (2-3)		12:00						X				HOLD	66
SS-95 (0-1)		12:30						X					67
SS-95 (1-2)		12:35						X				HOLD	68
SS-95 (2-3)		12:50						X				HOLD	69
SS-95A (0-1)		12:40						X				HOLD	70
SS-95A (1-2)		12:45						X				HOLD	71
SS-94 (0-1)		12:55						X					72

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH	11/24/14 12:25	[signature]	TRAN	11/24/14 1525
Relinquished by: [signature]	Company: KHH 11/24/14	Date/Time: 11/24/14	Received by: [signature]	Company: Tran	Date/Time: 11-24-14 @ 1525
Relinquished by: [signature]	Company: F.S.L	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

1/21/2015

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2960 Foster Creighton Drive
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Chain of Custody Record

Loc: 490
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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

1/21/2015

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	7 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-94 (1-2)	11/22/2014	13:00		S				X				HOLD 73
SS-94 (2-3)		13:05						X				HOLD 74
SS-94A (0-1)		13:10						X				HOLD 75
SS-94A (1-2)		13:15						X				HOLD 76
SS-94A (2-3)		13:20						X				HOLD 77 ✓
SS-87 (0-1)		13:25						X				78
SS-87 (1-2)		13:30						X				HOLD 79
SS-87 (2-3)		13:35						X				HOLD 80
SS-87A (0-1)		13:40						X				HOLD 81
SS-87A (1-2)		13:45						X				HOLD 82
SS-87A (2-3)		13:50						X				HOLD 83
SS-95B (0-1)		13:55						X				HOLD 84

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH	11/24/14 12:25	[signature]	TAN	11/24/14 1525
Laura Black	KMH 11/24/14	11-24-14 12:25	[signature]	TAN	11-24-14 @ 1525
Laura Black	F.S.I.	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

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2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	8 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:	
SS-95B (1-2)	11/22/2014	14:00		S				X				HOLD	85
SS-95B (2-2.25)		14:05						X				HOLD	86
SS-95C (0-1)		14:10						X				HOLD	87
SS-95C (1-2)		14:15						X				HOLD	88
SS-96 (0-1)		14:20						X					89
SS-96 (1-2)		14:25						X				HOLD	90
SS-96 (2-3)		14:30						X				HOLD	91
SS-96A (0-1)		14:35						X				HOLD	92
SS-96A (1-2)		14:40						X				HOLD	93
SS-96A (2-3)		14:45						X				HOLD	94
SS-24A (0-1)		14:50						X	X				95
SS-24A (1-2)		14:55						X	X			HOLD	96

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	H+H	11/24/14 12:25	[signature]	IMW	11/24/14 1525
Lacy Clark	KMH 11/24/14	11-24-14 12:25	[signature]	TAN	11-24-14 @ 1525
Lacy Clark	FSI		Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

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Chain of Custody Record

Loc: 490
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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	9 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:	
SS-24A (2-3)	11/22/2014	15:00		S				X	X			HOLD	97
SS-112 (0-1)		15:45						X					98
SS-112 (1-1.5)		15:50						X				HOLD	99
SS-114 (0-1)		15:55						X					100
SS-114 (1-1.5)		16:00						X				HOLD	101
SS-113 (0-1)		16:05						X					102
SS-113 (1-2)		16:10						X				HOLD	103
SS-113 (2-3)		16:15						X				HOLD	104 ✓
SS-113A (0-1)		16:20						X				HOLD	105
SS-113A (1-2)		16:25						X				HOLD	106
SS-113A (2-3)		16:30						X				HOLD	107
SS-115 (0-1)		16:35						X					108

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	FSI	11/24/14 12:25	[signature]	TAN	11/24/14 1525
Relinquished by: [signature]	Company: KMH ~~[illegible]~~ 11/24/14	Date/Time: 12:25 11-24-14	Received by: [signature]	Company: TAN	Date/Time: 11-24-14 @ 1525
Relinquished by: [signature]	Company: F.S.I.	Date/Time:	Received in Laboratory by:	Company:	Date/Time: 8.1/4.2/3.1/3.7c

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

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Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

1/21/2015

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	10 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-115 (1-2)	11/22/2014	16:40		S				X				HOLD -109
SS-115 (2-3)		16:45						X				HOLD 110
SS-115A (0-1)		16:50						X				HOLD 111
SS-115A (1-2)		16:55						X				HOLD 112
SS-115A (2-3)		17:00						X				HOLD 113
SS-114B (0-1)		17:05						X				HOLD 114
SS-114B (1-2)		17:10						X				HOLD 115
SS-114B (2-3)		17:15						X				HOLD 116
SS-114A (0-1)		17:20						X				HOLD 117
SS-114A (1-2)		17:25						X				HOLD 118
SS-114A (2-3)		17:30						X				HOLD 119
SS-44B (0-1)	11/23/14	9:05						X			X	120

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
	HH	11/24/14 12:25		TAN	11/24/14 1525
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
	KMT 11/24/14	11-24-14 1324		TAN	11-24-14 @1525
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:
	FSI				

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Chain of Custody Record

Loc: 490
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TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

1/21/2015

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	11 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:	
SS-44B (1-2)	11/23/14	9:10		S				X			X	HOLD	121
SS-44B (2-3)		9:15						X			X	HOLD	122
SS-44C (0-1)		9:20						X			X		123
SS-44C (1-2)		9:25						X			X	HOLD	124
SS-44C (2-3)		9:30						X			X	HOLD	125
SS-44D (0-1)		9:35						X			X		126
SS-44D (1-2)		9:40						X			X	HOLD	127
SS-44D (2-3)		9:45						X			X	HOLD	128
SS-44E (0-1)		9:50						X			X	HOLD	129
SS-44E (1-2)		9:55						X			X	HOLD	130
SS-44E (2-3)		10:00						X			X	HOLD	131 ✓
DUP-16		NA						X			X		132

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	TAN 11/24/14	11/24/14 12:25	[signature]	TAN	11/24/14 1525
Larry Oberth	~~KMH~~	11/24/14 1325	[signature]	TAN	11-24-14 @ 1525
Larry Oberth	F.S.S.	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

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Chain of Custody Record

Loc: 490
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TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	12 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-44G (0-1)	11/23/14	10:05		S				X			X	HOLD -133
SS-44G (1-2)		10:10						X			X	HOLD 134
SS-44G (2-3)		10:15						X			X	HOLD 135
SS-45A (0-1)		10:20						X			X	136
SS-45A (1-2)		10:25						X			X	HOLD 137
SS-45A (2-3)		10:30						X			X	HOLD 138
SS-45B (0-1)		10:35						X			X	139
SS-45B (1-2)		10:40						X			X	HOLD 140
SS-45B (2-3)		10:45						X			X	HOLD 141
SS-45C (0-1)		10:50						X			X	142
SS-45C (1-2)		10:55						X			X	HOLD 143
SS-45C (2-3)		11:00						X			X	HOLD 144

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: 12125 | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	H+H	11/24/14	[signature]	TAN	11/24/14 1525
Lacy Clark	Kimley-Horn 11/24/14	11/24/14 1225	[signature]	TAN	11-24-14 @1525
Lacy Clark	F.S.I		Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

1/21/2015

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	13 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-45D (0-1)	11/23/14	11:05		S				X			X	HOLD 145
SS-45D (1-2)		11:10						X			X	HOLD 146
SS-45D (2-3)		11:15						X			X	HOLD 147
SS-45E (0-1)		11:20						X			X	HOLD 148
SS-45E (1-2)		11:25						X			X	HOLD 149
SS-45E (2-3)		11:30						X			X	HOLD 150
SS-117 (0-1)		11:35						X		X	X	151
SS-117 (1-2)		11:40						X		X	X	HOLD 152
SS-117 (2-3)		11:45						X		X	X	HOLD 153
SS-117A (0-1)		11:50						X		X	X	HOLD 154
SS-117A (1-2)		11:55						X		X	X	HOLD 155
SS-117A (2-3)		12:00						X		X	X	HOLD 156

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: 12125 | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH	11/24/14	[signature]	TAN	11/24/14 1525
Larry Clark	~~Larry Clark~~	11/24-1525	[signature]	TAN	11-24-14 @ 1525
Larry Clark	F.S.I.		Received in Laboratory by:		

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

TestAmerica Nashville
2960 Foster Creighton Drive

Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

1/21/2015

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	14 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y / N)	Perform MS / MSD (Y / N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-117B (0-1)	11/23/14	12:05		S				X		X	X	HOLD 157
SS-117B (1-2)		12:10						X		X	X	HOLD 158 ✓
SS-117B (2-3)		12:15						X		X	X	HOLD 159
SS-117C (0-1)		12:20						X		X	X	HOLD 160
SS-117C (1-2)		12:25						X		X	X	HOLD 161
SS-117C (2-3)		12:30						X		X	X	HOLD 162
SS-116 (0-1)		12:35					X	X		X	X	MS/MSD 163
SS-116 (1-2)		12:40						X		X	X	HOLD 164
SS-116 (2-3)		12:45						X		X	X	HOLD 165
SS-116A (0-1)		12:50						X		X	X	HOLD 166
SS-116A (1-2)		12:55						X		X	X	HOLD 167
SS-116A (2-3)		13:00						X		X	X	HOLD 168

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No	Custody Seal No.:	Cooler Temp. (°C): Obs'd: _____ Corr'd: _____	Therm ID No.: _____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH KMH 11/24/14	11/24/14 12:25	[signature]	TAN	11/24/14 1525
Relinquished by: [signature]	Company: ~~[illegible]~~	Date/Time: 11-24-14	Received by: [signature]	Company: TAN	Date/Time: 11-24-14 @ 1525
Relinquished by: [signature]	Company: F.S.I.	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
phone 615.726.0177 fax

Chain of Custody Record

Loc: 490
67181
#1
A

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Regulatory Program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other:

Client Contact	Project Manager: Shannon Cottrill	Site Contact: Ralph McGee	Date:	COC No:
Hart and Hickman	Tel/Fax:	Lab Contact: Ken Hayes	Carrier:	15 of 15 COCs
2923 S Tryon St Suite 100	Analysis Turnaround Time			Sampler:
Charlotte, NC 28203	☐ CALENDAR DAYS ☐ WORKING DAYS			For Lab Use Only:
704-586-0007 Phone	TAT if different from Below _____			Walk-in Client:
	☐ 2 weeks			Lab Sampling:
Project Name: UMI.001	☑ 1 week			
Site: Umicore, Arab Alabama	☐ 2 days			Job / SDG No.:
P O # UMI.001	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type (C=Comp, G=Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS/MSD (Y/N)	Co	Cd	Mn	Ni	Sample Specific Notes:
SS-116B (0-1)	11/23/14	13:05		S				X		X	X	HOLD 169
SS-116B (1-2)		13:10						X		X	X	HOLD 170
SS-116B (2-3)		13:15						X		X	X	HOLD 171
SS-116C (0-1)		13:20						X		X	X	HOLD 172
SS-116C (1-2)		13:25						X		X	X	HOLD 173
SS-116C (2-3)		13:30						X		X	X	HOLD 174
SS-44F (0-1)		13:35						X			X	HOLD 175
SS-44F (1-2)		13:40						X			X	HOLD 176
SS-44F (2-3)		13:45						X			X	HOLD 177

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other _____

Possible Hazard Identification:
Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.

☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☑ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

☐ Return to Client ☑ Disposal by Lab ☑ Archive for 6 Months

Special Instructions/QC Requirements & Comments: Retain samples for 6 months

Custody Seals Intact: ☐ Yes ☐ No | Custody Seal No.: | Cooler Temp. (°C): Obs'd:_____ Corr'd:_____ | Therm ID No.:_____

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
[signature]	HH	11/24/14 12:25	[signature]		11/24/14 1525
[signature]	~~Hart Crowl~~	11-24-14	[signature]	TAN	11-24-14 @ 1525
[signature]	F.S.I.		Received in Laboratory by:	Company:	Date/Time:

Form No. CA-C-WI-002, Rev. 4.3, dated 12/05/2013

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-67181-1
SDG Number: UMI.001

Login Number: 67181
List Number: 1
Creator: McBride, Mike

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	8.1/4.2/3.1/3.7
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-66968-1
TestAmerica Sample Delivery Group: UMI.001
Client Project/Site: Umicore CSM NA

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
2/4/2015 11:27:26 AM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-66968-2	SS-108A (0-1)	Soil	11/20/14 15:40	11/21/14 15:50
490-66968-3	SS-108A (1-1.5)	Soil	11/20/14 15:45	11/21/14 15:50
490-66968-4	SS-109 (0-1)	Soil	11/20/14 15:50	11/21/14 15:50
490-66968-10	SS-111 (0-1)	Soil	11/20/14 16:40	11/21/14 15:50
490-66968-11	SS-110 (0-1)	Soil	11/20/14 16:55	11/21/14 15:50
490-66968-14	SS-104A (0-1)	Soil	11/20/14 14:35	11/21/14 15:50
490-66968-15	SS-104A (1-2)	Soil	11/20/14 14:40	11/21/14 15:50
490-66968-16	SS-104A (2-3)	Soil	11/20/14 14:45	11/21/14 15:50
490-66968-17	SS-105A (0-1)	Soil	11/20/14 14:50	11/21/14 15:50
490-66968-20	SS-107 (0-1)	Soil	11/20/14 15:10	11/21/14 15:50
490-66968-22	SS-108 (0-1)	Soil	11/20/14 15:20	11/21/14 15:50
490-66968-23	SS-108 (1-2)	Soil	11/20/14 15:25	11/21/14 15:50
490-66968-27	SS-103 (0-1)	Soil	11/20/14 13:00	11/21/14 15:50
490-66968-30	SS-106 (0-1)	Soil	11/20/14 13:15	11/21/14 15:50
490-66968-31	SS-106 (1-2)	Soil	11/20/14 13:20	11/21/14 15:50
490-66968-32	SS-104 (0-1)	Soil	11/20/14 14:05	11/21/14 15:50
490-66968-33	SS-104 (1-2)	Soil	11/20/14 14:10	11/21/14 15:50
490-66968-35	SS-105 (0-1)	Soil	11/20/14 14:20	11/21/14 15:50
490-66968-36	SS-105 (1-2)	Soil	11/20/14 14:25	11/21/14 15:50
490-66968-39	SS-100A (0-1)	Soil	11/20/14 11:40	11/21/14 15:50
490-66968-40	SS-100A (1-2)	Soil	11/20/14 11:45	11/21/14 15:50
490-66968-45	SS-102A (0-1)	Soil	11/20/14 12:10	11/21/14 15:50
490-66968-50	SS-100 (0-1)	Soil	11/20/14 10:20	11/21/14 15:50
490-66968-51	SS-100 (1-2)	Soil	11/20/14 10:25	11/21/14 15:50
490-66968-53	SS-102 (0-1)	Soil	11/20/14 10:35	11/21/14 15:50
490-66968-54	SS-102 (1-2)	Soil	11/20/14 10:40	11/21/14 15:50
490-66968-60	SS-97 (0-1)	Soil	11/20/14 09:00	11/21/14 15:50
490-66968-61	SS-97 (1-2)	Soil	11/20/14 09:05	11/21/14 15:50
490-66968-63	SS-98 (0-1)	Soil	11/20/14 09:15	11/21/14 15:50
490-66968-66	SS-99 (0-1)	Soil	11/20/14 09:45	11/21/14 15:50
490-66968-69	SS-101 (0-1)	Soil	11/20/14 10:00	11/21/14 15:50
490-66968-72	SS-68 (0-1)	Soil	11/21/14 10:50	11/21/14 15:50
490-66968-75	SS-69 (0-1)	Soil	11/21/14 11:05	11/21/14 15:50
490-66968-76	SS-69 (1-2)	Soil	11/21/14 11:10	11/21/14 15:50
490-66968-78	SS-70 (0-1)	Soil	11/21/14 11:20	11/21/14 15:50
490-66968-83	SS-75 (0-1)	Soil	11/21/14 12:41	11/21/14 15:50
490-66968-84	SS-75 (1-2)	Soil	11/21/14 12:42	11/21/14 15:50
490-66968-85	SS-75 (2-3)	Soil	11/21/14 12:43	11/21/14 15:50
490-66968-86	SS-75 (3-4)	Soil	11/21/14 12:44	11/21/14 15:50
490-66968-88	DUP-14	Soil	11/20/14 01:01	11/21/14 15:50
490-66968-89	DUP-15	Soil	11/21/14 01:01	11/21/14 15:50
490-66968-91	SS-69A (0-1)	Soil	11/21/14 11:50	11/21/14 15:50
490-66968-92	SS-69A (1-2)	Soil	11/21/14 11:55	11/21/14 15:50
490-66968-94	SS-73 (0-1)	Soil	11/21/14 12:05	11/21/14 15:50
490-66968-97	SS-74 (0-1)	Soil	11/21/14 12:20	11/21/14 15:50
490-66968-98	SS-74 (1-2)	Soil	11/21/14 12:25	11/21/14 15:50
490-66968-99	SS-74 (2-3)	Soil	11/21/14 12:30	11/21/14 15:50
490-66968-100	SS-74 (3-4)	Soil	11/21/14 12:35	11/21/14 15:50
490-66968-101	SS-74 (4-5)	Soil	11/21/14 12:40	11/21/14 15:50

Job ID: 490-66968-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-66968-1

Comments
No additional comments.

Receipt
The samples were received on 11/21/2014 3:50 PM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 3 coolers at receipt time were 1.9º C, 2.4º C and 2.6º C.

Metals
Method(s) 6010B, 6010C: ICSA in batch 490-215674 has a detect for Ag above the PQL. (ICSA 490-215674/11)

Method(s) 6010B, 6010C: ICSAB in batch 490-215674 fails high for Na at 122%. (ICSAB 490-215674/12)

Method(s) 6020: Due to sample matrix effect on the internal standard (ISTD), a dilution was required for the following sample(s): SS-75 (1-2) (490-66968-84), SS-74 (1-2) (490-66968-98), SS-74 (2-3) (490-66968-99),

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F1	MS and/or MSD Recovery exceeds the control limits
F2	MS/MSD RPD exceeds control limits
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC exceeds the control limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108A (0-1)

Lab Sample ID: 490-66968-2

Date Collected: 11/20/14 15:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1750		2.94		mg/Kg	☼	12/12/14 15:02	12/16/14 21:20	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108A (1-1.5)

Lab Sample ID: 490-66968-3

Date Collected: 11/20/14 15:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	293		0.589		mg/Kg	☼	01/06/15 11:45	01/09/15 04:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-109 (0-1)

Lab Sample ID: 490-66968-4

Date Collected: 11/20/14 15:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 79.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	220		0.617		mg/Kg	☼	11/26/14 13:40	11/27/14 02:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-111 (0-1)

Lab Sample ID: 490-66968-10

Date Collected: 11/20/14 16:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	145		1.17		mg/Kg	☼	12/12/14 15:02	12/16/14 21:26	2

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-110 (0-1)

Lab Sample ID: 490-66968-11

Date Collected: 11/20/14 16:55
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 74.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	193		0.656		mg/Kg	☼	11/26/14 13:40	11/27/14 02:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	74		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104A (0-1)

Lab Sample ID: 490-66968-14

Date Collected: 11/20/14 14:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 76.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1010		3.21		mg/Kg	☼	12/12/14 15:02	12/16/14 21:31	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	77		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104A (1-2)

Lab Sample ID: 490-66968-15

Date Collected: 11/20/14 14:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	340		0.614		mg/Kg	☼	01/06/15 11:45	01/09/15 04:19	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104A (2-3)

Lab Sample ID: 490-66968-16

Date Collected: 11/20/14 14:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	488		3.02		mg/Kg	☼	01/13/15 15:04	02/03/15 15:05	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			01/13/15 13:34	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-105A (0-1)

Lab Sample ID: 490-66968-17

Date Collected: 11/20/14 14:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	143		2.89		mg/Kg	☼	12/12/14 15:02	12/16/14 21:36	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-107 (0-1)

Lab Sample ID: 490-66968-20

Date Collected: 11/20/14 15:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 75.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	221		0.641		mg/Kg	☼	11/26/14 13:40	11/27/14 02:20	1
Manganese	1390		6.41		mg/Kg	☼	11/26/14 13:40	11/28/14 16:54	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108 (0-1)

Lab Sample ID: 490-66968-22

Date Collected: 11/20/14 15:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 76.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	1380		6.35		mg/Kg	☼	11/26/14 13:40	11/28/14 17:11	10
Manganese	1520		6.35		mg/Kg	☼	11/26/14 13:40	11/28/14 17:11	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	76		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108 (1-2)

Lab Sample ID: 490-66968-23

Date Collected: 11/20/14 15:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 80.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	247		2.96		mg/Kg	☼	12/12/14 15:02	12/16/14 21:41	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-103 (0-1)

Lab Sample ID: 490-66968-27

Date Collected: 11/20/14 13:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	99.3		0.589		mg/Kg	☼	11/26/14 13:40	11/27/14 02:42	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-106 (0-1)

Lab Sample ID: 490-66968-30

Date Collected: 11/20/14 13:15
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	754		5.94		mg/Kg	☼	11/26/14 13:40	11/29/14 14:45	10
Manganese	1540		5.94		mg/Kg	☼	11/26/14 13:40	11/29/14 14:45	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-106 (1-2)

Lab Sample ID: 490-66968-31

Date Collected: 11/20/14 13:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	311		2.86		mg/Kg	☼	12/12/14 15:02	12/16/14 21:46	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104 (0-1)

Lab Sample ID: 490-66968-32

Date Collected: 11/20/14 14:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	791		6.16		mg/Kg	☼	11/26/14 13:40	11/28/14 17:22	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104 (1-2)

Lab Sample ID: 490-66968-33

Date Collected: 11/20/14 14:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 89.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	120		2.71		mg/Kg	☼	12/12/14 15:02	12/16/14 21:51	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-105 (0-1)

Lab Sample ID: 490-66968-35

Date Collected: 11/20/14 14:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	271		0.593		mg/Kg	☼	11/26/14 13:40	11/27/14 02:59	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-105 (1-2)

Lab Sample ID: 490-66968-36

Date Collected: 11/20/14 14:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	129		2.87		mg/Kg	☼	12/12/14 15:02	12/16/14 22:07	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-100A (0-1)

Lab Sample ID: 490-66968-39

Date Collected: 11/20/14 11:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.8

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	274		2.92		mg/Kg	☼	12/12/14 15:02	12/16/14 22:12	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-100A (1-2)

Lab Sample ID: 490-66968-40

Date Collected: 11/20/14 11:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	3.49		0.577		mg/Kg	☼	01/06/15 11:45	01/09/15 05:15	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-102A (0-1)

Lab Sample ID: 490-66968-45

Date Collected: 11/20/14 12:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	75.7		2.78		mg/Kg	☼	12/12/14 15:02	12/16/14 22:17	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-100 (0-1)

Lab Sample ID: 490-66968-50

Date Collected: 11/20/14 10:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	797		5.90		mg/Kg	☼	11/26/14 13:40	11/28/14 17:28	10
Manganese	928		5.90		mg/Kg	☼	11/26/14 13:40	11/28/14 17:28	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-100 (1-2)

Lab Sample ID: 490-66968-51

Date Collected: 11/20/14 10:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 78.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	9.28		3.03		mg/Kg	☼	12/12/14 15:02	12/16/14 22:22	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-102 (0-1)

Lab Sample ID: 490-66968-53

Date Collected: 11/20/14 10:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	270		0.574		mg/Kg	☼	11/26/14 13:40	11/27/14 03:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-102 (1-2)

Lab Sample ID: 490-66968-54

Date Collected: 11/20/14 10:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	7.57		2.82		mg/Kg	☼	12/15/14 10:45	12/16/14 23:39	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-97 (0-1)

Lab Sample ID: 490-66968-60

Date Collected: 11/20/14 09:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	184		0.572		mg/Kg	☼	11/26/14 13:40	11/27/14 03:16	1
Manganese	106		0.572		mg/Kg	☼	11/26/14 13:40	11/27/14 03:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-97 (1-2)

Lab Sample ID: 490-66968-61

Date Collected: 11/20/14 09:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	21.2		2.84		mg/Kg	☼	12/15/14 10:45	12/16/14 23:54	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-98 (0-1)

Date Collected: 11/20/14 09:15
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-63

Matrix: Soil
Percent Solids: 84.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	71.0		0.572		mg/Kg	☼	11/26/14 13:40	11/27/14 01:41	1
Manganese	87.3		0.572		mg/Kg	☼	11/26/14 13:40	11/27/14 01:41	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-99 (0-1)

Lab Sample ID: 490-66968-66

Date Collected: 11/20/14 09:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 86.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	52.3		0.569		mg/Kg	☼	11/26/14 13:40	11/27/14 03:21	1
Manganese	53.9		0.569		mg/Kg	☼	11/26/14 13:40	11/27/14 03:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-101 (0-1)

Lab Sample ID: 490-66968-69

Date Collected: 11/20/14 10:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.9

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	49.5		0.601		mg/Kg	☼	11/26/14 13:40	11/27/14 03:27	1
Manganese	112		0.601		mg/Kg	☼	11/26/14 13:40	11/27/14 03:27	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-68 (0-1)

Lab Sample ID: 490-66968-72

Date Collected: 11/21/14 10:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	6.81		5.80		mg/Kg	☼	11/26/14 13:40	11/28/14 17:33	10
Cobalt	27.0		0.580		mg/Kg	☼	11/26/14 13:40	11/27/14 03:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-69 (0-1)

Lab Sample ID: 490-66968-75

Date Collected: 11/21/14 11:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 86.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	26.9		0.576		mg/Kg	☼	11/26/14 17:07	11/28/14 18:07	1
Cobalt	469		2.88		mg/Kg	☼	11/26/14 17:07	11/29/14 13:28	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-69 (1-2)

Date Collected: 11/21/14 11:10
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-76

Matrix: Soil
Percent Solids: 90.5

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		2.70		mg/Kg	☼	12/15/14 10:45	12/16/14 23:59	5
Cobalt	**21.7**		2.70		mg/Kg	☼	12/15/14 10:45	12/16/14 23:59	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**91**		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-70 (0-1)

Lab Sample ID: 490-66968-78

Date Collected: 11/21/14 11:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.09		0.567		mg/Kg	☼	11/26/14 17:07	11/28/14 18:34	1
Cobalt	122		0.567		mg/Kg	☼	11/26/14 17:07	11/28/14 18:34	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-75 (0-1)

Date Collected: 11/21/14 12:41
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-83

Matrix: Soil
Percent Solids: 69.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	32.0		0.712		mg/Kg	☼	11/26/14 17:07	11/28/14 18:40	1
Cobalt	6650		71.2		mg/Kg	☼	11/26/14 17:07	11/29/14 13:59	100
Nickel	2920		71.2		mg/Kg	☼	11/26/14 17:07	11/29/14 13:59	100
Manganese	6990		71.2		mg/Kg	☼	11/26/14 17:07	11/29/14 13:59	100

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	70		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-75 (1-2)

Lab Sample ID: 490-66968-84

Date Collected: 11/21/14 12:42
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 74.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	10.7		3.26		mg/Kg	☼	12/15/14 10:45	12/17/14 00:04	5
Cobalt	1130		3.26		mg/Kg	☼	12/15/14 10:45	12/17/14 00:04	5
Nickel	766		3.26		mg/Kg	☼	12/15/14 10:45	12/17/14 00:04	5
Manganese	2330		3.26		mg/Kg	☼	12/15/14 10:45	12/17/14 12:22	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	74		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-75 (2-3)

Lab Sample ID: 490-66968-85

Date Collected: 11/21/14 12:43
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 79.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.46		0.609		mg/Kg	☼	01/13/15 15:04	02/03/15 15:11	1
Cobalt	325		0.609		mg/Kg	☼	01/13/15 15:04	02/03/15 15:11	1
Nickel	81.7		0.609		mg/Kg	☼	01/13/15 15:04	02/03/15 15:11	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	79		0.10		%			01/13/15 13:34	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-75 (3-4)

Date Collected: 11/21/14 12:44
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-86

Matrix: Soil
Percent Solids: 78.3

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	157		0.618		mg/Kg	☼	01/06/15 11:45	01/09/15 05:10	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: DUP-14

Lab Sample ID: 490-66968-88

Date Collected: 11/20/14 01:01
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	360		0.564		mg/Kg	☼	11/26/14 17:07	11/28/14 18:46	1
Manganese	165		0.564		mg/Kg	☼	11/26/14 17:07	11/28/14 18:46	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: DUP-15

Date Collected: 11/21/14 01:01
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-89

Matrix: Soil
Percent Solids: 77.6

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	14.1		0.634		mg/Kg	☼	11/26/14 17:07	11/28/14 19:02	1
Cobalt	624		6.34		mg/Kg	☼	11/26/14 17:07	11/29/14 14:19	10
Nickel	204		6.34		mg/Kg	☼	11/26/14 17:07	11/29/14 14:19	10
Manganese	803		6.34		mg/Kg	☼	11/26/14 17:07	11/29/14 14:19	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	78		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-69A (0-1)

Lab Sample ID: 490-66968-91

Date Collected: 11/21/14 11:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	20.4		2.91		mg/Kg	☼	12/15/14 10:45	12/17/14 00:09	5
Cobalt	70.8		2.91		mg/Kg	☼	12/15/14 10:45	12/17/14 00:09	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-69A (1-2)

Lab Sample ID: 490-66968-92

Date Collected: 11/21/14 11:55
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 89.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.37		0.558		mg/Kg	☼	01/06/15 11:45	01/09/15 04:54	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-73 (0-1)

Date Collected: 11/21/14 12:05
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-94

Matrix: Soil
Percent Solids: 91.0

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	78.2		0.544		mg/Kg	☼	11/26/14 17:07	11/28/14 19:13	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	91		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (0-1)

Date Collected: 11/21/14 12:20
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-97

Matrix: Soil
Percent Solids: 86.4

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	3.60		0.581		mg/Kg	☼	11/26/14 17:07	11/28/14 19:08	1
Cobalt	675		5.81		mg/Kg	☼	11/26/14 17:07	11/29/14 14:25	10
Nickel	298		5.81		mg/Kg	☼	11/26/14 17:07	11/29/14 14:25	10
Manganese	987		5.81		mg/Kg	☼	11/26/14 17:07	11/29/14 14:25	10

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			11/24/14 09:27	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (1-2)

Lab Sample ID: 490-66968-98

Date Collected: 11/21/14 12:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 75.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	16.7		3.20		mg/Kg	☼	12/15/14 10:45	12/17/14 00:15	5
Cobalt	890		3.20		mg/Kg	☼	12/15/14 10:45	12/17/14 00:15	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	75		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (2-3)

Lab Sample ID: 490-66968-99

Date Collected: 11/21/14 12:30
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 73.7

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	14.2		3.23		mg/Kg	☼	12/15/14 10:45	12/17/14 00:20	5
Cobalt	652		3.23		mg/Kg	☼	12/15/14 10:45	12/17/14 00:20	5

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	74		0.10		%			12/04/14 11:35	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (3-4)

Lab Sample ID: 490-66968-100

Date Collected: 11/21/14 12:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.2

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	8.04		0.591		mg/Kg	☼	01/06/15 11:45	01/09/15 04:49	1
Cobalt	231		0.591		mg/Kg	☼	01/06/15 11:45	01/09/15 04:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			01/05/15 11:32	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (4-5)
Date Collected: 11/21/14 12:40
Date Received: 11/21/14 15:50

Lab Sample ID: 490-66968-101
Matrix: Soil
Percent Solids: 83.1

Method: 6020 - Metals (ICP/MS)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.601		mg/Kg	☼	01/13/15 15:04	02/03/15 15:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			01/13/15 13:34	1

Method: 6020 - Metals (ICP/MS)

Lab Sample ID: MB 490-209453/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209679 — **Prep Batch: 209453**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.500		mg/Kg		11/26/14 13:40	11/27/14 01:30	1
Manganese	ND		0.500		mg/Kg		11/26/14 13:40	11/27/14 01:30	1

Lab Sample ID: MB 490-209453/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209453**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.500		mg/Kg		11/26/14 13:40	11/28/14 16:04	1

Lab Sample ID: LCS 490-209453/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209679 — **Prep Batch: 209453**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	19.4	17.46		mg/Kg		90	80 - 120
Manganese	19.4	17.36		mg/Kg		90	80 - 120

Lab Sample ID: LCS 490-209453/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209453**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.4	18.57		mg/Kg		96	80 - 120

Lab Sample ID: 490-66968-63 MS — **Client Sample ID: SS-98 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209679 — **Prep Batch: 209453**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	71.0		23.4	113.9	F1	mg/Kg	☼	183	75 - 125
Manganese	87.3		23.4	110.3		mg/Kg	☼	98	75 - 125

Lab Sample ID: 490-66968-63 MSD — **Client Sample ID: SS-98 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209679 — **Prep Batch: 209453**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	71.0		23.7	90.24	F2	mg/Kg	☼	81	75 - 125	23	20
Manganese	87.3		23.7	75.05	F1 F2	mg/Kg	☼	-52	75 - 125	38	20

Lab Sample ID: MB 490-209544/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209544**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.486		mg/Kg		11/26/14 17:07	11/28/14 17:56	1
Cobalt	ND		0.486		mg/Kg		11/26/14 17:07	11/28/14 17:56	1
Manganese	ND		0.486		mg/Kg		11/26/14 17:07	11/28/14 17:56	1

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-209544/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210236 — **Prep Batch: 209544**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.486		mg/Kg		11/26/14 17:07	11/29/14 13:18	1
Cobalt	ND		0.486		mg/Kg		11/26/14 17:07	11/29/14 13:18	1
Nickel	ND		0.486		mg/Kg		11/26/14 17:07	11/29/14 13:18	1
Manganese	ND		0.486		mg/Kg		11/26/14 17:07	11/29/14 13:18	1

Lab Sample ID: LCS 490-209544/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209544**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	18.86		mg/Kg		94	80 - 120
Cobalt	20.1	19.30		mg/Kg		96	80 - 120
Manganese	20.1	20.40		mg/Kg		102	80 - 120

Lab Sample ID: LCS 490-209544/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 210236 — **Prep Batch: 209544**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	17.97		mg/Kg		89	80 - 120
Cobalt	20.1	18.84		mg/Kg		94	80 - 120
Nickel	20.1	18.72		mg/Kg		93	80 - 120
Manganese	20.1	18.94		mg/Kg		94	80 - 120

Lab Sample ID: 490-66968-75 MS — **Client Sample ID: SS-69 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209544**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	26.9		23.0	49.67		mg/Kg	☼	99	75 - 125

Lab Sample ID: 490-66968-75 MS — **Client Sample ID: SS-69 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210236 — **Prep Batch: 209544**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	27.5		23.0	49.78		mg/Kg	☼	97	75 - 125
Cobalt	469		23.0	692.4	4	mg/Kg	☼	969	75 - 125

Lab Sample ID: 490-66968-75 MSD — **Client Sample ID: SS-69 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 209947 — **Prep Batch: 209544**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	26.9		22.6	43.23	F1	mg/Kg	☼	72	75 - 125	14	20

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-66968-75 MSD — **Client Sample ID: SS-69 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 210236 — **Prep Batch: 209544**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	27.5		22.6	41.96	F1	mg/Kg	☼	64	75 - 125	17	20
Cobalt	469		22.6	489.6	4 F2	mg/Kg	☼	90	75 - 125	34	20

Lab Sample ID: MB 490-213724/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214346 — **Prep Batch: 213724**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.491		mg/Kg		12/12/14 15:02	12/16/14 00:54	1

Lab Sample ID: MB 490-213724/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 213724**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.491		mg/Kg		12/12/14 15:02	12/16/14 20:04	1

Lab Sample ID: LCS 490-213724/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214346 — **Prep Batch: 213724**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.2	19.23		mg/Kg		95	80 - 120

Lab Sample ID: LCS 490-213724/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 213724**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	20.2	20.48		mg/Kg		102	80 - 120

Lab Sample ID: 490-66918-A-6-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 213724**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	10.7		34.2	47.20		mg/Kg	☼	107	75 - 125

Lab Sample ID: 490-66918-A-6-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 213724**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	10.7		33.5	45.84		mg/Kg	☼	105	75 - 125	3	20

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: MB 490-214127/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 214127**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.495		mg/Kg		12/15/14 10:45	12/16/14 22:53	1
Cobalt	ND		0.495		mg/Kg		12/15/14 10:45	12/16/14 22:53	1
Nickel	ND		0.495		mg/Kg		12/15/14 10:45	12/16/14 22:53	1
Manganese	ND	^	0.495		mg/Kg		12/15/14 10:45	12/16/14 22:53	1

Lab Sample ID: MB 490-214127/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214816 — **Prep Batch: 214127**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Manganese	ND		0.495		mg/Kg		12/15/14 10:45	12/17/14 11:46	1

Lab Sample ID: LCS 490-214127/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 214127**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	19.03		mg/Kg		95	80 - 120
Cobalt	20.1	20.10		mg/Kg		100	80 - 120
Nickel	20.1	20.48		mg/Kg		102	80 - 120

Lab Sample ID: LCS 490-214127/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 215228 — **Prep Batch: 214127**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	20.1	21.83		mg/Kg		109	80 - 120

Lab Sample ID: LCSD 490-214127/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 214127**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	20.1	19.05		mg/Kg		95	80 - 120	0	20
Cobalt	20.1	19.82		mg/Kg		98	80 - 120	1	20
Nickel	20.1	20.30		mg/Kg		101	80 - 120	1	20

Lab Sample ID: LCSD 490-214127/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 215228 — **Prep Batch: 214127**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Manganese	20.1	21.55		mg/Kg		107	80 - 120	1	20

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 490-66910-A-1-G MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 214127**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium	ND		20.1	21.68		mg/Kg		108	75 - 125		
Cobalt	9.24		20.1	32.24		mg/Kg		115	75 - 125		
Nickel	1430		20.1	1607	4	mg/Kg		887	75 - 125		

Lab Sample ID: 490-66910-A-1-H MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 214620 — **Prep Batch: 214127**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		19.6	20.28		mg/Kg		103	75 - 125	7	20
Cobalt	9.24		19.6	30.69		mg/Kg		109	75 - 125	5	20
Nickel	1430		19.6	1537	4	mg/Kg		550	75 - 125	4	20

Lab Sample ID: MB 490-218559/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219309 — **Prep Batch: 218559**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.484		mg/Kg		01/06/15 11:45	01/09/15 03:08	1
Cobalt	ND		0.484		mg/Kg		01/06/15 11:45	01/09/15 03:08	1

Lab Sample ID: LCS 490-218559/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219309 — **Prep Batch: 218559**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium			19.8	18.49		mg/Kg		93	80 - 120		
Cobalt			19.8	19.80		mg/Kg		100	80 - 120		

Lab Sample ID: LCSD 490-218559/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219309 — **Prep Batch: 218559**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium			19.8	18.64		mg/Kg		94	80 - 120	1	20
Cobalt			19.8	19.57		mg/Kg		99	80 - 120	1	20

Lab Sample ID: 460-88440-A-1-H MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219309 — **Prep Batch: 218559**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium	ND		24.4	22.65		mg/Kg	☼	93	75 - 125		
Cobalt	ND		24.4	23.85		mg/Kg	☼	96	75 - 125		

Method: 6020 - Metals (ICP/MS) (Continued)

Lab Sample ID: 460-88440-A-1-I MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 219309 — **Prep Batch: 218559**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		23.6	23.22		mg/Kg	☼	98	75 - 125	2	20
Cobalt	ND		23.6	24.25		mg/Kg	☼	101	75 - 125	2	20

Lab Sample ID: MB 490-220080/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 225094 — **Prep Batch: 220080**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.490		mg/Kg		01/13/15 15:04	02/03/15 14:26	1
Cobalt	ND		0.490		mg/Kg		01/13/15 15:04	02/03/15 14:26	1
Nickel	ND		0.490		mg/Kg		01/13/15 15:04	02/03/15 14:26	1

Lab Sample ID: LCS 490-220080/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 225094 — **Prep Batch: 220080**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.9	21.59		mg/Kg		109	80 - 120
Cobalt	199	224.4		mg/Kg		113	80 - 120
Nickel	199	222.3		mg/Kg		112	80 - 120

Method: Moisture - Percent Moisture

Lab Sample ID: 490-66968-63 DU — **Client Sample ID: SS-98 (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 208620

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	84		85		%		0.9	20

Lab Sample ID: 490-66968-2 DU — **Client Sample ID: SS-108A (0-1)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 211302

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	81		80		%		1	20

Lab Sample ID: 490-66968-3 DU — **Client Sample ID: SS-108A (1-1.5)**
Matrix: Soil — **Prep Type: Total/NA**
Analysis Batch: 218304

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	84		83		%		2	20

Method: Moisture - Percent Moisture (Continued)

Lab Sample ID: 490-66968-16 DU
Matrix: Soil
Analysis Batch: 220040

Client Sample ID: SS-104A (2-3)
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	82			82		%				0.1	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Metals

Prep Batch: 209453

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-4	SS-109 (0-1)	Total/NA	Soil	3051A	
490-66968-11	SS-110 (0-1)	Total/NA	Soil	3051A	
490-66968-20	SS-107 (0-1)	Total/NA	Soil	3051A	
490-66968-22	SS-108 (0-1)	Total/NA	Soil	3051A	
490-66968-27	SS-103 (0-1)	Total/NA	Soil	3051A	
490-66968-30	SS-106 (0-1)	Total/NA	Soil	3051A	
490-66968-32	SS-104 (0-1)	Total/NA	Soil	3051A	
490-66968-35	SS-105 (0-1)	Total/NA	Soil	3051A	
490-66968-50	SS-100 (0-1)	Total/NA	Soil	3051A	
490-66968-53	SS-102 (0-1)	Total/NA	Soil	3051A	
490-66968-60	SS-97 (0-1)	Total/NA	Soil	3051A	
490-66968-63	SS-98 (0-1)	Total/NA	Soil	3051A	
490-66968-63 MS	SS-98 (0-1)	Total/NA	Soil	3051A	
490-66968-63 MSD	SS-98 (0-1)	Total/NA	Soil	3051A	
490-66968-66	SS-99 (0-1)	Total/NA	Soil	3051A	
490-66968-69	SS-101 (0-1)	Total/NA	Soil	3051A	
490-66968-72	SS-68 (0-1)	Total/NA	Soil	3051A	
LCS 490-209453/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-209453/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 209544

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-75	SS-69 (0-1)	Total/NA	Soil	3051A	
490-66968-75 MS	SS-69 (0-1)	Total/NA	Soil	3051A	
490-66968-75 MSD	SS-69 (0-1)	Total/NA	Soil	3051A	
490-66968-78	SS-70 (0-1)	Total/NA	Soil	3051A	
490-66968-83	SS-75 (0-1)	Total/NA	Soil	3051A	
490-66968-88	DUP-14	Total/NA	Soil	3051A	
490-66968-89	DUP-15	Total/NA	Soil	3051A	
490-66968-94	SS-73 (0-1)	Total/NA	Soil	3051A	
490-66968-97	SS-74 (0-1)	Total/NA	Soil	3051A	
LCS 490-209544/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-209544/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 209679

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-4	SS-109 (0-1)	Total/NA	Soil	6020	209453
490-66968-11	SS-110 (0-1)	Total/NA	Soil	6020	209453
490-66968-20	SS-107 (0-1)	Total/NA	Soil	6020	209453
490-66968-27	SS-103 (0-1)	Total/NA	Soil	6020	209453
490-66968-35	SS-105 (0-1)	Total/NA	Soil	6020	209453
490-66968-53	SS-102 (0-1)	Total/NA	Soil	6020	209453
490-66968-60	SS-97 (0-1)	Total/NA	Soil	6020	209453
490-66968-63	SS-98 (0-1)	Total/NA	Soil	6020	209453
490-66968-63 MS	SS-98 (0-1)	Total/NA	Soil	6020	209453
490-66968-63 MSD	SS-98 (0-1)	Total/NA	Soil	6020	209453
490-66968-66	SS-99 (0-1)	Total/NA	Soil	6020	209453
490-66968-69	SS-101 (0-1)	Total/NA	Soil	6020	209453
490-66968-72	SS-68 (0-1)	Total/NA	Soil	6020	209453
LCS 490-209453/2-A	Lab Control Sample	Total/NA	Solid	6020	209453
MB 490-209453/1-A	Method Blank	Total/NA	Solid	6020	209453

Metals (Continued)

Analysis Batch: 209947

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-20	SS-107 (0-1)	Total/NA	Soil	6020	209453
490-66968-22	SS-108 (0-1)	Total/NA	Soil	6020	209453
490-66968-32	SS-104 (0-1)	Total/NA	Soil	6020	209453
490-66968-50	SS-100 (0-1)	Total/NA	Soil	6020	209453
490-66968-72	SS-68 (0-1)	Total/NA	Soil	6020	209453
490-66968-75	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-75 MS	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-75 MSD	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-78	SS-70 (0-1)	Total/NA	Soil	6020	209544
490-66968-83	SS-75 (0-1)	Total/NA	Soil	6020	209544
490-66968-88	DUP-14	Total/NA	Soil	6020	209544
490-66968-89	DUP-15	Total/NA	Soil	6020	209544
490-66968-94	SS-73 (0-1)	Total/NA	Soil	6020	209544
490-66968-97	SS-74 (0-1)	Total/NA	Soil	6020	209544
LCS 490-209453/2-A	Lab Control Sample	Total/NA	Solid	6020	209453
LCS 490-209544/2-A	Lab Control Sample	Total/NA	Solid	6020	209544
MB 490-209453/1-A	Method Blank	Total/NA	Solid	6020	209453
MB 490-209544/1-A	Method Blank	Total/NA	Solid	6020	209544

Analysis Batch: 210236

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-30	SS-106 (0-1)	Total/NA	Soil	6020	209453
490-66968-75	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-75 MS	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-75 MSD	SS-69 (0-1)	Total/NA	Soil	6020	209544
490-66968-83	SS-75 (0-1)	Total/NA	Soil	6020	209544
490-66968-89	DUP-15	Total/NA	Soil	6020	209544
490-66968-97	SS-74 (0-1)	Total/NA	Soil	6020	209544
LCS 490-209544/2-A	Lab Control Sample	Total/NA	Solid	6020	209544
MB 490-209544/1-A	Method Blank	Total/NA	Solid	6020	209544

Prep Batch: 213724

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66918-A-6-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-66918-A-6-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-66968-2	SS-108A (0-1)	Total/NA	Soil	3051A	
490-66968-10	SS-111 (0-1)	Total/NA	Soil	3051A	
490-66968-14	SS-104A (0-1)	Total/NA	Soil	3051A	
490-66968-17	SS-105A (0-1)	Total/NA	Soil	3051A	
490-66968-23	SS-108 (1-2)	Total/NA	Soil	3051A	
490-66968-31	SS-106 (1-2)	Total/NA	Soil	3051A	
490-66968-33	SS-104 (1-2)	Total/NA	Soil	3051A	
490-66968-36	SS-105 (1-2)	Total/NA	Soil	3051A	
490-66968-39	SS-100A (0-1)	Total/NA	Soil	3051A	
490-66968-45	SS-102A (0-1)	Total/NA	Soil	3051A	
490-66968-51	SS-100 (1-2)	Total/NA	Soil	3051A	
LCS 490-213724/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-213724/1-A	Method Blank	Total/NA	Solid	3051A	

Metals (Continued)

Prep Batch: 214127

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66910-A-1-G MS	Matrix Spike	Total/NA	Solid	3051A	
490-66910-A-1-H MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-66968-54	SS-102 (1-2)	Total/NA	Soil	3051A	
490-66968-61	SS-97 (1-2)	Total/NA	Soil	3051A	
490-66968-76	SS-69 (1-2)	Total/NA	Soil	3051A	
490-66968-84	SS-75 (1-2)	Total/NA	Soil	3051A	
490-66968-91	SS-69A (0-1)	Total/NA	Soil	3051A	
490-66968-98	SS-74 (1-2)	Total/NA	Soil	3051A	
490-66968-99	SS-74 (2-3)	Total/NA	Soil	3051A	
LCS 490-214127/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-214127/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-214127/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 214346

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-213724/2-A	Lab Control Sample	Total/NA	Solid	6020	213724
MB 490-213724/1-A	Method Blank	Total/NA	Solid	6020	213724

Analysis Batch: 214620

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66910-A-1-G MS	Matrix Spike	Total/NA	Solid	6020	214127
490-66910-A-1-H MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	214127
490-66918-A-6-B MS	Matrix Spike	Total/NA	Solid	6020	213724
490-66918-A-6-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	213724
490-66968-2	SS-108A (0-1)	Total/NA	Soil	6020	213724
490-66968-10	SS-111 (0-1)	Total/NA	Soil	6020	213724
490-66968-14	SS-104A (0-1)	Total/NA	Soil	6020	213724
490-66968-17	SS-105A (0-1)	Total/NA	Soil	6020	213724
490-66968-23	SS-108 (1-2)	Total/NA	Soil	6020	213724
490-66968-31	SS-106 (1-2)	Total/NA	Soil	6020	213724
490-66968-33	SS-104 (1-2)	Total/NA	Soil	6020	213724
490-66968-36	SS-105 (1-2)	Total/NA	Soil	6020	213724
490-66968-39	SS-100A (0-1)	Total/NA	Soil	6020	213724
490-66968-45	SS-102A (0-1)	Total/NA	Soil	6020	213724
490-66968-51	SS-100 (1-2)	Total/NA	Soil	6020	213724
490-66968-54	SS-102 (1-2)	Total/NA	Soil	6020	214127
490-66968-61	SS-97 (1-2)	Total/NA	Soil	6020	214127
490-66968-76	SS-69 (1-2)	Total/NA	Soil	6020	214127
490-66968-84	SS-75 (1-2)	Total/NA	Soil	6020	214127
490-66968-91	SS-69A (0-1)	Total/NA	Soil	6020	214127
490-66968-98	SS-74 (1-2)	Total/NA	Soil	6020	214127
490-66968-99	SS-74 (2-3)	Total/NA	Soil	6020	214127
LCS 490-213724/2-A	Lab Control Sample	Total/NA	Solid	6020	213724
LCS 490-214127/2-A	Lab Control Sample	Total/NA	Solid	6020	214127
LCSD 490-214127/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	214127
MB 490-213724/1-A	Method Blank	Total/NA	Solid	6020	213724
MB 490-214127/1-A	Method Blank	Total/NA	Solid	6020	214127

Analysis Batch: 214816

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-84	SS-75 (1-2)	Total/NA	Soil	6020	214127

Metals (Continued)

Analysis Batch: 214816 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-214127/1-A	Method Blank	Total/NA	Solid	6020	214127

Analysis Batch: 215228

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-214127/2-A	Lab Control Sample	Total/NA	Solid	6020	214127
LCSD 490-214127/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	214127

Prep Batch: 218559

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
460-88440-A-1-H MS	Matrix Spike	Total/NA	Solid	3051A	
460-88440-A-1-I MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-66968-3	SS-108A (1-1.5)	Total/NA	Soil	3051A	
490-66968-15	SS-104A (1-2)	Total/NA	Soil	3051A	
490-66968-40	SS-100A (1-2)	Total/NA	Soil	3051A	
490-66968-86	SS-75 (3-4)	Total/NA	Soil	3051A	
490-66968-92	SS-69A (1-2)	Total/NA	Soil	3051A	
490-66968-100	SS-74 (3-4)	Total/NA	Soil	3051A	
LCS 490-218559/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-218559/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-218559/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 219309

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
460-88440-A-1-H MS	Matrix Spike	Total/NA	Solid	6020	218559
460-88440-A-1-I MSD	Matrix Spike Duplicate	Total/NA	Solid	6020	218559
490-66968-3	SS-108A (1-1.5)	Total/NA	Soil	6020	218559
490-66968-15	SS-104A (1-2)	Total/NA	Soil	6020	218559
490-66968-40	SS-100A (1-2)	Total/NA	Soil	6020	218559
490-66968-86	SS-75 (3-4)	Total/NA	Soil	6020	218559
490-66968-92	SS-69A (1-2)	Total/NA	Soil	6020	218559
490-66968-100	SS-74 (3-4)	Total/NA	Soil	6020	218559
LCS 490-218559/2-A	Lab Control Sample	Total/NA	Solid	6020	218559
LCSD 490-218559/3-A	Lab Control Sample Dup	Total/NA	Solid	6020	218559
MB 490-218559/1-A	Method Blank	Total/NA	Solid	6020	218559

Prep Batch: 220080

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-16	SS-104A (2-3)	Total/NA	Soil	3051A	
490-66968-85	SS-75 (2-3)	Total/NA	Soil	3051A	
490-66968-101	SS-74 (4-5)	Total/NA	Soil	3051A	
LCS 490-220080/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-220080/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 225094

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-16	SS-104A (2-3)	Total/NA	Soil	6020	220080
490-66968-85	SS-75 (2-3)	Total/NA	Soil	6020	220080
490-66968-101	SS-74 (4-5)	Total/NA	Soil	6020	220080
LCS 490-220080/2-A	Lab Control Sample	Total/NA	Solid	6020	220080
MB 490-220080/1-A	Method Blank	Total/NA	Solid	6020	220080

General Chemistry

Analysis Batch: 208620

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-4	SS-109 (0-1)	Total/NA	Soil	Moisture	
490-66968-11	SS-110 (0-1)	Total/NA	Soil	Moisture	
490-66968-20	SS-107 (0-1)	Total/NA	Soil	Moisture	
490-66968-22	SS-108 (0-1)	Total/NA	Soil	Moisture	
490-66968-27	SS-103 (0-1)	Total/NA	Soil	Moisture	
490-66968-30	SS-106 (0-1)	Total/NA	Soil	Moisture	
490-66968-32	SS-104 (0-1)	Total/NA	Soil	Moisture	
490-66968-35	SS-105 (0-1)	Total/NA	Soil	Moisture	
490-66968-50	SS-100 (0-1)	Total/NA	Soil	Moisture	
490-66968-53	SS-102 (0-1)	Total/NA	Soil	Moisture	
490-66968-60	SS-97 (0-1)	Total/NA	Soil	Moisture	
490-66968-63	SS-98 (0-1)	Total/NA	Soil	Moisture	
490-66968-63 DU	SS-98 (0-1)	Total/NA	Soil	Moisture	
490-66968-63 MS	SS-98 (0-1)	Total/NA	Soil	Moisture	
490-66968-63 MSD	SS-98 (0-1)	Total/NA	Soil	Moisture	
490-66968-66	SS-99 (0-1)	Total/NA	Soil	Moisture	
490-66968-69	SS-101 (0-1)	Total/NA	Soil	Moisture	
490-66968-72	SS-68 (0-1)	Total/NA	Soil	Moisture	
490-66968-75	SS-69 (0-1)	Total/NA	Soil	Moisture	
490-66968-78	SS-70 (0-1)	Total/NA	Soil	Moisture	
490-66968-83	SS-75 (0-1)	Total/NA	Soil	Moisture	
490-66968-88	DUP-14	Total/NA	Soil	Moisture	
490-66968-89	DUP-15	Total/NA	Soil	Moisture	
490-66968-94	SS-73 (0-1)	Total/NA	Soil	Moisture	
490-66968-97	SS-74 (0-1)	Total/NA	Soil	Moisture	

Analysis Batch: 211302

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-2	SS-108A (0-1)	Total/NA	Soil	Moisture	
490-66968-2 DU	SS-108A (0-1)	Total/NA	Soil	Moisture	
490-66968-10	SS-111 (0-1)	Total/NA	Soil	Moisture	
490-66968-14	SS-104A (0-1)	Total/NA	Soil	Moisture	
490-66968-17	SS-105A (0-1)	Total/NA	Soil	Moisture	
490-66968-23	SS-108 (1-2)	Total/NA	Soil	Moisture	
490-66968-31	SS-106 (1-2)	Total/NA	Soil	Moisture	
490-66968-33	SS-104 (1-2)	Total/NA	Soil	Moisture	
490-66968-36	SS-105 (1-2)	Total/NA	Soil	Moisture	
490-66968-39	SS-100A (0-1)	Total/NA	Soil	Moisture	
490-66968-45	SS-102A (0-1)	Total/NA	Soil	Moisture	
490-66968-51	SS-100 (1-2)	Total/NA	Soil	Moisture	
490-66968-54	SS-102 (1-2)	Total/NA	Soil	Moisture	
490-66968-61	SS-97 (1-2)	Total/NA	Soil	Moisture	
490-66968-76	SS-69 (1-2)	Total/NA	Soil	Moisture	
490-66968-84	SS-75 (1-2)	Total/NA	Soil	Moisture	
490-66968-91	SS-69A (0-1)	Total/NA	Soil	Moisture	
490-66968-98	SS-74 (1-2)	Total/NA	Soil	Moisture	
490-66968-99	SS-74 (2-3)	Total/NA	Soil	Moisture	

Analysis Batch: 218304

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66900-B-20 MS	Matrix Spike	Total/NA	Solid	Moisture	

General Chemistry (Continued)

Analysis Batch: 218304 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66900-B-20 MSD	Matrix Spike Duplicate	Total/NA	Solid	Moisture	
490-66968-3	SS-108A (1-1.5)	Total/NA	Soil	Moisture	
490-66968-3 DU	SS-108A (1-1.5)	Total/NA	Soil	Moisture	
490-66968-15	SS-104A (1-2)	Total/NA	Soil	Moisture	
490-66968-40	SS-100A (1-2)	Total/NA	Soil	Moisture	
490-66968-86	SS-75 (3-4)	Total/NA	Soil	Moisture	
490-66968-92	SS-69A (1-2)	Total/NA	Soil	Moisture	
490-66968-100	SS-74 (3-4)	Total/NA	Soil	Moisture	

Analysis Batch: 220040

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-66968-16	SS-104A (2-3)	Total/NA	Soil	Moisture	
490-66968-16 DU	SS-104A (2-3)	Total/NA	Soil	Moisture	
490-66968-85	SS-75 (2-3)	Total/NA	Soil	Moisture	
490-66968-101	SS-74 (4-5)	Total/NA	Soil	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108A (0-1)

Lab Sample ID: 490-66968-2
Date Collected: 11/20/14 15:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.525 g	100 mL	214620	12/16/14 21:20	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-108A (1-1.5)

Lab Sample ID: 490-66968-3
Date Collected: 11/20/14 15:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.503 g	100 mL	219309	01/09/15 04:24	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Client Sample ID: SS-109 (0-1)

Lab Sample ID: 490-66968-4
Date Collected: 11/20/14 15:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 79.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.510 g	100 mL	209679	11/27/14 02:09	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-111 (0-1)

Lab Sample ID: 490-66968-10
Date Collected: 11/20/14 16:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		2	0.513 g	100 mL	214620	12/16/14 21:26	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-110 (0-1)

Lab Sample ID: 490-66968-11
Date Collected: 11/20/14 16:55
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 74.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.513 g	100 mL	209679	11/27/14 02:14	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104A (0-1)

Lab Sample ID: 490-66968-14
Date Collected: 11/20/14 14:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 76.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.507 g	100 mL	214620	12/16/14 21:31	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-104A (1-2)

Lab Sample ID: 490-66968-15
Date Collected: 11/20/14 14:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.500 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.500 g	100 mL	219309	01/09/15 04:19	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Client Sample ID: SS-104A (2-3)

Lab Sample ID: 490-66968-16
Date Collected: 11/20/14 14:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	220080	01/13/15 15:04	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.505 g	100 mL	225094	02/03/15 15:05	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			220040	01/13/15 13:34	RRS	TAL NSH

Client Sample ID: SS-105A (0-1)

Lab Sample ID: 490-66968-17
Date Collected: 11/20/14 14:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.506 g	100 mL	214620	12/16/14 21:36	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-107 (0-1)

Lab Sample ID: 490-66968-20
Date Collected: 11/20/14 15:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 75.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.519 g	100 mL	209679	11/27/14 02:20	CME	TAL NSH
Total/NA	Prep	3051A			0.519 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.519 g	100 mL	209947	11/28/14 16:54	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-108 (0-1)

Lab Sample ID: 490-66968-22
Date Collected: 11/20/14 15:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 76.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.518 g	100 mL	209947	11/28/14 17:11	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-108 (1-2)

Lab Sample ID: 490-66968-23
Date Collected: 11/20/14 15:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 80.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.523 g	100 mL	214620	12/16/14 21:41	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-103 (0-1)

Lab Sample ID: 490-66968-27
Date Collected: 11/20/14 13:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.504 g	100 mL	209679	11/27/14 02:42	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-106 (0-1)

Lab Sample ID: 490-66968-30
Date Collected: 11/20/14 13:15
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.504 g	100 mL	210236	11/29/14 14:45	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-106 (1-2)

Lab Sample ID: 490-66968-31
Date Collected: 11/20/14 13:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.515 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.515 g	100 mL	214620	12/16/14 21:46	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-104 (0-1)

Lab Sample ID: 490-66968-32
Date Collected: 11/20/14 14:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 81.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.499 g	100 mL	209947	11/28/14 17:22	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-104 (1-2)

Lab Sample ID: 490-66968-33
Date Collected: 11/20/14 14:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 89.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.517 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.517 g	100 mL	214620	12/16/14 21:51	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-105 (0-1)

Lab Sample ID: 490-66968-35
Date Collected: 11/20/14 14:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	209679	11/27/14 02:59	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-105 (1-2)

Lab Sample ID: 490-66968-36
Date Collected: 11/20/14 14:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.511 g	100 mL	214620	12/16/14 22:07	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-100A (0-1)

Lab Sample ID: 490-66968-39
Date Collected: 11/20/14 11:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.511 g	100 mL	214620	12/16/14 22:12	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-100A (1-2)

Lab Sample ID: 490-66968-40
Date Collected: 11/20/14 11:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.514 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.514 g	100 mL	219309	01/09/15 05:15	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Client Sample ID: SS-102A (0-1)

Lab Sample ID: 490-66968-45
Date Collected: 11/20/14 12:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.525 g	100 mL	214620	12/16/14 22:17	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-100 (0-1)

Lab Sample ID: 490-66968-50
Date Collected: 11/20/14 10:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.513 g	100 mL	209947	11/28/14 17:28	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-100 (1-2)

Lab Sample ID: 490-66968-51
Date Collected: 11/20/14 10:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 78.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	213724	12/12/14 15:02	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.524 g	100 mL	214620	12/16/14 22:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-102 (0-1)

Lab Sample ID: 490-66968-53
Date Collected: 11/20/14 10:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.512 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.512 g	100 mL	209679	11/27/14 03:10	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-102 (1-2)

Lab Sample ID: 490-66968-54
Date Collected: 11/20/14 10:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.518 g	100 mL	214620	12/16/14 23:39	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-97 (0-1)

Lab Sample ID: 490-66968-60
Date Collected: 11/20/14 09:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.513 g	100 mL	209679	11/27/14 03:16	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-97 (1-2)

Lab Sample ID: 490-66968-61
Date Collected: 11/20/14 09:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.512 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.512 g	100 mL	214620	12/16/14 23:54	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-98 (0-1)

Lab Sample ID: 490-66968-63
Date Collected: 11/20/14 09:15
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.519 g	100 mL	209679	11/27/14 01:41	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-99 (0-1)

Lab Sample ID: 490-66968-66
Date Collected: 11/20/14 09:45
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 86.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	209679	11/27/14 03:21	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-101 (0-1)

Lab Sample ID: 490-66968-69
Date Collected: 11/20/14 10:00
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.9

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.496 g	100 mL	209679	11/27/14 03:27	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-68 (0-1)

Lab Sample ID: 490-66968-72
Date Collected: 11/21/14 10:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 82.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.525 g	100 mL	209679	11/27/14 03:44	CME	TAL NSH
Total/NA	Prep	3051A			0.525 g	100 mL	209453	11/26/14 13:40	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.525 g	100 mL	209947	11/28/14 17:33	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-69 (0-1)

Lab Sample ID: 490-66968-75
Date Collected: 11/21/14 11:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 86.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	209947	11/28/14 18:07	CME	TAL NSH
Total/NA	Prep	3051A			0.501 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.501 g	100 mL	210236	11/29/14 13:28	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-69 (1-2)

Lab Sample ID: 490-66968-76
Date Collected: 11/21/14 11:10
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 90.5

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.511 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.511 g	100 mL	214620	12/16/14 23:59	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-70 (0-1)

Lab Sample ID: 490-66968-78
Date Collected: 11/21/14 11:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.523 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.523 g	100 mL	209947	11/28/14 18:34	CME	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-70 (0-1)

Lab Sample ID: 490-66968-78
Date Collected: 11/21/14 11:20
Matrix: Soil
Date Received: 11/21/14 15:50

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-75 (0-1)

Lab Sample ID: 490-66968-83
Date Collected: 11/21/14 12:41
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 69.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.504 g	100 mL	209947	11/28/14 18:40	CME	TAL NSH
Total/NA	Prep	3051A			0.504 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		100	0.504 g	100 mL	210236	11/29/14 13:59	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-75 (1-2)

Lab Sample ID: 490-66968-84
Date Collected: 11/21/14 12:42
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 74.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.516 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.516 g	100 mL	214620	12/17/14 00:04	JBD	TAL NSH
Total/NA	Prep	3051A			0.516 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.516 g	100 mL	214816	12/17/14 12:22	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-75 (2-3)

Lab Sample ID: 490-66968-85
Date Collected: 11/21/14 12:43
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 79.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.520 g	100 mL	220080	01/13/15 15:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.520 g	100 mL	225094	02/03/15 15:11	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			220040	01/13/15 13:34	RRS	TAL NSH

Client Sample ID: SS-75 (3-4)

Lab Sample ID: 490-66968-86
Date Collected: 11/21/14 12:44
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 78.3

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.516 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.516 g	100 mL	219309	01/09/15 05:10	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: DUP-14

Lab Sample ID: 490-66968-88
Date Collected: 11/20/14 01:01
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 84.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.524 g	100 mL	209947	11/28/14 18:46	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: DUP-15

Lab Sample ID: 490-66968-89
Date Collected: 11/21/14 01:01
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 77.6

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.508 g	100 mL	209947	11/28/14 19:02	CME	TAL NSH
Total/NA	Prep	3051A			0.508 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.508 g	100 mL	210236	11/29/14 14:19	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-69A (0-1)

Lab Sample ID: 490-66968-91
Date Collected: 11/21/14 11:50
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 85.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.503 g	100 mL	214620	12/17/14 00:09	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-69A (1-2)

Lab Sample ID: 490-66968-92
Date Collected: 11/21/14 11:55
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 89.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.503 g	100 mL	219309	01/09/15 04:54	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Client Sample ID: SS-73 (0-1)

Lab Sample ID: 490-66968-94
Date Collected: 11/21/14 12:05
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 91.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.505 g	100 mL	209947	11/28/14 19:13	CME	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Client Sample ID: SS-74 (0-1)

Lab Sample ID: 490-66968-97
Date Collected: 11/21/14 12:20
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 86.4

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.498 g	100 mL	209947	11/28/14 19:08	CME	TAL NSH
Total/NA	Prep	3051A			0.498 g	100 mL	209544	11/26/14 17:07	NJB	TAL NSH
Total/NA	Analysis	6020		10	0.498 g	100 mL	210236	11/29/14 14:25	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			208620	11/24/14 09:27	RRS	TAL NSH

Client Sample ID: SS-74 (1-2)

Lab Sample ID: 490-66968-98
Date Collected: 11/21/14 12:25
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 75.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.520 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.520 g	100 mL	214620	12/17/14 00:15	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-74 (2-3)

Lab Sample ID: 490-66968-99
Date Collected: 11/21/14 12:30
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 73.7

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	214127	12/15/14 10:45	NJB	TAL NSH
Total/NA	Analysis	6020		5	0.525 g	100 mL	214620	12/17/14 00:20	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			211302	12/04/14 11:35	RRS	TAL NSH

Client Sample ID: SS-74 (3-4)

Lab Sample ID: 490-66968-100
Date Collected: 11/21/14 12:35
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.2

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	218559	01/06/15 11:45	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.509 g	100 mL	219309	01/09/15 04:49	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			218304	01/05/15 11:32	RRS	TAL NSH

Client Sample ID: SS-74 (4-5)

Lab Sample ID: 490-66968-101
Date Collected: 11/21/14 12:40
Matrix: Soil
Date Received: 11/21/14 15:50
Percent Solids: 83.1

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	220080	01/13/15 15:04	NJB	TAL NSH
Total/NA	Analysis	6020		1	0.501 g	100 mL	225094	02/03/15 15:16	JBD	TAL NSH
Total/NA	Analysis	Moisture		1			220040	01/13/15 13:34	RRS	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Method	Method Description	Protocol	Laboratory
6020	Metals (ICP/MS)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore CSM NA

TestAmerica Job ID: 490-66968-1
SDG: UMI.001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-15
Arkansas DEQ	State Program	6	88-0737	04-25-15
California	NELAP	9	1168CA	10-31-14 *
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	03-31-15 *
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-15
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-29-15
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-15
South Carolina (DW)	State Program	4	84009 (002)	02-23-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-15
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-66968-01 Chain of Custody

Cooler Received/Opened On 11.21.14 @ 1550

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 2.4 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where:

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) MDM

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (intial) MDM

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) MDM

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) MDM

I certify that I attached a label with the unique LIMS number to each container (intial) MDM

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#

BIS = Broken in shipment

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
66968

COOLER RECEIPT FORM

Cooler Received/Opened On 11.21.14@ 1550

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 1.9 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO..NA

4. Were custody seals on outside of cooler? YES..NO..NA

   If yes, how many and where:

5. Were the seals intact, signed, and dated correctly? YES...NO..NA

6. Were custody papers inside cooler? YES..NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) mom

7. Were custody seals on containers: YES NO and Intact YES...NO..NA

   Were these signed and dated correctly? YES...NO..NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES..NO...NA

12. Did all container labels and tags agree with custody papers? YES..NO...NA

13a. Were VOA vials received? YES..NO..NA

   b. Was there any observable headspace present in any VOA vial? YES...NO..NA

14. Was there a Trip Blank in this cooler? YES...NO..NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (intial) mom

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

   b. Did the bottle labels indicate that the correct preservatives were used YES...NO..NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) mom

17. Were custody papers properly filled out (ink, signed, etc)? YES..NO...NA

18. Did you sign the custody papers in the appropriate place? YES..NO...NA

19. Were correct containers used for the analysis requested? YES..NO...NA

20. Was sufficient amount of sample sent in each container? YES..NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) mom

I certify that I attached a label with the unique LIMS number to each container (intial) mom

21. Were there Non-Conformance issues at login? YES..NO Was a NCM generated? YES..NO..#

BIS = Broken in shipment

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

Loc: 490
66968

COOLER RECEIPT FORM

Cooler Received/Opened On 11-21-14 @ 1550

1. Tracking # N/A (last 4 digits, FedEx)

Courier: Client IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 2.6 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO..NA

4. Were custody seals on outside of cooler? YES..NO..NA

   If yes, how many and where:

5. Were the seals intact, signed, and dated correctly? YES...NO..NA

6. Were custody papers inside cooler? YES..NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) MDM

7. Were custody seals on containers: YES NO and Intact YES...NO..NA

   Were these signed and dated correctly? YES...NO..NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES..NO...NA

12. Did all container labels and tags agree with custody papers? YES..NO...NA

13a. Were VOA vials received? YES..NO..NA

   b. Was there any observable headspace present in any VOA vial? YES...NO..NA

14. Was there a Trip Blank in this cooler? YES...NO..NA If multiple coolers, sequence #

I certify that I unloaded the cooler and answered questions 7-14 (intial) MDM

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

   b. Did the bottle labels indicate that the correct preservatives were used YES...NO..NA

16. Was residual chlorine present? YES...NO..NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) MDM

17. Were custody papers properly filled out (ink, signed, etc)? YES..NO...NA

18. Did you sign the custody papers in the appropriate place? YES..NO...NA

19. Were correct containers used for the analysis requested? YES..NO...NA

20. Was sufficient amount of sample sent in each container? YES..NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) MDM

I certify that I attached a label with the unique LIMS number to each container (intial) MDM

21. Were there Non-Conformance issues at login? YES..NO Was a NCM generated? YES..NO..#

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart + Hickman	Shannon Cottrill		281067
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 9**
2923 S Tryon St. Suite 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McCree	Ken Hayes

Project Name and Location (State): 11MI.001 Arab AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: 49004741

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: Co	Mn	Special Instructions/ Conditions of Receipt	
SS-107A (1-2)	11/20/14	15:35				X							X	X	HOLD	-1
SS-108A (0-1)	↓	15:40				↓							↓	↓	HOLD	2
SS-108A (1-1.5)		15:45													HOLD	3
SS-109 (0-1)		15:50											X			4
SS-109 (1-2)		15:55													HOLD	5
SS-109A (0-1)		16:00													HOLD	6
SS-109A (1-1.75)		16:05													HOLD	7
SS-111A (0-1)		16:30													HOLD	8
SS-111A (1-2)		16:35													HOLD	9
SS-111 (0-1)		16:40													HOLD	10
SS-110 (0-1)		16:55														11
SS-110A (0-1)	↓	17:00				↓							↓		HOLD	12

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Return for 6 months

	Date	Time		Date	Time
1. Relinquished By: Ralph McCree	11/21/14	1315	1. Received By: Charlie Alexander		
2. Relinquished By			2. Received By: TAN	11/21/14	1550
3. Relinquished By			3. Received By: TAN	11/21/14	1550

Comments: 2.6/1.9/2.4c

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

TAL-4124 (1007)

Client: Hart+Hickman	Project Manager: Shannon Cottrill	Date	Chain of Custody Number: 281068
Address: 2923 S Tryon St Suite 100	Telephone Number (Area Code)/Fax Number: 704-586-0007	Lab Number	Page 2 of 9
City: Charlotte; State: NC; Zip Code: 28203	Site Contact	Lab Contact	
Project Name and Location (State): UMI.001 Crab AL	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.: 49004741			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Co	Mn	Special Instructions/ Conditions of Receipt	
SS-105 (2-3)	11/20/14	14:30				X							X		HOLD	13
SS-104A (0-1)		14:35													HOLD	14
SS-104A (1-2)		14:40													HOLD	15
SS-104A (2-3)		14:45													HOLD	16
SS-105A (0-1)		14:50													HOLD	17
SS-105A (1-2)		14:55													HOLD	18
SS-105A (2-3)		15:00													HOLD	19
SS-107 (0-1)		15:10												X		20
SS-107 (1-2)		15:15												X	HOLD	21
SS-108 (0-1)		15:20												X		22
SS-108 (1-2)		15:25												X	HOLD	23
SS-107A (0-1)		15:30												X	HOLD	24

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

	Date	Time		Date	Time
1. Relinquished By: [signature]	11/21/14	1315	1. Received By: Charlie Alexander		
2. Relinquished By			2. Received By: [signature] 11/AN	11/21/14	1550
3. Relinquished By			3. Received By		

Comments: 2.6/1.9/2.4

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

TAL-4124 (1007)

Client: Hart+Hickman	Project Manager: Shannon Cottrill	Date:	Chain of Custody Number: 281072
Address: 2923 S. Tryon St, Suite 100	Telephone Number (Area Code)/Fax Number: 704-586-0007	Lab Number:	Page 3 of 9
City: Charlotte; State: NC; Zip Code: 28203	Site Contact:	Lab Contact:	
Project Name and Location (State): UMI.001, Arab AL	Carrier/Waybill Number:		
Contract/Purchase Order/Quote No.: 49004741			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	CO	MS	Special Instructions/ Conditions of Receipt	
SS-101B (1-2)	11/20/14	12:30				X							X	X	HOLD	25
SS-101B (2-3)		12:35												X	HOLD	26
SS-103 (0-1)		13:00														27
SS-103 (1-2)		13:05													HOLD	28
SS-103 (2-3)		13:10													HOLD	29
SS-106 (0-1)		13:15												X		30
SS-106 (1-2)		13:20												X	HOLD	31
SS-104 (0-1)		14:05														32
SS-104 (1-2)		14:10													HOLD	33
SS-104 (2-3)		14:15													HOLD	34
SS-105 (0-1)		14:20														35
SS-105 (1-2)		14:25													HOLD	36

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

1. Relinquished By: Kyle M	Date: 11/21/14	Time: 1315	1. Received By: Charlie Alexander	Date:	Time:
2. Relinquished By:	Date:	Time:	2. Received By: MAN	Date: 11/21/14	Time: 1550
3. Relinquished By:	Date:	Time:	3. Received By:	Date: 11.21.14	Time: 1550

Comments: 2.4/1.9/2.4.

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

Client: Hart+Hickman	Project Manager: Shannon Cottrill	Date:	Chain of Custody Number: 281070
Address: 2923 S Tryon St, Suite 100	Telephone Number (Area Code)/Fax Number: 704-586-0007	Lab Number:	Page 4 of 9
City: Charlotte; State: NC; Zip Code: 28203	Site Contact:	Lab Contact:	
Project Name and Location (State): UMI.001, Arab AL	Carrier/Waybill Number:		
Contract/Purchase Order/Quote No.: 49004741			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Co	Mn										Special Instructions/ Conditions of Receipt	
SS-99A (1-2)	11/20/14	11:30				X								X	X										HOLD	37
SS-99A (2-3)		11:35																								38
SS-100A (0-1)		11:40																								39
SS-100A (1-2)		11:45																								40
SS-100A (2-3)		11:50																								41
SS-101A (0-1)		11:55																								42
SS-101A (1-2)		12:00																								43
SS-101A (2-3)		12:05																								44
SS-102A (0-1)		12:10											X	X												45
SS-102A (1-2)		12:15											X	X												46
SS-102A (2-3)		12:20											X	X												47 ✓
SS-101B (0-1)		12:25											X	X	X											48

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

	Date	Time		Date	Time
1. Relinquished By: [signature]	11/21/14	1315	1. Received By: Charlie Alexander		
2. Relinquished By:			2. Received By: [signature] TAU	11/21/14	1550
3. Relinquished By:			3. Received By: [signature]	11.21.14	1550

Comments: 2.4/1.9/2.4

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

Client Information	Sampler:	Lab PM: Hayes, Ken	Carrier Tracking No(s):	COC No: 490-31101-11113.1
Client Contact: Mr. Shannon Cottrill	Phone: 704 618 1314	E-Mail: ken.hayes@testamericainc.com		Page: Page 1 of 1
Company: Hart & Hickman, PC				Job #:
Address: 2923 S Tryon Street Suite 100	Due Date Requested:			
City: Charlotte	TAT Requested (days):			
State, Zip: NC, 28203				
Phone: 704-586-0007(Tel)	PO #: Purchase Order not required			
Email: scottrill@harthickman.com	WO #:			
Project Name: Arab AL	Project #: 49004741			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B - (MOD) Copy Analytes	Co	Mn	Total Number of containers	Special Instructions/Note:	
			Preservation Code:				D					
SS-101 (2-3)	11/20/14	10:10		S ~~Water~~				X	X		HOLD	49
SS-100 (0-1)		10:20		S ~~Water~~								50
SS-100 (1-2)		10:25		S ~~Water~~							HOLD	51
SS-100 (2-3)		10:30		S ~~Water~~							HOLD	52
SS-102 (0-1)		10:35						X				53
SS-102 (1-2)		10:40						X			HOLD	54
SS-102 (2-3)		10:45						X			HOLD	55
SS-98A (0-1)		11:00							X		HOLD	56
SS-98A (1-2)		11:05									HOLD	57
SS-98A (2-3)		11:10									HOLD	58
SS-99A (0-1)		11:25									HOLD	59

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown ☐ Radiological

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return To Client ☑ Disposal By Lab ☒ Archive For 6 Months

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: Retain Samples for 6 months

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 11/21/14 1315	Company HHH	Received by:	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 11/21/14 1550	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 11.21.14 @ 155	Company TAN
Custody Seals Intact: Δ Yes Δ No	Custody Seal No.:		Cooler Temperature(s) °C and Other Remarks: 2.6/1.9/2.4c		

TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Phone (615) 726-0177 Fax (615) 726-3404

Chain of Custody Record

TestAmerica

Loc: 490
66968

Client Information	Sampler:	Lab PM: Hayes, Ken	Carrier Tracking No(s):	COC No: 490-31101-11113.1
Client Contact: Mr. Shannon Cottrill	Phone:	E-Mail: ken.hayes@testamericainc.com		Page: Page 6 of 9
Company: Hart & Hickman, PC				Job #:
Address: 2923 S Tryon Street Suite 100	Due Date Requested:			
City: Charlotte	TAT Requested (days):			
State, Zip: NC, 28203				
Phone: 704-586-0007(Tel)	PO #: Purchase Order not required			
Email: scottrill@harthickman.com	WO #:			
Project Name: Arab AL	Project #: 49004741			
Site:	SSOW#:			

Analysis Requested

Preservation Codes:
A - HCL, B - NaOH, C - Zn Acetate, D - Nitric Acid, E - NaHSO4, F - MeOH, G - Amchlor, H - Ascorbic Acid, I - Ice, J - DI Water, K - EDTA, L - EDA
M - Hexane, N - None, O - AsNaO2, P - Na2O4S, Q - Na2SO3, R - Na2S2SO3, S - H2SO4, T - TSP Dodecahydrate, U - Acetone, V - MCAA, W - ph 4-5, Z - other (specify)
Other:

Sample Identification	Sample Date	Sample Time	Sample Type (C=comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	Field Filtered Sample (Yes or No)	Perform MS/MSD (Yes or No)	6010B - (MOD) Copy Analytes	Co	Mn	Total Number of containers	Special Instructions/Note:	
				Preservation Code:								
SS-97 (0-1)	11/20/14	9:00		S ~~Water~~				X	X			60
SS-97 (1-2)		9:05		S ~~Water~~							HOLD	61
SS-97 (2-3)		9:10		S ~~Water~~							HOLD	62
SS-98 (0-1)		9:15		S ~~Water~~								63
SS-98 (1-2)		9:20		S							HOLD	64
SS-98 (2-3)		9:25									HOLD	65
SS-99 (0-1)		9:45										66
SS-99 (1-2)		9:50									HOLD	67
SS-99 (2-3)		9:55									HOLD	68
SS-101 (0-1)		10:00										69
SS-101 (1-2)		10:05									HOLD	70

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* ☐ *Poison B* ☒ *Unknown* ☐ *Radiological*

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☒ *Disposal By Lab* ☐ *Archive For* _____ *Months*

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements: Return Sample for 6 months

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:		
Relinquished by:	Date/Time: 11/21/14	Company: HH	Received by: Charlie Alexander (TAN)	Date/Time:	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 11/21/14 1550	Company
Relinquished by:	Date/Time:	Company	Received by:	Date/Time: 11.21.14 @1550	Company: TAN

Custody Seals Intact: Δ Yes Δ No
Custody Seal No.:
Cooler Temperature(s) °C and Other Remarks: 2.6/1.9/2.4c

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart Hickman, PC			281079
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 7 of 9
City / State / Zip Code	Site Contact / Lab Contact		
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Analysis (Attach list if more space is needed): Co, Cd

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Co	Cd	Special Instructions/ Conditions of Receipt	
SS-110A (1-1.5)	11/20/14	17:05				X							X		HOLD	71
SS-68 (0-1)	11/21/14	10:50												X		72
SS-68 (1-2)		10:55													HOLD	73
SS-68 (2-3)		11:00													HOLD	74
SS-69 (0-1)		11:05														75
SS-69 (1-2)		11:10													HOLD	76
SS-69 (2-3)		11:15													HOLD	77
SS-70 (0-1)		11:20														78
SS-70 (1-2)		11:25													HOLD	79
SS-70 (2-3)		11:30													HOLD	80
SS-68A (0-1)		11:35													HOLD	81
SS-68A (1-2)		11:40													HOLD	82

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 Months

	Date	Time		Date	Time
1. Relinquished By: Kyle M. A	11/21/14	1315	1. Received By: Charles Alexander		
2. Relinquished By			2. Received By: TAN	11/21/14	1550
3. Relinquished By			3. Received By: TAN	11.21.14	1550

Comments

2.6 / 1.9 / 2.4

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

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Loc: 490
66968

Client: Hent + Hickman	Project Manager	Date	Chain of Custody Number: 281081
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 8 of 9
City / State / Zip Code	Site Contact	Lab Contact	
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Co	Cd	Ni	Mn	Special Instructions/ Conditions of Receipt	
SS-75 (0-1)	11/21/14	12:41				X							X	X	X	X		83
SS-75 (1-2)	↓	12:42				↓							↓	↓	↓	↓	HOLD	84
SS-75 (2-3)	↓	12:43				↓							↓	↓	↓	↓	HOLD	85
SS-75 (3-4)	↓	12:44				↓							↓	↓	↓	↓	HOLD	86
SS-75 (4-5)	↓	12:45				↓							↓	↓	↓	↓	HOLD	87
DUP-14	11/20/14	NA				X							X			X		88
DUP-15	11/21/14	NA				X							X	X	X	X		89

Analysis (Attach list if more space is needed)

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify): Retain for 6 months

	Date	Time		Date	Time
1. Relinquished By: RLRMA	11/21/14	1315	1. Received By: Charlie Alexander		
2. Relinquished By			2. Received By: TMAN	11/21/14	1550
3. Relinquished By			3. Received By: Tran	11-21-14	1550

Comments

2.4/1.9/24c

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes☐ No☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490
66968

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hent + Hickman			281080
Address	Telephone Number (Area Code)/Fax Number	Lab Number	Page 9 of 9
City / State / Zip Code	Site Contact / Lab Contact		
Project Name and Location (State)	Carrier/Waybill Number		
Contract/Purchase Order/Quote No.			

Analysis (Attach list if more space is needed)

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Co	Cd	Mn	Ni	Special Instructions/ Conditions of Receipt	
SS-68A (2-3)	11/21/14	11:45				X							X	X			HOLD	90
SS-69A (0-1)	↓	11:50				↓							↓	↓			HOLD	91
SS-69A (1-2)		11:55															HOLD	92
SS-69A (2-3)		12:00															HOLD	93
SS-73 (0-1)		12:05											X					94
SS-73 (1-2)		12:10											X				HOLD	95
SS-73 (2-3)		12:15											X				HOLD	96
SS-74 (0-1)		12:20											X	X	X	X		97
SS-74 (1-2)		12:25															HOLD	98
SS-74 (2-3)		12:30															HOLD	99 ✓
SS-74 (3-4)		12:35															HOLD	100
SS-74 (4-5)	↓	12:40				↓							↓	↓	↓	↓	HOLD	101

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal
☐ Return To Client ☒ Disposal By Lab ☒ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required
☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other_____

QC Requirements (Specify) → Return for 6 months

	Date	Time		Date	Time
1. Relinquished By: Ralph M'A	11/21/14	1315	1. Received By: Charlie Alyank		
2. Relinquished By			2. Received By: TAN	11/21/14	1550
3. Relinquished By			3. Received By: TAN	11-21-14	1550

Comments

2.4/1.9/2.4c

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-66968-1
SDG Number: UMI.001

Login Number: 66968
List Number: 1
Creator: McBride, Mike

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	N/A	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.6/1.9/2.4
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	True	

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-79027-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore - AL

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
5/29/2015 4:14:10 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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Have a Question? Ask The Expert

Visit us at: www.testamericainc.com

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-79027-1	Rinse Blank	Water	05/20/15 13:15	05/22/15 08:30
490-79027-2	IDW Soil 20150520	Solid	05/20/15 13:45	05/22/15 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Job ID: 490-79027-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-79027-1

Comments
No additional comments.

Receipt
The samples were received on 5/22/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 3.5º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Client Sample ID: Rinse Blank

Lab Sample ID: 490-79027-1

Date Collected: 05/20/15 13:15
Date Received: 05/22/15 08:30

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		05/26/15 13:53	05/27/15 12:48	1
Cobalt	ND		0.0100		mg/L		05/26/15 13:53	05/27/15 12:48	1
Manganese	ND		0.0150		mg/L		05/26/15 13:53	05/27/15 12:48	1
Nickel	ND		0.0100		mg/L		05/26/15 13:53	05/27/15 12:48	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Client Sample ID: IDW Soil 20150520

Date Collected: 05/20/15 13:45
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79027-2

Matrix: Solid
Percent Solids: 87.5

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	**180**		2.28		mg/Kg	☼	05/26/15 09:23	05/26/15 17:11	1
Nickel	**210**		2.28		mg/Kg	☼	05/26/15 09:23	05/26/15 17:11	1
Manganese	**202**		3.41		mg/Kg	☼	05/26/15 09:23	05/26/15 17:11	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
As	ND		0.500		mg/L		05/26/15 16:34	05/27/15 19:47	1
Ba	ND		10.0		mg/L		05/26/15 16:34	05/27/15 19:47	1
Cd	**0.325**		0.100		mg/L		05/26/15 16:34	05/27/15 19:47	1
Cr	ND		0.500		mg/L		05/26/15 16:34	05/27/15 19:47	1
Pb	ND		0.500		mg/L		05/26/15 16:34	05/27/15 19:47	1
Se	ND		0.100		mg/L		05/26/15 16:34	05/27/15 19:47	1
Ag	ND		0.500		mg/L		05/26/15 16:34	05/27/15 19:47	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		05/27/15 08:06	05/27/15 14:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**88**		0.10		%			05/22/15 16:55	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 490-251010/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		1.95		mg/Kg		05/26/15 09:23	05/26/15 16:21	1
Manganese	ND		2.92		mg/Kg		05/26/15 09:23	05/26/15 16:21	1
Nickel	ND		1.95		mg/Kg		05/26/15 09:23	05/26/15 16:21	1

Lab Sample ID: LCS 490-251010/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	201	212.4		mg/Kg		106	80 - 120
Manganese	201	207.8		mg/Kg		104	80 - 120
Nickel	201	209.4		mg/Kg		104	80 - 120

Lab Sample ID: 490-79044-A-37-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	32.7		239	289.1		mg/Kg	☼	107	75 - 125
Manganese	41.7		239	283.2		mg/Kg	☼	101	75 - 125
Nickel	38.0		239	292.7		mg/Kg	☼	106	75 - 125

Lab Sample ID: 490-79044-A-37-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	32.7		237	261.2		mg/Kg	☼	96	75 - 125	10	20
Manganese	41.7		237	256.7		mg/Kg	☼	91	75 - 125	10	20
Nickel	38.0		237	263.8		mg/Kg	☼	95	75 - 125	10	20

Lab Sample ID: MB 490-251158/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.0100		mg/L		05/26/15 13:53	05/27/15 11:16	1
Cadmium	ND		0.00100		mg/L		05/26/15 13:53	05/27/15 11:16	1
Manganese	ND		0.0150		mg/L		05/26/15 13:53	05/27/15 11:16	1
Nickel	ND		0.0100		mg/L		05/26/15 13:53	05/27/15 11:16	1

Lab Sample ID: LCS 490-251158/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	0.500	0.5442		mg/L		109	80 - 120
Cadmium	0.0500	0.05240		mg/L		105	80 - 120
Manganese	0.500	0.5135		mg/L		103	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 490-251158/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Nickel	0.500	0.5405		mg/L		108	80 - 120

Lab Sample ID: LCSD 490-251158/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	0.500	0.5433		mg/L		109	80 - 120	0	20
Cadmium	0.0500	0.05230		mg/L		105	80 - 120	0	20
Manganese	0.500	0.5139		mg/L		103	80 - 120	0	20
Nickel	0.500	0.5393		mg/L		108	80 - 120	0	20

Lab Sample ID: 490-78889-B-1-B MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	ND		0.500	0.5319		mg/L		106	75 - 125
Cadmium	ND		0.0500	0.05110		mg/L		102	75 - 125
Manganese	ND		0.500	0.5175		mg/L		104	75 - 125
Nickel	ND		0.500	0.5305		mg/L		106	75 - 125

Lab Sample ID: 490-78889-B-1-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 251511 — **Prep Batch: 251158**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	ND		0.500	0.5425		mg/L		109	75 - 125	2	20
Cadmium	ND		0.0500	0.05210		mg/L		104	75 - 125	2	20
Manganese	ND		0.500	0.5065		mg/L		101	75 - 125	2	20
Nickel	ND		0.500	0.5373		mg/L		107	75 - 125	1	20

Lab Sample ID: MB 490-251215/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
As	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:37	1
Ba	ND		10.0		mg/L		05/26/15 16:34	05/27/15 18:37	1
Cd	ND		0.100		mg/L		05/26/15 16:34	05/27/15 18:37	1
Cr	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:37	1
Pb	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:37	1
Se	ND		0.100		mg/L		05/26/15 16:34	05/27/15 18:37	1
Ag	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:37	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 490-251215/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
As	2.00	1.966		mg/L		98	80 - 120
Ba	20.0	21.31		mg/L		107	80 - 120
Cd	2.00	1.985		mg/L		99	80 - 120
Cr	10.0	9.744		mg/L		97	80 - 120
Pb	10.0	10.49		mg/L		105	80 - 120
Se	2.00	1.948		mg/L		97	80 - 120
Ag	2.00	2.020		mg/L		101	80 - 120

Lab Sample ID: LCSD 490-251215/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
As	2.00	1.965		mg/L		98	80 - 120	0	20
Ba	20.0	21.67		mg/L		108	80 - 120	2	20
Cd	2.00	2.017		mg/L		101	80 - 120	2	20
Cr	10.0	9.990		mg/L		100	80 - 120	2	20
Pb	10.0	10.68		mg/L		107	80 - 120	2	20
Se	2.00	2.009		mg/L		100	80 - 120	3	20
Ag	2.00	2.078		mg/L		104	80 - 120	3	20

Lab Sample ID: MB 490-250761/1-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
As	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:49	1
Ba	ND		10.0		mg/L		05/26/15 16:34	05/27/15 18:49	1
Cd	ND		0.100		mg/L		05/26/15 16:34	05/27/15 18:49	1
Cr	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:49	1
Pb	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:49	1
Se	ND		0.100		mg/L		05/26/15 16:34	05/27/15 18:49	1
Ag	ND		0.500		mg/L		05/26/15 16:34	05/27/15 18:49	1

Lab Sample ID: 490-79024-A-1-C MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
As	ND		2.00	2.085		mg/L		104	75 - 125
Ba	ND		20.0	22.88		mg/L		112	75 - 125
Cd	ND		2.00	2.079		mg/L		104	75 - 125
Cr	ND		10.0	10.33		mg/L		103	75 - 125
Pb	ND		10.0	11.00		mg/L		109	75 - 125
Se	ND		2.00	2.091		mg/L		105	75 - 125
Ag	ND		2.00	2.127		mg/L		105	75 - 125

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 490-79024-A-1-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251613 — **Prep Batch: 251215**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
As	ND		2.00	1.993		mg/L		100	75 - 125	5	20
Ba	ND		20.0	21.92		mg/L		108	75 - 125	4	20
Cd	ND		2.00	2.001		mg/L		100	75 - 125	4	20
Cr	ND		10.0	9.900		mg/L		99	75 - 125	4	20
Pb	ND		10.0	10.57		mg/L		105	75 - 125	4	20
Se	ND		2.00	2.048		mg/L		102	75 - 125	2	20
Ag	ND		2.00	2.080		mg/L		103	75 - 125	2	20

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 490-251260/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		05/27/15 08:06	05/27/15 13:19	1

Lab Sample ID: LCS 490-251260/3-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.0200	0.01980		mg/L		99	80 - 120

Lab Sample ID: LCSD 490-251260/4-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	0.0200	0.01835		mg/L		92	80 - 120	8	20

Lab Sample ID: MB 490-250759/1-F — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		05/27/15 08:06	05/27/15 13:22	1

Lab Sample ID: MB 490-250760/1-D — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		05/27/15 08:06	05/27/15 14:13	1

Method: 7470A - Mercury (CVAA) (Continued)

Lab Sample ID: MB 490-250761/1-C — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		05/27/15 08:06	05/27/15 14:16	1

Lab Sample ID: 490-78962-A-1-N MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Mercury	ND		0.0200	0.01904		mg/L		95	75 - 125		

Lab Sample ID: 490-78962-A-1-O MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 251496 — **Prep Batch: 251260**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.0200	0.01867		mg/L		93	75 - 125	2	20

Method: Moisture - Percent Moisture

Lab Sample ID: 280-69674-D-4 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	80			80		%				0	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Metals

Leach Batch: 250759

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78962-A-1-N MS	Matrix Spike	TCLP	Solid	1311	
490-78962-A-1-O MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
MB 490-250759/1-F	Method Blank	TCLP	Solid	1311	

Leach Batch: 250760

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-250760/1-D	Method Blank	TCLP	Solid	1311	

Leach Batch: 250761

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79024-A-1-C MS	Matrix Spike	TCLP	Solid	1311	
490-79024-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
490-79027-2	IDW Soil 20150520	TCLP	Solid	1311	
MB 490-250761/1-B	Method Blank	TCLP	Solid	1311	
MB 490-250761/1-C	Method Blank	TCLP	Solid	1311	

Prep Batch: 251010

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79027-2	IDW Soil 20150520	Total/NA	Solid	3051A	
490-79044-A-37-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-79044-A-37-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
LCS 490-251010/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251010/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 251158

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78889-B-1-B MS	Matrix Spike	Total/NA	Water	3010A	
490-78889-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	
490-79027-1	Rinse Blank	Total/NA	Water	3010A	
LCS 490-251158/2-A	Lab Control Sample	Total/NA	Water	3010A	
LCSD 490-251158/3-A	Lab Control Sample Dup	Total/NA	Water	3010A	
MB 490-251158/1-A	Method Blank	Total/NA	Water	3010A	

Prep Batch: 251215

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79024-A-1-C MS	Matrix Spike	TCLP	Solid	3010A	250761
490-79024-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	3010A	250761
490-79027-2	IDW Soil 20150520	TCLP	Solid	3010A	250761
LCS 490-251215/2-A	Lab Control Sample	Total/NA	Solid	3010A	
LCSD 490-251215/3-A	Lab Control Sample Dup	Total/NA	Solid	3010A	
MB 490-250761/1-B	Method Blank	TCLP	Solid	3010A	250761
MB 490-251215/1-A	Method Blank	Total/NA	Solid	3010A	

Prep Batch: 251260

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78962-A-1-N MS	Matrix Spike	TCLP	Solid	7470A	250759
490-78962-A-1-O MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	250759
490-79027-2	IDW Soil 20150520	TCLP	Solid	7470A	250761
LCS 490-251260/3-A	Lab Control Sample	Total/NA	Solid	7470A	
LCSD 490-251260/4-A	Lab Control Sample Dup	Total/NA	Solid	7470A	
MB 490-250759/1-F	Method Blank	TCLP	Solid	7470A	250759

Metals (Continued)

Prep Batch: 251260 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-250760/1-D	Method Blank	TCLP	Solid	7470A	250760
MB 490-250761/1-C	Method Blank	TCLP	Solid	7470A	250761
MB 490-251260/1-A	Method Blank	Total/NA	Solid	7470A	

Analysis Batch: 251269

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79027-2	IDW Soil 20150520	Total/NA	Solid	6010B	251010
490-79044-A-37-B MS	Matrix Spike	Total/NA	Solid	6010B	251010
490-79044-A-37-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6010B	251010
LCS 490-251010/2-A	Lab Control Sample	Total/NA	Solid	6010B	251010
MB 490-251010/1-A	Method Blank	Total/NA	Solid	6010B	251010

Analysis Batch: 251496

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78962-A-1-N MS	Matrix Spike	TCLP	Solid	7470A	251260
490-78962-A-1-O MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	251260
490-79027-2	IDW Soil 20150520	TCLP	Solid	7470A	251260
LCS 490-251260/3-A	Lab Control Sample	Total/NA	Solid	7470A	251260
LCSD 490-251260/4-A	Lab Control Sample Dup	Total/NA	Solid	7470A	251260
MB 490-250759/1-F	Method Blank	TCLP	Solid	7470A	251260
MB 490-250760/1-D	Method Blank	TCLP	Solid	7470A	251260
MB 490-250761/1-C	Method Blank	TCLP	Solid	7470A	251260
MB 490-251260/1-A	Method Blank	Total/NA	Solid	7470A	251260

Analysis Batch: 251511

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-78889-B-1-B MS	Matrix Spike	Total/NA	Water	6010B	251158
490-78889-B-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	6010B	251158
490-79027-1	Rinse Blank	Total/NA	Water	6010B	251158
LCS 490-251158/2-A	Lab Control Sample	Total/NA	Water	6010B	251158
LCSD 490-251158/3-A	Lab Control Sample Dup	Total/NA	Water	6010B	251158
MB 490-251158/1-A	Method Blank	Total/NA	Water	6010B	251158

Analysis Batch: 251613

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79024-A-1-C MS	Matrix Spike	TCLP	Solid	6010B	251215
490-79024-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	6010B	251215
490-79027-2	IDW Soil 20150520	TCLP	Solid	6010B	251215
LCS 490-251215/2-A	Lab Control Sample	Total/NA	Solid	6010B	251215
LCSD 490-251215/3-A	Lab Control Sample Dup	Total/NA	Solid	6010B	251215
MB 490-250761/1-B	Method Blank	TCLP	Solid	6010B	251215
MB 490-251215/1-A	Method Blank	Total/NA	Solid	6010B	251215

General Chemistry

Analysis Batch: 250659

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
280-69674-D-4 DU	Duplicate	Total/NA	Solid	Moisture	
490-79027-2	IDW Soil 20150520	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Client Sample ID: Rinse Blank

Lab Sample ID: 490-79027-1
Date Collected: 05/20/15 13:15
Matrix: Water
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	251158	05/26/15 13:53	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	251511	05/27/15 12:48	ADN	TAL NSH

Client Sample ID: IDW Soil 20150520

Lab Sample ID: 490-79027-2
Date Collected: 05/20/15 13:45
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			1.0 g	1.0 mL	250761	05/23/15 12:19	SJM	TAL NSH
TCLP	Prep	3010A			5 mL	50 mL	251215	05/26/15 16:34	ZLN	TAL NSH
TCLP	Analysis	6010B		1	5 mL	50 mL	251613	05/27/15 19:47	LEG	TAL NSH
Total/NA	Prep	3051A			0.502 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.502 g	100 mL	251269	05/26/15 17:11	LEG	TAL NSH
TCLP	Leach	1311			1.0 g	1.0 mL	250761	05/23/15 12:19	SJM	TAL NSH
TCLP	Prep	7470A			3 mL	30 mL	251260	05/27/15 08:06	NJB	TAL NSH
TCLP	Analysis	7470A		1	3 mL	30 mL	251496	05/27/15 14:18	RDF	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/22/15 16:55	MAA	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL NSH
7470A	Mercury (CVAA)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79027-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	05-31-15
Kentucky (UST)	State Program	4	19	06-30-15
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-15
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15
Virginia	NELAP	3	460152	06-14-15
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

490-79027 Chain of Custody

Cooler Received/Opened On 5/22/2015 @ 0830

1. Tracking # 68867 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 3.5 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

COC in another cooler

I certify that I opened the cooler and answered questions 1-6 (intial) MDM

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) MD

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) MD

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) MD

I certify that I attached a label with the unique LIMS number to each container (intial) MD

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281478
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page** 1 of 1
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McKee	Ken Hayes

Project Name and Location (State)	Carrier/Waybill Number
Umicore - AL	

Contract/Purchase Order/Quote No.: UMF-001

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis (Attach list if more space is needed): 6010*	TCLP Metals	Total Metals**	Special Instructions/ Conditions of Receipt
1 Rinse Blank	5/20/15	1315		X					X				X			*Cd, Co, Mn + Ni
2 IDW Soil 20150520	5/20/15	1345				X	X							X	X	** Co Mn + Ni only

Loc: 490
79027

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
[signature]	5/21/15	1100	[signature] FAN 3.5	5/22/15	0830
2. Relinquished By	Date	Time	2. Received By	Date	Time
3. Relinquished By	Date	Time	3. Received By	Date	Time

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

5/29/2015

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-79027-1
SDG Number: UMI-001

Login Number: 79027
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-81140-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore - Arab, Alabama

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
6/25/2015 3:39:35 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-81140-1	MW-1	Water	06/21/15 11:05	06/23/15 09:00
490-81140-2	MW-1D	Water	06/21/15 11:20	06/23/15 09:00
490-81140-3	MW-3R	Water	06/21/15 15:10	06/23/15 09:00
490-81140-4	MW-3D R	Water	06/21/15 14:55	06/23/15 09:00
490-81140-5	MW-10	Water	06/21/15 13:55	06/23/15 09:00
490-81140-6	MW-10D	Water	06/21/15 14:00	06/23/15 09:00
490-81140-7	MW-11	Water	06/21/15 12:30	06/23/15 09:00
490-81140-8	MW-11D	Water	06/21/15 12:35	06/23/15 09:00
490-81140-9	DUP-1 20150621	Water	06/21/15 00:01	06/23/15 09:00
490-81140-10	Rinse Tubing 06222015	Water	06/22/15 11:05	06/23/15 09:00
490-81140-11	Rinse Bladder 06222015	Water	06/22/15 11:10	06/23/15 09:00

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Job ID: 490-81140-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-81140-1

Comments
No additional comments.

Receipt
The samples were received on 6/23/2015 9:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.3º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-1

Date Collected: 06/21/15 11:05
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-1

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 19:54	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 19:54	1
Manganese	**0.704**		0.0150		mg/L		06/24/15 09:20	06/24/15 19:54	1
Nickel	**0.0118**		0.0100		mg/L		06/24/15 09:20	06/24/15 19:54	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-1D

Date Collected: 06/21/15 11:20
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-2

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 20:55	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 20:55	1
Manganese	ND		0.0150		mg/L		06/24/15 09:20	06/24/15 20:55	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 20:55	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-3R

Date Collected: 06/21/15 15:10
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-3

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 20:59	1
Cobalt	**0.0285**		0.0100		mg/L		06/24/15 09:20	06/24/15 20:59	1
Manganese	**1.63**		0.0150		mg/L		06/24/15 09:20	06/24/15 20:59	1
Nickel	**0.0343**		0.0100		mg/L		06/24/15 09:20	06/24/15 20:59	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-3D R

Date Collected: 06/21/15 14:55
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-4

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:04	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:04	1
Manganese	**0.0773**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:04	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:04	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-10

Date Collected: 06/21/15 13:55
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-5

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:08	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:08	1
Manganese	**0.191**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:08	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:08	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-10D

Date Collected: 06/21/15 14:00
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-6

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:12	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:12	1
Manganese	**0.0731**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:12	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:12	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-11

Date Collected: 06/21/15 12:30
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-7

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:17	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:17	1
Manganese	**0.388**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:17	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:17	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-11D

Date Collected: 06/21/15 12:35
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-8

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:21	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:21	1
Manganese	**0.0523**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:21	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:21	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: DUP-1 20150621

Lab Sample ID: 490-81140-9

Date Collected: 06/21/15 00:01
Date Received: 06/23/15 09:00

Matrix: Water

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:26	1
Cobalt	**0.0282**		0.0100		mg/L		06/24/15 09:20	06/24/15 21:26	1
Manganese	**1.66**		0.0150		mg/L		06/24/15 09:20	06/24/15 21:26	1
Nickel	**0.0353**		0.0100		mg/L		06/24/15 09:20	06/24/15 21:26	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: Rinse Tubing 06222015

Lab Sample ID: 490-81140-10

Date Collected: 06/22/15 11:05
Matrix: Water
Date Received: 06/23/15 09:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:39	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:39	1
Manganese	ND		0.0150		mg/L		06/24/15 09:20	06/24/15 21:39	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:39	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: Rinse Bladder 06222015

Lab Sample ID: 490-81140-11

Date Collected: 06/22/15 11:10
Matrix: Water
Date Received: 06/23/15 09:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 21:43	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:43	1
Manganese	ND		0.0150		mg/L		06/24/15 09:20	06/24/15 21:43	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 21:43	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 490-258886/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 19:27	1
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 19:27	1
Manganese	ND		0.0150		mg/L		06/24/15 09:20	06/24/15 19:27	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 19:27	1

Lab Sample ID: LCS 490-258886/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.0500	0.05230		mg/L		105	80 - 120
Cobalt	0.500	0.5387		mg/L		108	80 - 120
Manganese	0.500	0.5368		mg/L		107	80 - 120
Nickel	0.500	0.5375		mg/L		108	80 - 120

Lab Sample ID: LCSD 490-258886/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	0.0500	0.05310		mg/L		106	80 - 120	2	20
Cobalt	0.500	0.5482		mg/L		110	80 - 120	2	20
Manganese	0.500	0.5444		mg/L		109	80 - 120	1	20
Nickel	0.500	0.5453		mg/L		109	80 - 120	1	20

Lab Sample ID: 490-81140-1 MS — **Client Sample ID: MW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.0500	0.05210		mg/L		104	75 - 125
Cobalt	ND		0.500	0.5378		mg/L		108	75 - 125
Manganese	0.704		0.500	1.220		mg/L		103	75 - 125
Nickel	0.0118		0.500	0.5431		mg/L		106	75 - 125

Lab Sample ID: 490-81140-1 MSD — **Client Sample ID: MW-1**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		0.0500	0.05210		mg/L		104	75 - 125	0	20
Cobalt	ND		0.500	0.5391		mg/L		108	75 - 125	0	20
Manganese	0.704		0.500	1.223		mg/L		104	75 - 125	0	20
Nickel	0.0118		0.500	0.5429		mg/L		106	75 - 125	0	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Metals

Prep Batch: 258886

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81140-1	MW-1	Total/NA	Water	3010A	
490-81140-1 MS	MW-1	Total/NA	Water	3010A	
490-81140-1 MSD	MW-1	Total/NA	Water	3010A	
490-81140-2	MW-1D	Total/NA	Water	3010A	
490-81140-3	MW-3R	Total/NA	Water	3010A	
490-81140-4	MW-3D R	Total/NA	Water	3010A	
490-81140-5	MW-10	Total/NA	Water	3010A	
490-81140-6	MW-10D	Total/NA	Water	3010A	
490-81140-7	MW-11	Total/NA	Water	3010A	
490-81140-8	MW-11D	Total/NA	Water	3010A	
490-81140-9	DUP-1 20150621	Total/NA	Water	3010A	
490-81140-10	Rinse Tubing 06222015	Total/NA	Water	3010A	
490-81140-11	Rinse Bladder 06222015	Total/NA	Water	3010A	
LCS 490-258886/2-A	Lab Control Sample	Total/NA	Water	3010A	
LCSD 490-258886/3-A	Lab Control Sample Dup	Total/NA	Water	3010A	
MB 490-258886/1-A	Method Blank	Total/NA	Water	3010A	

Analysis Batch: 259224

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81140-1	MW-1	Total/NA	Water	6010B	258886
490-81140-1 MS	MW-1	Total/NA	Water	6010B	258886
490-81140-1 MSD	MW-1	Total/NA	Water	6010B	258886
490-81140-2	MW-1D	Total/NA	Water	6010B	258886
490-81140-3	MW-3R	Total/NA	Water	6010B	258886
490-81140-4	MW-3D R	Total/NA	Water	6010B	258886
490-81140-5	MW-10	Total/NA	Water	6010B	258886
490-81140-6	MW-10D	Total/NA	Water	6010B	258886
490-81140-7	MW-11	Total/NA	Water	6010B	258886
490-81140-8	MW-11D	Total/NA	Water	6010B	258886
490-81140-9	DUP-1 20150621	Total/NA	Water	6010B	258886
490-81140-10	Rinse Tubing 06222015	Total/NA	Water	6010B	258886
490-81140-11	Rinse Bladder 06222015	Total/NA	Water	6010B	258886
LCS 490-258886/2-A	Lab Control Sample	Total/NA	Water	6010B	258886
LCSD 490-258886/3-A	Lab Control Sample Dup	Total/NA	Water	6010B	258886
MB 490-258886/1-A	Method Blank	Total/NA	Water	6010B	258886

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-1
Date Collected: 06/21/15 11:05
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-1
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 19:54	ADN	TAL NSH

Client Sample ID: MW-1D
Date Collected: 06/21/15 11:20
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-2
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 20:55	ADN	TAL NSH

Client Sample ID: MW-3R
Date Collected: 06/21/15 15:10
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-3
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 20:59	ADN	TAL NSH

Client Sample ID: MW-3D R
Date Collected: 06/21/15 14:55
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-4
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:04	ADN	TAL NSH

Client Sample ID: MW-10
Date Collected: 06/21/15 13:55
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-5
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:08	ADN	TAL NSH

Client Sample ID: MW-10D
Date Collected: 06/21/15 14:00
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-6
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:12	ADN	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Client Sample ID: MW-11
Date Collected: 06/21/15 12:30
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-7
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:17	ADN	TAL NSH

Client Sample ID: MW-11D
Date Collected: 06/21/15 12:35
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-8
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:21	ADN	TAL NSH

Client Sample ID: DUP-1 20150621
Date Collected: 06/21/15 00:01
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-9
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:26	ADN	TAL NSH

Client Sample ID: Rinse Tubing 06222015
Date Collected: 06/22/15 11:05
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-10
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:39	ADN	TAL NSH

Client Sample ID: Rinse Bladder 06222015
Date Collected: 06/22/15 11:10
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81140-11
Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 21:43	ADN	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL NSH

Protocol References:

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81140-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-15 *
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-15 *
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15 *
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15 *
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15 *
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15 *
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15 *
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

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Nashville, TN

COOLER RECEIPT FORM

490-81140 Chain of Custody

Cooler Received/Opened On 6/23/2015 @ 0900

1. Tracking # 6904 (last 4 digits, FedEx)

Courier: Fed-ex IR Gun ID 17960357

2. Temperature of rep. sample or temp blank when opened: 2.3 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 2 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) ✓

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) DA

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES...NO...NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) DA

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) DA

I certify that I attached a label with the unique LIMS number to each container (intial) DA

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt 2.3

Drinking Water? Yes ☐ No ☒

TestAmerica
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Loc: 490
81140

6/25/2015

Client	Project Manager	Date	Chain of Custody Number
HART & HICKMAN, PC	SHANNON COTTRILL	6/22/2015	283130
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 SOUTH TRYON ST SUITE 100	704 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
CHARLOTTE	NC	28203	RALPH McGEE	KEN HAYES

Project Name and Location (State): UNICORE - ARAB, ALABAMA

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UNI-001

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Analysis (Attach list if more space is needed): EPA 6010 **										Special Instructions/ Conditions of Receipt
1	MW-1	6/21/15	1105		X						X					X										* MS/MSD
2	MW-1D	6/21/15	1120		X						X					X										
3	MW-3R	6/21/15	1510		X						X					X										
4	MW-3D R	6/21/15	1455		X						X					X										
5	MW-10	6/21/15	1355		X						X					X										
6	MW-10D	6/21/15	1400		X						X					X										
7	MW-11	6/21/15	1230		X						X					X										
8	MW-11D	6/21/15	1235								X					X										
9	DUP-1 20150621	6/21/15	—								X					X										
10	RINSE TUBING 06222015	6/22/15	1105		X						X					X										
11	RINSE BLADDER 06222015	6/22/15	1110		X						X					X										

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	6/22/15	1400	1. Received By: [signature] TAN	6-23-15	0900
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments: ** EPA 6010 FOR CADMIUM, COBALT, MANGANESE, AND NICKEL ONLY

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-81140-1
SDG Number: UMI-001

Login Number: 81140
List Number: 1
Creator: Armstrong, Daniel

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.3C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-81134-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore - Arab, Alabama

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
6/29/2015 1:20:37 PM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-81134-1	IDW WATER 06222015	Water	06/22/15 10:30	06/23/15 09:00
490-81134-2	IDW SOIL 06222015	Soil	06/22/15 10:10	06/23/15 09:00

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Job ID: 490-81134-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-81134-1

Comments
No additional comments.

Receipt
The samples were received on 6/23/2015 9:00 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 2.3º C.

Metals
Method(s) 6010B: The laboratory control sample (LCS) for batch preparation batch 490-259340 and analytical batch 490-259611 recovered outside control limits for the following analytes: silver, arsenic, barium, cadmium, chrome, lead and selenium. These analytes were biased high in the LCS and were not detected in the associated samples; therefore, the data have been reported.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep
Method(s) 1311: Filter only, no rotatable solid, AQ - IDW WATER 06222015 (490-81134-1)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Definitions/Glossary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Qualifiers

Metals

Qualifier	Qualifier Description
F1	MS and/or MSD Recovery is outside acceptance limits.
F2	MS/MSD RPD exceeds control limits
*	LCS or LCSD is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Client Sample ID: IDW WATER 06222015

Lab Sample ID: 490-81134-1

Date Collected: 06/22/15 10:30
Matrix: Water
Date Received: 06/23/15 09:00

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	**0.00170**		0.00100		mg/L		06/24/15 09:20	06/24/15 20:51	1
Cobalt	**0.0602**		0.0100		mg/L		06/24/15 09:20	06/24/15 20:51	1
Manganese	**3.21**		0.0150		mg/L		06/24/15 09:20	06/24/15 20:51	1
Nickel	**0.166**		0.0100		mg/L		06/24/15 09:20	06/24/15 20:51	1

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:10	1
Barium	ND	*	10.0		mg/L		06/25/15 11:07	06/25/15 20:10	1
Cadmium	ND	*	0.100		mg/L		06/25/15 11:07	06/25/15 20:10	1
Chromium	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:10	1
Lead	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:10	1
Selenium	ND	*	0.100		mg/L		06/25/15 11:07	06/25/15 20:10	1
Silver	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:10	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		06/25/15 17:21	06/26/15 16:09	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Client Sample ID: IDW SOIL 06222015

Lab Sample ID: 490-81134-2

Date Collected: 06/22/15 10:10
Matrix: Soil
Date Received: 06/23/15 09:00

Method: 6010B - Metals (ICP) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:14	1
Barium	ND	*	10.0		mg/L		06/25/15 11:07	06/25/15 20:14	1
Cadmium	ND	*	0.100		mg/L		06/25/15 11:07	06/25/15 20:14	1
Chromium	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:14	1
Lead	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:14	1
Selenium	ND	*	0.100		mg/L		06/25/15 11:07	06/25/15 20:14	1
Silver	ND	*	0.500		mg/L		06/25/15 11:07	06/25/15 20:14	1

Method: 7470A - Mercury (CVAA) - TCLP

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		06/25/15 17:21	06/26/15 17:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**80**		0.10		%			06/23/15 10:29	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Client Sample ID: IDW SOIL 06222015

Date Collected: 06/22/15 10:10
Date Received: 06/23/15 09:00

Lab Sample ID: 490-81134-2

Matrix: Soil
Percent Solids: 80.3

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.21		mg/Kg	☼	06/24/15 09:34	06/24/15 20:57	1
Cobalt	**3.74**		2.43		mg/Kg	☼	06/24/15 09:34	06/24/15 20:57	1
Nickel	**6.26**		2.43		mg/Kg	☼	06/24/15 09:34	06/24/15 20:57	1
Manganese	**244**		3.64		mg/Kg	☼	06/24/15 09:34	06/24/15 20:57	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 490-258886/1-A — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 19:27	1
Cadmium	ND		0.00100		mg/L		06/24/15 09:20	06/24/15 19:27	1
Manganese	ND		0.0150		mg/L		06/24/15 09:20	06/24/15 19:27	1
Nickel	ND		0.0100		mg/L		06/24/15 09:20	06/24/15 19:27	1

Lab Sample ID: LCS 490-258886/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	0.500	0.5387		mg/L		108	80 - 120
Cadmium	0.0500	0.05230		mg/L		105	80 - 120
Manganese	0.500	0.5368		mg/L		107	80 - 120
Nickel	0.500	0.5375		mg/L		108	80 - 120

Lab Sample ID: LCSD 490-258886/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	0.500	0.5482		mg/L		110	80 - 120	2	20
Cadmium	0.0500	0.05310		mg/L		106	80 - 120	2	20
Manganese	0.500	0.5444		mg/L		109	80 - 120	1	20
Nickel	0.500	0.5453		mg/L		109	80 - 120	1	20

Lab Sample ID: 490-81140-A-1-B MS — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	ND		0.500	0.5378		mg/L		108	75 - 125
Cadmium	ND		0.0500	0.05210		mg/L		104	75 - 125
Manganese	0.704		0.500	1.220		mg/L		103	75 - 125
Nickel	0.0118		0.500	0.5431		mg/L		106	75 - 125

Lab Sample ID: 490-81140-A-1-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Total/NA**
Analysis Batch: 259224 — **Prep Batch: 258886**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	ND		0.500	0.5391		mg/L		108	75 - 125	0	20
Cadmium	ND		0.0500	0.05210		mg/L		104	75 - 125	0	20
Manganese	0.704		0.500	1.223		mg/L		104	75 - 125	0	20
Nickel	0.0118		0.500	0.5429		mg/L		106	75 - 125	0	20

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: MB 490-258901/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259218 — **Prep Batch: 258901**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cobalt	ND		1.93		mg/Kg		06/24/15 09:34	06/24/15 19:51	1
Cadmium	ND		0.967		mg/Kg		06/24/15 09:34	06/24/15 19:51	1
Manganese	ND		2.90		mg/Kg		06/24/15 09:34	06/24/15 19:51	1
Nickel	ND		1.93		mg/Kg		06/24/15 09:34	06/24/15 19:51	1

Lab Sample ID: LCS 490-258901/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259218 — **Prep Batch: 258901**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	200	194.9		mg/Kg		97	80 - 120
Cadmium	20.0	19.12		mg/Kg		95	80 - 120
Manganese	200	196.7		mg/Kg		98	80 - 120
Nickel	200	194.7		mg/Kg		97	80 - 120

Lab Sample ID: 490-81107-A-4-C MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259218 — **Prep Batch: 258901**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cobalt	6.45		219	218.9		mg/Kg	☼	97	75 - 125
Cadmium	ND		21.9	20.80		mg/Kg	☼	94	75 - 125
Manganese	440	F1	219	474.4	F1	mg/Kg	☼	15	75 - 125
Nickel	12.0		219	222.8		mg/Kg	☼	96	75 - 125

Lab Sample ID: 490-81107-A-4-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259218 — **Prep Batch: 258901**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	6.45		217	210.0		mg/Kg	☼	94	75 - 125	4	20
Cadmium	ND		21.7	19.96		mg/Kg	☼	91	75 - 125	4	20
Manganese	440	F1	217	554.0	F1	mg/Kg	☼	52	75 - 125	15	20
Nickel	12.0		217	214.3		mg/Kg	☼	93	75 - 125	4	20

Lab Sample ID: MB 490-259340/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259611 — **Prep Batch: 259340**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:04	1
Barium	ND		10.0		mg/L		06/25/15 11:07	06/25/15 19:04	1
Cadmium	ND		0.100		mg/L		06/25/15 11:07	06/25/15 19:04	1
Chromium	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:04	1
Lead	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:04	1
Selenium	ND		0.100		mg/L		06/25/15 11:07	06/25/15 19:04	1
Silver	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:04	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 490-259340/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259611 — **Prep Batch: 259340**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	2.00	3.225	*	mg/L		161	80 - 120
Barium	20.0	33.77	*	mg/L		169	80 - 120
Cadmium	2.00	3.270	*	mg/L		164	80 - 120
Chromium	10.0	15.86	*	mg/L		159	80 - 120
Lead	10.0	17.08	*	mg/L		171	80 - 120
Selenium	2.00	3.174	*	mg/L		159	80 - 120
Silver	2.00	3.192	*	mg/L		160	80 - 120

Lab Sample ID: MB 490-258981/1-B — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259611 — **Prep Batch: 259340**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:13	1
Barium	ND		10.0		mg/L		06/25/15 11:07	06/25/15 19:13	1
Cadmium	ND		0.100		mg/L		06/25/15 11:07	06/25/15 19:13	1
Chromium	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:13	1
Lead	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:13	1
Selenium	ND		0.100		mg/L		06/25/15 11:07	06/25/15 19:13	1
Silver	ND		0.500		mg/L		06/25/15 11:07	06/25/15 19:13	1

Lab Sample ID: 490-81122-A-1-C MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259611 — **Prep Batch: 259340**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Arsenic	ND	F2 F1 *	2.00	2.886	F1	mg/L		144	75 - 125
Barium	ND	F2 F1 *	20.0	28.38	F1	mg/L		133	75 - 125
Cadmium	0.130	F2 F1 *	2.00	2.765	F1	mg/L		132	75 - 125
Chromium	ND	F2 F1 *	10.0	12.85	F1	mg/L		129	75 - 125
Lead	ND	F2 F1 *	10.0	12.59	F1	mg/L		126	75 - 125
Selenium	0.140	F2 F1 *	2.00	3.066	F1	mg/L		146	75 - 125
Silver	ND	F2 F1 *	2.00	2.821	F1	mg/L		141	75 - 125

Lab Sample ID: 490-81122-A-1-D MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259611 — **Prep Batch: 259340**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Arsenic	ND	F2 F1 *	2.00	2.258	F2	mg/L		113	75 - 125	24	20
Barium	ND	F2 F1 *	20.0	22.62	F2	mg/L		104	75 - 125	23	20
Cadmium	0.130	F2 F1 *	2.00	2.187	F2	mg/L		103	75 - 125	23	20
Chromium	ND	F2 F1 *	10.0	10.01	F2	mg/L		100	75 - 125	25	20
Lead	ND	F2 F1 *	10.0	9.848	F2	mg/L		98	75 - 125	24	20
Selenium	0.140	F2 F1 *	2.00	2.409	F2	mg/L		113	75 - 125	24	20
Silver	ND	F2 F1 *	2.00	2.208	F2	mg/L		110	75 - 125	24	20

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 490-259524/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259864 — **Prep Batch: 259524**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		06/25/15 17:21	06/26/15 15:49	1

Lab Sample ID: LCS 490-259524/3-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 259864 — **Prep Batch: 259524**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	0.0200	0.02149		mg/L		107	80 - 120

Lab Sample ID: MB 490-258981/1-D — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259864 — **Prep Batch: 259524**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND		0.00200		mg/L		06/25/15 17:21	06/26/15 15:52	1

Lab Sample ID: 490-81137-C-1-D MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259864 — **Prep Batch: 259524**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Mercury	ND		0.0200	0.02055		mg/L		103	75 - 125

Lab Sample ID: 490-81137-C-1-E MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: TCLP**
Analysis Batch: 259864 — **Prep Batch: 259524**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Mercury	ND		0.0200	0.02007		mg/L		100	75 - 125	2	20

Method: Moisture - Percent Moisture

Lab Sample ID: 490-81078-L-1 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 258547

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	84		84		%		0.2	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Metals

Prep Batch: 258886

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81134-1	IDW WATER 06222015	Total/NA	Water	3010A	
490-81140-A-1-B MS	Matrix Spike	Total/NA	Water	3010A	
490-81140-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	3010A	
LCS 490-258886/2-A	Lab Control Sample	Total/NA	Water	3010A	
LCSD 490-258886/3-A	Lab Control Sample Dup	Total/NA	Water	3010A	
MB 490-258886/1-A	Method Blank	Total/NA	Water	3010A	

Prep Batch: 258901

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81107-A-4-C MS	Matrix Spike	Total/NA	Solid	3051A	
490-81107-A-4-D MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-81134-2	IDW SOIL 06222015	Total/NA	Soil	3051A	
LCS 490-258901/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-258901/1-A	Method Blank	Total/NA	Solid	3051A	

Leach Batch: 258981

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81122-A-1-C MS	Matrix Spike	TCLP	Solid	1311	
490-81122-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
490-81134-1	IDW WATER 06222015	TCLP	Water	1311	
490-81134-2	IDW SOIL 06222015	TCLP	Soil	1311	
490-81137-C-1-D MS	Matrix Spike	TCLP	Solid	1311	
490-81137-C-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
MB 490-258981/1-B	Method Blank	TCLP	Solid	1311	
MB 490-258981/1-D	Method Blank	TCLP	Solid	1311	

Analysis Batch: 259218

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81107-A-4-C MS	Matrix Spike	Total/NA	Solid	6010B	258901
490-81107-A-4-D MSD	Matrix Spike Duplicate	Total/NA	Solid	6010B	258901
490-81134-2	IDW SOIL 06222015	Total/NA	Soil	6010B	258901
LCS 490-258901/2-A	Lab Control Sample	Total/NA	Solid	6010B	258901
MB 490-258901/1-A	Method Blank	Total/NA	Solid	6010B	258901

Analysis Batch: 259224

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81134-1	IDW WATER 06222015	Total/NA	Water	6010B	258886
490-81140-A-1-B MS	Matrix Spike	Total/NA	Water	6010B	258886
490-81140-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Water	6010B	258886
LCS 490-258886/2-A	Lab Control Sample	Total/NA	Water	6010B	258886
LCSD 490-258886/3-A	Lab Control Sample Dup	Total/NA	Water	6010B	258886
MB 490-258886/1-A	Method Blank	Total/NA	Water	6010B	258886

Prep Batch: 259340

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81122-A-1-C MS	Matrix Spike	TCLP	Solid	3010A	258981
490-81122-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	3010A	258981
490-81134-1	IDW WATER 06222015	TCLP	Water	3010A	258981
490-81134-2	IDW SOIL 06222015	TCLP	Soil	3010A	258981
LCS 490-259340/2-A	Lab Control Sample	Total/NA	Solid	3010A	
MB 490-258981/1-B	Method Blank	TCLP	Solid	3010A	258981

Metals (Continued)

Prep Batch: 259340 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-259340/1-A	Method Blank	Total/NA	Solid	3010A	

Prep Batch: 259524

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81134-1	IDW WATER 06222015	TCLP	Water	7470A	258981
490-81134-2	IDW SOIL 06222015	TCLP	Soil	7470A	258981
490-81137-C-1-D MS	Matrix Spike	TCLP	Solid	7470A	258981
490-81137-C-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	258981
LCS 490-259524/3-A	Lab Control Sample	Total/NA	Solid	7470A	
MB 490-258981/1-D	Method Blank	TCLP	Solid	7470A	258981
MB 490-259524/1-A	Method Blank	Total/NA	Solid	7470A	

Analysis Batch: 259611

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81122-A-1-C MS	Matrix Spike	TCLP	Solid	6010B	259340
490-81122-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	6010B	259340
490-81134-1	IDW WATER 06222015	TCLP	Water	6010B	259340
490-81134-2	IDW SOIL 06222015	TCLP	Soil	6010B	259340
LCS 490-259340/2-A	Lab Control Sample	Total/NA	Solid	6010B	259340
MB 490-258981/1-B	Method Blank	TCLP	Solid	6010B	259340
MB 490-259340/1-A	Method Blank	Total/NA	Solid	6010B	259340

Analysis Batch: 259864

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81134-1	IDW WATER 06222015	TCLP	Water	7470A	259524
490-81137-C-1-D MS	Matrix Spike	TCLP	Solid	7470A	259524
490-81137-C-1-E MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	259524
LCS 490-259524/3-A	Lab Control Sample	Total/NA	Solid	7470A	259524
MB 490-258981/1-D	Method Blank	TCLP	Solid	7470A	259524
MB 490-259524/1-A	Method Blank	Total/NA	Solid	7470A	259524

Analysis Batch: 259881

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81134-2	IDW SOIL 06222015	TCLP	Soil	7470A	259524

General Chemistry

Analysis Batch: 258547

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-81078-L-1 DU	Duplicate	Total/NA	Solid	Moisture	
490-81134-2	IDW SOIL 06222015	Total/NA	Soil	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Client Sample ID: IDW WATER 06222015

Lab Sample ID: 490-81134-1
Date Collected: 06/22/15 10:30
Matrix: Water
Date Received: 06/23/15 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			1.0 g	1.0 mL	258981	06/24/15 11:22	RMS	TAL NSH
TCLP	Prep	3010A			5.0 mL	50.0 mL	259340	06/25/15 11:07	ZLN	TAL NSH
TCLP	Analysis	6010B		1	5.0 mL	50.0 mL	259611	06/25/15 20:10	LEG	TAL NSH
Total/NA	Prep	3010A			50 mL	50 mL	258886	06/24/15 09:20	TSC	TAL NSH
Total/NA	Analysis	6010B		1	50 mL	50 mL	259224	06/24/15 20:51	ADN	TAL NSH
TCLP	Leach	1311			1.0 g	1.0 mL	258981	06/24/15 11:22	RMS	TAL NSH
TCLP	Prep	7470A			3 mL	30 mL	259524	06/25/15 17:21	RDF	TAL NSH
TCLP	Analysis	7470A		1	3 mL	30 mL	259864	06/26/15 16:09	CME	TAL NSH

Client Sample ID: IDW SOIL 06222015

Lab Sample ID: 490-81134-2
Date Collected: 06/22/15 10:10
Matrix: Soil
Date Received: 06/23/15 09:00

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
TCLP	Leach	1311			1.0 g	1.0 mL	258981	06/24/15 11:22	RMS	TAL NSH
TCLP	Prep	3010A			5.0 mL	50.0 mL	259340	06/25/15 11:07	ZLN	TAL NSH
TCLP	Analysis	6010B		1	5.0 mL	50.0 mL	259611	06/25/15 20:14	LEG	TAL NSH
Total/NA	Prep	3051A			0.513 g	100 mL	258901	06/24/15 09:34	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.513 g	100 mL	259218	06/24/15 20:57	LEG	TAL NSH
TCLP	Leach	1311			1.0 g	1.0 mL	258981	06/24/15 11:22	RMS	TAL NSH
TCLP	Prep	7470A			3 mL	30 mL	259524	06/25/15 17:21	RDF	TAL NSH
TCLP	Analysis	7470A		1	3 mL	30 mL	259881	06/26/15 17:31	RDF	TAL NSH
Total/NA	Analysis	Moisture		1			258547	06/23/15 10:29	MAA	TAL NSH

Laboratory References:
TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL NSH
7470A	Mercury (CVAA)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - Arab, Alabama

TestAmerica Job ID: 490-81134-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-15 *
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-15 *
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-15 *
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	06-30-15 *
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-15 *
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15 *
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-15
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

490-81134 Chain of Custody

Cooler Received/Opened On 6/23/2015 @ 0900

1. Tracking # 6904 (last 4 digits, FedEx)

Courier: Fed-ex IR Gun ID 17960357

2. Temperature of rep. sample or temp blank when opened: 2.3 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 2 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) DA

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) DA

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) DA

I certify that I attached a label with the unique LIMS number to each container (intial) DA

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

6/29/2015

[redacted]

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt 2.3

Drinking Water? Yes ☐ No ☐

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

Loc: 490

81134

6/29/2015

Client	Project Manager	Date	Chain of Custody Number
Hayes + Hickman, PC	Shannon Cottrell	06/22/2015	283104
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 South Tryon St. Suite 100	(704) 586 0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McCloe	Ken Hayes

Project Name and Location (State)	Carrier/Waybill Number
Unicone - Arab, Alabama	

Contract/Purchase Order/Quote No.: UAI-001

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil		Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		Analysis (Attach list if more space is needed): TCLP RCRA Metals	EPA 6010 *	Special Instructions/ Conditions of Receipt
IDW WATER 06222015	6/22/15	1030		X				X		X					X	X	
IDW SOIL 06222015	6/22/15	1010				X		X		X					X	X	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☒ Unknown

Sample Disposal: ☐ Return To Client ☒ Disposal By Lab ☐ Archive For _____ Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: Ralph McCloe	6/22/15	1400	1. Received By: TAN	6-23-15	0900
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments: * EPA 6010 for Cadmium, Cobalt, Manganese, and Nickel only

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-81134-1
SDG Number: UMI-001

Login Number: 81134
List Number: 1
Creator: Armstrong, Daniel

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	2.3C
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-79038-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore - AL

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
7/7/2015 10:01:12 AM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

Review your project results through TotalAccess

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Visit us at: www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-79038-1	Dup-24	Solid	05/20/15 01:01	05/22/15 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Job ID: 490-79038-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-79038-1

Comments
No additional comments.

Receipt
The sample was received on 5/22/2015 8:30 AM; the sample arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 1.0º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Definitions/Glossary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Qualifiers

Metals

Qualifier	Qualifier Description
F2	MS/MSD RPD exceeds control limits
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Client Sample ID: Dup-24

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79038-1

Matrix: Solid

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			07/06/15 12:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Client Sample ID: Dup-24

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79038-1

Matrix: Solid
Percent Solids: 86.8

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	287	F2	1.14		mg/Kg	☼	07/02/15 13:17	07/06/15 11:59	1
Cobalt	1730	F2	2.29		mg/Kg	☼	07/02/15 13:17	07/06/15 11:59	1

QC Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 490-261564/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.992		mg/Kg		07/02/15 13:17	07/06/15 11:46	1
Cobalt	ND		1.98		mg/Kg		07/02/15 13:17	07/06/15 11:46	1

Lab Sample ID: LCS 490-261564/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.8	19.13		mg/Kg		97	80 - 120
Cobalt	198	192.2		mg/Kg		97	80 - 120

Lab Sample ID: 490-79038-1 MS — **Client Sample ID: Dup-24**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	287	F2	22.6	158.8	4	mg/Kg	☼	-567	75 - 125
Cobalt	1730	F2	226	1095	4	mg/Kg	☼	-278	75 - 125

Lab Sample ID: 490-79038-1 MSD — **Client Sample ID: Dup-24**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	287	F2	22.9	288.6	4 F2	mg/Kg	☼	6	75 - 125	58	20
Cobalt	1730	F2	229	1395	4 F2	mg/Kg	☼	-144	75 - 125	24	20

Method: Moisture - Percent Moisture

Lab Sample ID: 490-79044-A-105 DU — **Client Sample ID: Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262159

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	87		87		%		0	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Metals

Prep Batch: 261564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79038-1	Dup-24	Total/NA	Solid	3051A	
490-79038-1 MS	Dup-24	Total/NA	Solid	3051A	
490-79038-1 MSD	Dup-24	Total/NA	Solid	3051A	
LCS 490-261564/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-261564/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 262343

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79038-1	Dup-24	Total/NA	Solid	6010B	261564
490-79038-1 MS	Dup-24	Total/NA	Solid	6010B	261564
490-79038-1 MSD	Dup-24	Total/NA	Solid	6010B	261564
LCS 490-261564/2-A	Lab Control Sample	Total/NA	Solid	6010B	261564
MB 490-261564/1-A	Method Blank	Total/NA	Solid	6010B	261564

General Chemistry

Analysis Batch: 262159

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79038-1	Dup-24	Total/NA	Solid	Moisture	
490-79044-A-105 DU	Duplicate	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Client Sample ID: Dup-24
Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79038-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	Moisture		1			262159	07/06/15 12:01	AJK	TAL NSH

Client Sample ID: Dup-24
Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79038-1
Matrix: Solid
Percent Solids: 86.8

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	261564	07/02/15 13:17	KMS	TAL NSH
Total/NA	Analysis	6010B		1	0.504 g	100 mL	262343	07/06/15 11:59	LEG	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79038-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	10-31-15 *
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-15
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	09-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	10-16-15
Oklahoma	State Program	6	9412	08-31-15
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15 *
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-15 *
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

490-79038 Chain of Custody

Cooler Received/Opened On: 5/22/2015 @0830

1. Tracking # 6890 (last 4 digits, FedEx)

Courier: Fed-Ex IR Gun ID: 14740456

2. Temperature of rep. sample or temp blank when opened: 1.0 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

COC in another cooler

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

7/7/2015

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281479
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 1**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State)	Carrier/Waybill Number
Umicore - AC	

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79038

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold**	Special Instructions/ Conditions of Receipt
DUP-24	5/20/15	—				X	X						X	X	*Co, Cd, Mn, Ni only
															**Hold Pending
															HH Authorization

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	5/21/15	1100	1. Received By: [signature] / TAN 1.0	5/22/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-79038-1
SDG Number: UMI-001

Login Number: 79038
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Drive
Nashville, TN 37204
Tel: (615)726-0177

TestAmerica Job ID: 490-79044-1
TestAmerica Sample Delivery Group: UMI-001
Client Project/Site: Umicore - AL

For:
Hart & Hickman, PC
2923 S Tryon Street
Suite 100
Charlotte, North Carolina 28203

Attn: Mr. Shannon Cottrill

Authorized for release by:
8/12/2015 9:47:02 AM

Ken Hayes, Project Manager II
(615)301-5035
ken.hayes@testamericainc.com

LINKS

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Results relate only to the items tested and the sample(s) as received by the laboratory.

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Sample Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-79044-1	SS-132 (0-1)	Solid	05/18/15 16:20	05/22/15 08:30
490-79044-7	SS-131 (0-1)	Solid	05/18/15 17:15	05/22/15 08:30
490-79044-14	SS-130 (0-1)	Solid	05/19/15 08:15	05/22/15 08:30
490-79044-21	SS-129 (0-1)	Solid	05/19/15 09:50	05/22/15 08:30
490-79044-32	SS-128 (0-1)	Solid	05/19/15 10:05	05/22/15 08:30
490-79044-37	SS-127 (0-1)	Solid	05/19/15 10:30	05/22/15 08:30
490-79044-46	SS-126 (0-1)	Solid	05/19/15 11:35	05/22/15 08:30
490-79044-55	SS-125 (0-1)	Solid	05/19/15 12:10	05/22/15 08:30
490-79044-62	SS-124 (0-1)	Solid	05/19/15 13:00	05/22/15 08:30
490-79044-63	SS-124 (1-2)	Solid	05/19/15 13:05	05/22/15 08:30
490-79044-65	SS-124A (0-1)	Solid	05/19/15 13:25	05/22/15 08:30
490-79044-67	SS-124B (0-1)	Solid	05/19/15 13:15	05/22/15 08:30
490-79044-69	SS-123/SS-42D (0-1)	Solid	05/19/15 13:50	05/22/15 08:30
490-79044-72	SS-123A/SS-43B (0-1)	Solid	05/19/15 14:20	05/22/15 08:30
490-79044-74	SS-123B/SS-42F (0-1)	Solid	05/19/15 13:35	05/22/15 08:30
490-79044-77	SS-122/SS-42C (0-1)	Solid	05/19/15 15:20	05/22/15 08:30
490-79044-83	SS-121 (0-1)	Solid	05/19/15 16:00	05/22/15 08:30
490-79044-84	SS-121 (1-2)	Solid	05/19/15 16:05	05/22/15 08:30
490-79044-86	SS-121A/SS-42A (0-1)	Solid	05/19/15 16:15	05/22/15 08:30
490-79044-88	SS-121B (0-1)	Solid	05/19/15 16:30	05/22/15 08:30
490-79044-89	SS-120 (0-1)	Solid	05/20/15 09:20	05/22/15 08:30
490-79044-94	SS-120B/SS-42 (0-1)	Solid	05/20/15 09:35	05/22/15 08:30
490-79044-97	SS-120C/SS-42B (0-1)	Solid	05/20/15 10:25	05/22/15 08:30
490-79044-99	SS-119 (0-1)	Solid	05/20/15 10:50	05/22/15 08:30
490-79044-100	SS-119 (1-2)	Solid	05/20/15 10:55	05/22/15 08:30
490-79044-102	SS-119A (0-1)	Solid	05/20/15 12:00	05/22/15 08:30
490-79044-104	SS-119B (0-1)	Solid	05/20/15 10:55	05/22/15 08:30
490-79044-105	SS-119B (1-2)	Solid	05/20/15 10:58	05/22/15 08:30
490-79044-106	SS-118 (0-1)	Solid	05/20/15 11:00	05/22/15 08:30
490-79044-107	SS-118 (1-2)	Solid	05/20/15 11:05	05/22/15 08:30
490-79044-109	SS-118A (0-1)	Solid	05/20/15 11:50	05/22/15 08:30
490-79044-110	SS-118A (1-2)	Solid	05/20/15 11:55	05/22/15 08:30
490-79044-111	SS-118B (0-1)	Solid	05/20/15 11:30	05/22/15 08:30
490-79044-112	SS-118B (1-2)	Solid	05/20/15 11:35	05/22/15 08:30
490-79044-113	SS-118C (0-1)	Solid	05/20/15 12:20	05/22/15 08:30
490-79044-114	SS-118C (1-2)	Solid	05/20/15 12:25	05/22/15 08:30
490-79044-115	DUP-18	Solid	05/19/15 01:01	05/22/15 08:30
490-79044-116	DUP-19	Solid	05/19/15 01:01	05/22/15 08:30
490-79044-117	DUP-20	Solid	05/20/15 01:01	05/22/15 08:30
490-79044-118	DUP-21	Solid	05/20/15 01:01	05/22/15 08:30
490-79044-119	DUP-22	Solid	05/20/15 01:01	05/22/15 08:30
490-79044-120	DUP-23	Solid	05/20/15 01:01	05/22/15 08:30

Case Narrative

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Job ID: 490-79044-1

Laboratory: TestAmerica Nashville

Narrative

Job Narrative
490-79044-1

Comments
No additional comments.

Receipt
The samples were received on 5/22/2015 8:30 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperatures of the 4 coolers at receipt time were 1.0º C, 1.2º C, 2.8º C and 3.5º C.

Metals
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Organic Prep
No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

Qualifiers

Metals

Qualifier	Qualifier Description
4	MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.
F2	MS/MSD RPD exceeds control limits
F1	MS and/or MSD Recovery is outside acceptance limits.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
¤	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains no Free Liquid
DER	Duplicate error ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision level concentration
MDA	Minimum detectable activity
EDL	Estimated Detection Limit
MDC	Minimum detectable concentration
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative error ratio
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-132 (0-1)

Date Collected: 05/18/15 16:20
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-1

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.34		mg/Kg	☼	05/26/15 09:23	05/26/15 17:16	1
Cobalt	**20.6**		2.67		mg/Kg	☼	05/26/15 09:23	05/26/15 17:16	1
Manganese	**266**		4.01		mg/Kg	☼	05/26/15 09:23	05/26/15 17:16	1
Nickel	**16.8**		2.67		mg/Kg	☼	05/26/15 09:23	05/26/15 17:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**71**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-131 (0-1)

Date Collected: 05/18/15 17:15
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-7

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.26		mg/Kg	☼	05/26/15 09:23	05/26/15 17:20	1
Cobalt	**6.24**		2.52		mg/Kg	☼	05/26/15 09:23	05/26/15 17:20	1
Manganese	**247**		3.78		mg/Kg	☼	05/26/15 09:23	05/26/15 17:20	1
Nickel	**5.82**		2.52		mg/Kg	☼	05/26/15 09:23	05/26/15 17:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**80**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-130 (0-1)

Date Collected: 05/19/15 08:15
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-14

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.26		mg/Kg	☼	05/26/15 09:23	05/26/15 17:24	1
Cobalt	**15.8**		2.53		mg/Kg	☼	05/26/15 09:23	05/26/15 17:24	1
Manganese	**106**		3.79		mg/Kg	☼	05/26/15 09:23	05/26/15 17:24	1
Nickel	**12.8**		2.53		mg/Kg	☼	05/26/15 09:23	05/26/15 17:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**76**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-129 (0-1)

Date Collected: 05/19/15 09:50
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-21

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.19		mg/Kg	☼	05/26/15 09:23	05/26/15 17:28	1
Cobalt	**26.9**		2.37		mg/Kg	☼	05/26/15 09:23	05/26/15 17:28	1
Manganese	**57.5**		3.56		mg/Kg	☼	05/26/15 09:23	05/26/15 17:28	1
Nickel	**23.6**		2.37		mg/Kg	☼	05/26/15 09:23	05/26/15 17:28	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**83**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-128 (0-1)

Date Collected: 05/19/15 10:05
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-32

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.21		mg/Kg	☼	05/26/15 09:23	05/26/15 17:32	1
Cobalt	**12.8**		2.42		mg/Kg	☼	05/26/15 09:23	05/26/15 17:32	1
Manganese	**11.5**		3.63		mg/Kg	☼	05/26/15 09:23	05/26/15 17:32	1
Nickel	**8.65**		2.42		mg/Kg	☼	05/26/15 09:23	05/26/15 17:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**83**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-127 (0-1)

Date Collected: 05/19/15 10:30
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-37

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.21		mg/Kg	☼	05/26/15 09:23	05/26/15 16:30	1
Cobalt	**32.7**		2.42		mg/Kg	☼	05/26/15 09:23	05/26/15 16:30	1
Manganese	**41.7**		3.63		mg/Kg	☼	05/26/15 09:23	05/26/15 16:30	1
Nickel	**38.0**		2.42		mg/Kg	☼	05/26/15 09:23	05/26/15 16:30	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**82**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-126 (0-1)

Date Collected: 05/19/15 11:35
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-46

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.11		mg/Kg	☼	05/26/15 09:23	05/26/15 17:36	1
Cobalt	**6.50**		2.23		mg/Kg	☼	05/26/15 09:23	05/26/15 17:36	1
Manganese	**31.1**		3.34		mg/Kg	☼	05/26/15 09:23	05/26/15 17:36	1
Nickel	**7.73**		2.23		mg/Kg	☼	05/26/15 09:23	05/26/15 17:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**87**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-125 (0-1)

Date Collected: 05/19/15 12:10
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-55

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.15		mg/Kg	☼	05/26/15 09:23	05/26/15 17:49	1
Cobalt	**6.52**		2.30		mg/Kg	☼	05/26/15 09:23	05/26/15 17:49	1
Manganese	**42.3**		3.46		mg/Kg	☼	05/26/15 09:23	05/26/15 17:49	1
Nickel	**6.40**		2.30		mg/Kg	☼	05/26/15 09:23	05/26/15 17:49	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**87**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-124 (0-1)

Date Collected: 05/19/15 13:00
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-62

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.40		1.19		mg/Kg	☼	05/26/15 09:23	05/26/15 17:53	1
Cobalt	76.5		2.38		mg/Kg	☼	05/26/15 09:23	05/26/15 17:53	1
Manganese	87.8		3.57		mg/Kg	☼	05/26/15 09:23	05/26/15 17:53	1
Nickel	63.0		2.38		mg/Kg	☼	05/26/15 09:23	05/26/15 17:53	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	83		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-124 (1-2)

Date Collected: 05/19/15 13:05
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-63

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.14		mg/Kg	☼	06/01/15 16:17	06/02/15 17:39	1
Cobalt	**6.44**		2.28		mg/Kg	☼	06/01/15 16:17	06/02/15 17:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**86**		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-124A (0-1)

Date Collected: 05/19/15 13:25
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-65

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.06		mg/Kg	☼	06/01/15 16:17	06/02/15 17:44	1
Cobalt	**5.19**		2.13		mg/Kg	☼	06/01/15 16:17	06/02/15 17:44	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**90**		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-124B (0-1)

Date Collected: 05/19/15 13:15
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-67

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.10		mg/Kg	☼	06/01/15 16:17	06/02/15 17:48	1
Cobalt	**21.5**		2.20		mg/Kg	☼	06/01/15 16:17	06/02/15 17:48	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**90**		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-123/SS-42D (0-1)

Lab Sample ID: 490-79044-69

Date Collected: 05/19/15 13:50
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.88		1.15		mg/Kg	☼	05/26/15 11:05	05/26/15 22:39	1
Cobalt	149	F2 F1	2.30		mg/Kg	☼	05/26/15 11:05	05/26/15 22:39	1
Manganese	162	F2 F1	3.46		mg/Kg	☼	05/26/15 11:05	05/26/15 22:39	1
Nickel	161	F2 F1	2.30		mg/Kg	☼	05/26/15 11:05	05/26/15 22:39	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-123A/SS-43B (0-1)

Lab Sample ID: 490-79044-72

Date Collected: 05/19/15 14:20
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.13		mg/Kg	☼	06/01/15 16:17	06/02/15 18:01	1
Cobalt	**10.3**		2.27		mg/Kg	☼	06/01/15 16:17	06/02/15 18:01	1
Manganese	**92.5**		3.40		mg/Kg	☼	06/01/15 16:17	06/02/15 18:01	1
Nickel	**8.19**		2.27		mg/Kg	☼	06/01/15 16:17	06/02/15 18:01	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**87**		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-123B/SS-42F (0-1)

Lab Sample ID: 490-79044-74

Date Collected: 05/19/15 13:35
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.12		mg/Kg	☼	05/26/15 09:23	05/26/15 17:57	1
Cobalt	**11.6**		2.24		mg/Kg	☼	05/26/15 09:23	05/26/15 17:57	1
Manganese	**93.4**		3.36		mg/Kg	☼	05/26/15 09:23	05/26/15 17:57	1
Nickel	**7.43**		2.24		mg/Kg	☼	05/26/15 09:23	05/26/15 17:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**88**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-122/SS-42C (0-1)

Lab Sample ID: 490-79044-77

Date Collected: 05/19/15 15:20
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	4.74	F1	1.16		mg/Kg	☼	05/26/15 14:16	05/26/15 20:57	1
Cobalt	90.0		2.32		mg/Kg	☼	05/26/15 14:16	05/26/15 20:57	1
Manganese	147		3.48		mg/Kg	☼	05/26/15 14:16	05/26/15 20:57	1
Nickel	54.4	F1	2.32		mg/Kg	☼	05/26/15 14:16	05/26/15 20:57	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-121 (0-1)

Date Collected: 05/19/15 16:00
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-83

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	8.25	F1	1.13		mg/Kg	☼	05/27/15 15:04	05/27/15 22:24	1
Cobalt	79.9		2.26		mg/Kg	☼	05/27/15 15:04	05/27/15 22:24	1
Manganese	216	F1	3.39		mg/Kg	☼	05/27/15 15:04	05/27/15 22:24	1
Nickel	69.3		2.26		mg/Kg	☼	05/27/15 15:04	05/27/15 22:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	85		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-121 (1-2)

Date Collected: 05/19/15 16:05
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-84

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.55		1.17		mg/Kg	☼	06/01/15 16:17	06/02/15 18:05	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-121A/SS-42A (0-1)

Lab Sample ID: 490-79044-86

Date Collected: 05/19/15 16:15
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.87		1.19		mg/Kg	☼	05/26/15 11:05	05/26/15 23:08	1
Cobalt	20.9		2.37		mg/Kg	☼	05/26/15 11:05	05/26/15 23:08	1
Manganese	126		3.56		mg/Kg	☼	05/26/15 11:05	05/26/15 23:08	1
Nickel	13.6		2.37		mg/Kg	☼	05/26/15 11:05	05/26/15 23:08	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	84		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-121B (0-1)

Date Collected: 05/19/15 16:30
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-88

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.08		mg/Kg	☼	06/01/15 16:17	06/02/15 18:09	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-120 (0-1)

Date Collected: 05/20/15 09:20
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-89

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	3.81		1.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:12	1
Cobalt	91.7		2.31		mg/Kg	☼	05/26/15 11:05	05/26/15 23:12	1
Manganese	201		3.46		mg/Kg	☼	05/26/15 11:05	05/26/15 23:12	1
Nickel	95.0		2.31		mg/Kg	☼	05/26/15 11:05	05/26/15 23:12	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-120B/SS-42 (0-1)

Lab Sample ID: 490-79044-94

Date Collected: 05/20/15 09:35
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.22		1.13		mg/Kg	☼	05/27/15 13:19	05/27/15 21:03	1
Cobalt	18.6		2.25		mg/Kg	☼	05/27/15 13:19	05/27/15 21:03	1
Manganese	68.7		3.38		mg/Kg	☼	05/27/15 13:19	05/27/15 21:03	1
Nickel	15.4		2.25		mg/Kg	☼	05/27/15 13:19	05/27/15 21:03	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-120C/SS-42B (0-1)

Lab Sample ID: 490-79044-97

Date Collected: 05/20/15 10:25
Matrix: Solid
Date Received: 05/22/15 08:30

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.63		1.14		mg/Kg	☼	05/27/15 14:29	05/27/15 19:50	1
Cobalt	10.8		2.29		mg/Kg	☼	05/27/15 14:29	05/27/15 19:50	1
Manganese	150	F1	3.43		mg/Kg	☼	05/27/15 14:29	05/27/15 19:50	1
Nickel	15.4		2.29		mg/Kg	☼	05/27/15 14:29	05/27/15 19:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119 (0-1)

Date Collected: 05/20/15 10:50
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-99

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	11.5		1.08		mg/Kg	☼	05/26/15 11:05	05/26/15 23:16	1
Cobalt	133		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:16	1
Manganese	268		3.23		mg/Kg	☼	05/26/15 11:05	05/26/15 23:16	1
Nickel	158		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:16	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			05/23/15 10:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119 (1-2)

Date Collected: 05/20/15 10:55
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-100

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.14		mg/Kg	☼	06/01/15 16:17	06/02/15 18:14	1
Cobalt	**8.65**		2.27		mg/Kg	☼	06/01/15 16:17	06/02/15 18:14	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**89**		0.10		%			06/02/15 10:58	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119A (0-1)

Date Collected: 05/20/15 12:00
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-102

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	4.12	F1	1.22		mg/Kg	☼	06/01/15 16:17	06/02/15 17:18	1
Cobalt	21.6	F1	2.44		mg/Kg	☼	06/01/15 16:17	06/02/15 17:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	81		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119B (0-1)

Date Collected: 05/20/15 10:55
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-104

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	14.7		1.11		mg/Kg	☼	06/01/15 16:17	06/02/15 18:18	1
Cobalt	142		2.22		mg/Kg	☼	06/01/15 16:17	06/02/15 18:18	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119B (1-2)

Date Collected: 05/20/15 10:58
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-105

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.13		mg/Kg	☼	07/02/15 13:17	07/06/15 12:20	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			07/06/15 12:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118 (0-1)

Date Collected: 05/20/15 11:00
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-106

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	52.4		1.14		mg/Kg	☼	05/26/15 11:05	05/26/15 23:21	1
Cobalt	927		2.29		mg/Kg	☼	05/26/15 11:05	05/26/15 23:21	1
Manganese	338		3.43		mg/Kg	☼	05/26/15 11:05	05/26/15 23:21	1
Nickel	500		2.29		mg/Kg	☼	05/26/15 11:05	05/26/15 23:21	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	88		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118 (1-2)

Date Collected: 05/20/15 11:05
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-107

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	6.66		1.07		mg/Kg	☼	06/01/15 16:17	06/02/15 18:23	1
Cobalt	89.8		2.14		mg/Kg	☼	06/01/15 16:17	06/02/15 18:23	1
Manganese	146		3.21		mg/Kg	☼	06/01/15 16:17	06/02/15 18:23	1
Nickel	45.7		2.14		mg/Kg	☼	06/01/15 16:17	06/02/15 18:23	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	90		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118A (0-1)

Date Collected: 05/20/15 11:50
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-109

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	37.0		1.13		mg/Kg	☼	06/01/15 16:17	06/02/15 18:27	1
Cobalt	397		2.26		mg/Kg	☼	06/01/15 16:17	06/02/15 18:27	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118A (1-2)

Date Collected: 05/20/15 11:55
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-110

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	8.08		1.10		mg/Kg	☼	07/02/15 13:17	07/06/15 12:24	1
Cobalt	47.3		2.19		mg/Kg	☼	07/02/15 13:17	07/06/15 12:24	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			07/06/15 12:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118B (0-1)

Date Collected: 05/20/15 11:30
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-111

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	8.70		1.23		mg/Kg	☼	06/01/15 16:17	06/02/15 18:31	1
Cobalt	267		2.46		mg/Kg	☼	06/01/15 16:17	06/02/15 18:31	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	82		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118B (1-2)

Date Collected: 05/20/15 11:35
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-112

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.15		mg/Kg	☼	07/02/15 13:17	07/06/15 12:38	1
Cobalt	**34.7**		2.30		mg/Kg	☼	07/02/15 13:17	07/06/15 12:38	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**87**		0.10		%			07/06/15 12:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118C (0-1)

Date Collected: 05/20/15 12:20
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-113

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	97.0		1.15		mg/Kg	☼	06/01/15 16:17	06/02/15 18:36	1
Cobalt	1740		2.29		mg/Kg	☼	06/01/15 16:17	06/02/15 18:36	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			06/02/15 11:57	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118C (1-2)

Date Collected: 05/20/15 12:25
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-114

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	2.90		1.08		mg/Kg	☼	07/02/15 13:17	07/06/15 12:42	1
Cobalt	4.45		2.16		mg/Kg	☼	07/02/15 13:17	07/06/15 12:42	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	90		0.10		%			07/06/15 12:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-18

Date Collected: 05/19/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-115

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.08		mg/Kg	☼	05/26/15 11:05	05/26/15 23:25	1
Cobalt	**16.3**		2.16		mg/Kg	☼	05/26/15 11:05	05/26/15 23:25	1
Manganese	**60.0**		3.24		mg/Kg	☼	05/26/15 11:05	05/26/15 23:25	1
Nickel	**14.4**		2.16		mg/Kg	☼	05/26/15 11:05	05/26/15 23:25	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	**88**		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-19

Date Collected: 05/19/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-116

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	13.7		1.12		mg/Kg	☼	05/26/15 11:05	05/26/15 23:29	1
Cobalt	764		2.24		mg/Kg	☼	05/26/15 11:05	05/26/15 23:29	1
Manganese	1140		3.37		mg/Kg	☼	05/26/15 11:05	05/26/15 23:29	1
Nickel	184		2.24		mg/Kg	☼	05/26/15 11:05	05/26/15 23:29	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	86		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-20

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-117

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	3.70		1.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:33	1
Cobalt	80.9		2.30		mg/Kg	☼	05/26/15 11:05	05/26/15 23:33	1
Manganese	158		3.45		mg/Kg	☼	05/26/15 11:05	05/26/15 23:33	1
Nickel	73.4		2.30		mg/Kg	☼	05/26/15 11:05	05/26/15 23:33	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	87		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-21

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-118

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	23.3		1.07		mg/Kg	☼	05/26/15 11:05	05/26/15 23:37	1
Cobalt	316		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:37	1
Manganese	321		3.22		mg/Kg	☼	05/26/15 11:05	05/26/15 23:37	1
Nickel	306		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:37	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	90		0.10		%			05/23/15 09:43	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-22

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-119

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	41.4		1.11		mg/Kg	☼	05/26/15 11:05	05/26/15 23:50	1
Cobalt	763		2.21		mg/Kg	☼	05/26/15 11:05	05/26/15 23:50	1
Manganese	325		3.32		mg/Kg	☼	05/26/15 11:05	05/26/15 23:50	1
Nickel	491		2.21		mg/Kg	☼	05/26/15 11:05	05/26/15 23:50	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	89		0.10		%			05/23/15 10:01	1

Client Sample Results

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-23

Date Collected: 05/20/15 01:01
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-120

Matrix: Solid

Method: 6010B - Metals (ICP)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	1.74		1.07		mg/Kg	☼	05/26/15 11:05	05/26/15 23:54	1
Cobalt	23.9		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:54	1
Manganese	128		3.22		mg/Kg	☼	05/26/15 11:05	05/26/15 23:54	1
Nickel	14.1		2.15		mg/Kg	☼	05/26/15 11:05	05/26/15 23:54	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Solids	92		0.10		%			05/23/15 10:01	1

Method: 6010B - Metals (ICP)

Lab Sample ID: MB 490-251010/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.973		mg/Kg		05/26/15 09:23	05/26/15 16:21	1
Cobalt	ND		1.95		mg/Kg		05/26/15 09:23	05/26/15 16:21	1
Manganese	ND		2.92		mg/Kg		05/26/15 09:23	05/26/15 16:21	1
Nickel	ND		1.95		mg/Kg		05/26/15 09:23	05/26/15 16:21	1

Lab Sample ID: LCS 490-251010/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	20.72		mg/Kg		103	80 - 120
Cobalt	201	212.4		mg/Kg		106	80 - 120
Manganese	201	207.8		mg/Kg		104	80 - 120
Nickel	201	209.4		mg/Kg		104	80 - 120

Lab Sample ID: 490-79044-37 MS — **Client Sample ID: SS-127 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		23.9	25.25		mg/Kg	☼	102	75 - 125
Cobalt	32.7		239	289.1		mg/Kg	☼	107	75 - 125
Manganese	41.7		239	283.2		mg/Kg	☼	101	75 - 125
Nickel	38.0		239	292.7		mg/Kg	☼	106	75 - 125

Lab Sample ID: 490-79044-37 MSD — **Client Sample ID: SS-127 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251269 — **Prep Batch: 251010**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	ND		23.7	23.37		mg/Kg	☼	95	75 - 125	8	20
Cobalt	32.7		237	261.2		mg/Kg	☼	96	75 - 125	10	20
Manganese	41.7		237	256.7		mg/Kg	☼	91	75 - 125	10	20
Nickel	38.0		237	263.8		mg/Kg	☼	95	75 - 125	10	20

Lab Sample ID: MB 490-251087/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251087**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.00		mg/Kg		05/26/15 11:05	05/26/15 22:30	1
Cobalt	ND		2.00		mg/Kg		05/26/15 11:05	05/26/15 22:30	1
Manganese	ND		3.01		mg/Kg		05/26/15 11:05	05/26/15 22:30	1
Nickel	ND		2.00		mg/Kg		05/26/15 11:05	05/26/15 22:30	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 490-251087/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251087**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.7	20.87		mg/Kg		106	80 - 120
Cobalt	197	213.4		mg/Kg		108	80 - 120
Manganese	197	211.0		mg/Kg		107	80 - 120
Nickel	197	209.5		mg/Kg		106	80 - 120

Lab Sample ID: 490-79044-69 MS — **Client Sample ID: SS-123/SS-42D (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251087**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	2.88		23.1	25.39		mg/Kg	☼	98	75 - 125
Cobalt	149	F2 F1	231	324.0		mg/Kg	☼	76	75 - 125
Manganese	162	F2 F1	231	362.8		mg/Kg	☼	87	75 - 125
Nickel	161	F2 F1	231	312.7	F1	mg/Kg	☼	66	75 - 125

Lab Sample ID: 490-79044-69 MSD — **Client Sample ID: SS-123/SS-42D (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251087**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	2.88		22.1	26.58		mg/Kg	☼	107	75 - 125	5	20
Cobalt	149	F2 F1	221	478.7	F1 F2	mg/Kg	☼	149	75 - 125	39	20
Manganese	162	F2 F1	221	489.1	F1 F2	mg/Kg	☼	148	75 - 125	30	20
Nickel	161	F2 F1	221	497.1	F1 F2	mg/Kg	☼	152	75 - 125	46	20

Lab Sample ID: MB 490-251168/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251168**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.978		mg/Kg		05/26/15 14:16	05/26/15 20:49	1
Cobalt	ND		1.96		mg/Kg		05/26/15 14:16	05/26/15 20:49	1
Manganese	ND		2.94		mg/Kg		05/26/15 14:16	05/26/15 20:49	1
Nickel	ND		1.96		mg/Kg		05/26/15 14:16	05/26/15 20:49	1

Lab Sample ID: LCS 490-251168/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251168**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.2	20.67		mg/Kg		103	80 - 120
Cobalt	202	211.1		mg/Kg		105	80 - 120
Manganese	202	209.3		mg/Kg		104	80 - 120
Nickel	202	208.7		mg/Kg		104	80 - 120

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 490-79044-77 MS — **Client Sample ID: SS-122/SS-42C (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251168**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	4.74	F1	23.1	34.60	F1	mg/Kg	☼	129	75 - 125
Cobalt	90.0		231	319.2		mg/Kg	☼	99	75 - 125
Manganese	147		231	406.2		mg/Kg	☼	112	75 - 125
Nickel	54.4	F1	231	315.3		mg/Kg	☼	113	75 - 125

Lab Sample ID: 490-79044-77 MSD — **Client Sample ID: SS-122/SS-42C (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251270 — **Prep Batch: 251168**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	4.74	F1	23.5	40.36	F1	mg/Kg	☼	151	75 - 125	15	20
Cobalt	90.0		235	366.9		mg/Kg	☼	118	75 - 125	14	20
Manganese	147		235	433.5		mg/Kg	☼	122	75 - 125	7	20
Nickel	54.4	F1	235	363.8	F1	mg/Kg	☼	131	75 - 125	14	20

Lab Sample ID: MB 490-251454/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.956		mg/Kg		05/27/15 13:19	05/27/15 20:41	1
Cobalt	ND		1.91		mg/Kg		05/27/15 13:19	05/27/15 20:41	1
Manganese	ND		2.87		mg/Kg		05/27/15 13:19	05/27/15 20:41	1

Lab Sample ID: MB 490-251454/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251848 — **Prep Batch: 251454**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Nickel	ND		1.91		mg/Kg		05/27/15 13:19	05/28/15 12:10	1

Lab Sample ID: LCS 490-251454/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.8	18.31		mg/Kg		92	80 - 120
Cobalt	198	187.0		mg/Kg		94	80 - 120
Manganese	198	182.9		mg/Kg		92	80 - 120
Nickel	198	185.4		mg/Kg		93	80 - 120

Lab Sample ID: LCSD 490-251454/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	20.2	19.88		mg/Kg		99	80 - 120	8	20
Cobalt	202	202.8		mg/Kg		101	80 - 120	8	20
Manganese	202	200.2		mg/Kg		99	80 - 120	9	20

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCSD 490-251454/3-A — **Client Sample ID: Lab Control Sample Dup**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte			Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Nickel			202	201.6		mg/Kg		100	80 - 120	8	20

Lab Sample ID: 490-79044-94 MS — **Client Sample ID: SS-120B/SS-42 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium	1.22		22.5	22.87		mg/Kg	☼	96	75 - 125		
Cobalt	18.6		225	241.8		mg/Kg	☼	99	75 - 125		
Manganese	68.7		225	294.7		mg/Kg	☼	100	75 - 125		
Nickel	15.4		225	239.1		mg/Kg	☼	99	75 - 125		

Lab Sample ID: 490-79044-94 MSD — **Client Sample ID: SS-120B/SS-42 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251454**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	1.22		21.6	22.53		mg/Kg	☼	99	75 - 125	1	20
Cobalt	18.6		216	240.0		mg/Kg	☼	102	75 - 125	1	20
Manganese	68.7		216	275.9		mg/Kg	☼	96	75 - 125	7	20
Nickel	15.4		216	237.9		mg/Kg	☼	103	75 - 125	0	20

Lab Sample ID: MB 490-251487/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251487**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.00		mg/Kg		05/27/15 14:29	05/27/15 19:42	1
Cobalt	ND		2.00		mg/Kg		05/27/15 14:29	05/27/15 19:42	1
Manganese	ND		3.01		mg/Kg		05/27/15 14:29	05/27/15 19:42	1
Nickel	ND		2.00		mg/Kg		05/27/15 14:29	05/27/15 19:42	1

Lab Sample ID: LCS 490-251487/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251487**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium			19.6	18.75		mg/Kg		96	80 - 120		
Cobalt			196	191.0		mg/Kg		98	80 - 120		
Manganese			196	190.8		mg/Kg		98	80 - 120		
Nickel			196	190.6		mg/Kg		97	80 - 120		

Lab Sample ID: 490-79044-97 MS — **Client Sample ID: SS-120C/SS-42B (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251487**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits		
Cadmium	2.63		22.3	22.78		mg/Kg	☼	90	75 - 125		
Cobalt	10.8		223	218.5		mg/Kg	☼	93	75 - 125		

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 490-79044-97 MS — **Client Sample ID: SS-120C/SS-42B (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251487**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Manganese	150	F1	223	303.2	F1	mg/Kg	☼	69	75 - 125
Nickel	15.4		223	222.0		mg/Kg	☼	93	75 - 125

Lab Sample ID: 490-79044-97 MSD — **Client Sample ID: SS-120C/SS-42B (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251487**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	2.63		22.4	23.59		mg/Kg	☼	93	75 - 125	3	20
Cobalt	10.8		224	225.1		mg/Kg	☼	95	75 - 125	3	20
Manganese	150	F1	224	290.2	F1	mg/Kg	☼	62	75 - 125	4	20
Nickel	15.4		224	228.7		mg/Kg	☼	95	75 - 125	3	20

Lab Sample ID: MB 490-251501/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251501**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		1.00		mg/Kg		05/27/15 15:04	05/27/15 22:15	1
Cobalt	ND		2.01		mg/Kg		05/27/15 15:04	05/27/15 22:15	1
Manganese	ND		3.01		mg/Kg		05/27/15 15:04	05/27/15 22:15	1
Nickel	ND		2.01		mg/Kg		05/27/15 15:04	05/27/15 22:15	1

Lab Sample ID: LCS 490-251501/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251501**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.0	19.62		mg/Kg		98	80 - 120
Cobalt	200	200.4		mg/Kg		100	80 - 120
Manganese	200	198.2		mg/Kg		99	80 - 120
Nickel	200	199.2		mg/Kg		100	80 - 120

Lab Sample ID: 490-79044-83 MS — **Client Sample ID: SS-121 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251501**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	8.25	F1	22.7	24.11	F1	mg/Kg	☼	70	75 - 125
Cobalt	79.9		227	269.3		mg/Kg	☼	83	75 - 125
Manganese	216	F1	227	294.1	F1	mg/Kg	☼	34	75 - 125
Nickel	69.3		227	257.7		mg/Kg	☼	83	75 - 125

Lab Sample ID: 490-79044-83 MSD — **Client Sample ID: SS-121 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251501**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	8.25	F1	23.2	27.97		mg/Kg	☼	85	75 - 125	15	20

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: 490-79044-83 MSD — **Client Sample ID: SS-121 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 251615 — **Prep Batch: 251501**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cobalt	79.9		232	263.0		mg/Kg	☼	79	75 - 125	2	20
Manganese	216	F1	232	278.8	F1	mg/Kg	☼	27	75 - 125	5	20
Nickel	69.3		232	266.0		mg/Kg	☼	85	75 - 125	3	20

Lab Sample ID: MB 490-252819/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253165 — **Prep Batch: 252819**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.986		mg/Kg		06/01/15 16:17	06/02/15 17:10	1
Cobalt	ND		1.97		mg/Kg		06/01/15 16:17	06/02/15 17:10	1
Manganese	ND		2.96		mg/Kg		06/01/15 16:17	06/02/15 17:10	1
Nickel	ND		1.97		mg/Kg		06/01/15 16:17	06/02/15 17:10	1

Lab Sample ID: LCS 490-252819/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253165 — **Prep Batch: 252819**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	20.1	21.16		mg/Kg		105	80 - 120
Cobalt	201	211.4		mg/Kg		105	80 - 120
Manganese	201	210.6		mg/Kg		105	80 - 120
Nickel	201	211.0		mg/Kg		105	80 - 120

Lab Sample ID: 490-79044-102 MS — **Client Sample ID: SS-119A (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253165 — **Prep Batch: 252819**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	4.12	F1	24.3	38.18	F1	mg/Kg	☼	140	75 - 125
Cobalt	21.6	F1	243	331.7	F1	mg/Kg	☼	128	75 - 125

Lab Sample ID: 490-79044-102 MSD — **Client Sample ID: SS-119A (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 253165 — **Prep Batch: 252819**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	4.12	F1	23.9	32.30		mg/Kg	☼	118	75 - 125	17	20
Cobalt	21.6	F1	239	290.4		mg/Kg	☼	112	75 - 125	13	20

Lab Sample ID: MB 490-261564/1-A — **Client Sample ID: Method Blank**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.992		mg/Kg		07/02/15 13:17	07/06/15 11:46	1
Cobalt	ND		1.98		mg/Kg		07/02/15 13:17	07/06/15 11:46	1

Method: 6010B - Metals (ICP) (Continued)

Lab Sample ID: LCS 490-261564/2-A — **Client Sample ID: Lab Control Sample**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	19.8	19.13		mg/Kg		97	80 - 120
Cobalt	198	192.2		mg/Kg		97	80 - 120

Lab Sample ID: 490-79038-A-1-B MS — **Client Sample ID: Matrix Spike**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	287	F2	22.6	158.8	4	mg/Kg	☼	-567	75 - 125
Cobalt	1730	F2	226	1095	4	mg/Kg	☼	-278	75 - 125

Lab Sample ID: 490-79038-A-1-C MSD — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262343 — **Prep Batch: 261564**

Analyte	Sample Result	Sample Qualifier	Spike Added	MSD Result	MSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	287	F2	22.9	288.6	4 F2	mg/Kg	☼	6	75 - 125	58	20
Cobalt	1730	F2	229	1395	4 F2	mg/Kg	☼	-144	75 - 125	24	20

Method: Moisture - Percent Moisture

Lab Sample ID: 490-79044-1 DU — **Client Sample ID: SS-132 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	71		71		%		0	20

Lab Sample ID: 490-79044-37 DU — **Client Sample ID: SS-127 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	82		80		%		3	20

Lab Sample ID: 490-79044-69 DU — **Client Sample ID: SS-123/SS-42D (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	86		86		%		0.1	20

Lab Sample ID: 490-79044-77 DU — **Client Sample ID: SS-122/SS-42C (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Solids	85		87		%		2	20

Method: Moisture - Percent Moisture (Continued)

Lab Sample ID: 490-79044-83 DU — **Client Sample ID: SS-121 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	85			86		%				1	20

Lab Sample ID: 490-79044-94 DU — **Client Sample ID: SS-120B/SS-42 (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	89			87		%				2	20

Lab Sample ID: 490-79044-97 DU — **Client Sample ID: SS-120C/SS-42B (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 250659

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	87			87		%				0.7	20

Lab Sample ID: 490-79044-102 DU — **Client Sample ID: SS-119A (0-1)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 252915

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	81			81		%				0	20

Lab Sample ID: 490-79044-105 DU — **Client Sample ID: SS-119B (1-2)**
Matrix: Solid — **Prep Type: Total/NA**
Analysis Batch: 262159

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Percent Solids	87			87		%				0	20

QC Association Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Metals

Prep Batch: 251010

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-1	SS-132 (0-1)	Total/NA	Solid	3051A	
490-79044-7	SS-131 (0-1)	Total/NA	Solid	3051A	
490-79044-14	SS-130 (0-1)	Total/NA	Solid	3051A	
490-79044-21	SS-129 (0-1)	Total/NA	Solid	3051A	
490-79044-32	SS-128 (0-1)	Total/NA	Solid	3051A	
490-79044-37	SS-127 (0-1)	Total/NA	Solid	3051A	
490-79044-37 MS	SS-127 (0-1)	Total/NA	Solid	3051A	
490-79044-37 MSD	SS-127 (0-1)	Total/NA	Solid	3051A	
490-79044-46	SS-126 (0-1)	Total/NA	Solid	3051A	
490-79044-55	SS-125 (0-1)	Total/NA	Solid	3051A	
490-79044-62	SS-124 (0-1)	Total/NA	Solid	3051A	
490-79044-74	SS-123B/SS-42F (0-1)	Total/NA	Solid	3051A	
LCS 490-251010/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251010/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 251087

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-69	SS-123/SS-42D (0-1)	Total/NA	Solid	3051A	
490-79044-69 MS	SS-123/SS-42D (0-1)	Total/NA	Solid	3051A	
490-79044-69 MSD	SS-123/SS-42D (0-1)	Total/NA	Solid	3051A	
490-79044-86	SS-121A/SS-42A (0-1)	Total/NA	Solid	3051A	
490-79044-89	SS-120 (0-1)	Total/NA	Solid	3051A	
490-79044-99	SS-119 (0-1)	Total/NA	Solid	3051A	
490-79044-106	SS-118 (0-1)	Total/NA	Solid	3051A	
490-79044-115	DUP-18	Total/NA	Solid	3051A	
490-79044-116	DUP-19	Total/NA	Solid	3051A	
490-79044-117	DUP-20	Total/NA	Solid	3051A	
490-79044-118	DUP-21	Total/NA	Solid	3051A	
490-79044-119	DUP-22	Total/NA	Solid	3051A	
490-79044-120	DUP-23	Total/NA	Solid	3051A	
LCS 490-251087/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251087/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 251168

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-77	SS-122/SS-42C (0-1)	Total/NA	Solid	3051A	
490-79044-77 MS	SS-122/SS-42C (0-1)	Total/NA	Solid	3051A	
490-79044-77 MSD	SS-122/SS-42C (0-1)	Total/NA	Solid	3051A	
LCS 490-251168/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251168/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 251269

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-1	SS-132 (0-1)	Total/NA	Solid	6010B	251010
490-79044-7	SS-131 (0-1)	Total/NA	Solid	6010B	251010
490-79044-14	SS-130 (0-1)	Total/NA	Solid	6010B	251010
490-79044-21	SS-129 (0-1)	Total/NA	Solid	6010B	251010
490-79044-32	SS-128 (0-1)	Total/NA	Solid	6010B	251010
490-79044-37	SS-127 (0-1)	Total/NA	Solid	6010B	251010
490-79044-37 MS	SS-127 (0-1)	Total/NA	Solid	6010B	251010
490-79044-37 MSD	SS-127 (0-1)	Total/NA	Solid	6010B	251010

Metals (Continued)

Analysis Batch: 251269 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-46	SS-126 (0-1)	Total/NA	Solid	6010B	251010
490-79044-55	SS-125 (0-1)	Total/NA	Solid	6010B	251010
490-79044-62	SS-124 (0-1)	Total/NA	Solid	6010B	251010
490-79044-74	SS-123B/SS-42F (0-1)	Total/NA	Solid	6010B	251010
LCS 490-251010/2-A	Lab Control Sample	Total/NA	Solid	6010B	251010
MB 490-251010/1-A	Method Blank	Total/NA	Solid	6010B	251010

Analysis Batch: 251270

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-69	SS-123/SS-42D (0-1)	Total/NA	Solid	6010B	251087
490-79044-69 MS	SS-123/SS-42D (0-1)	Total/NA	Solid	6010B	251087
490-79044-69 MSD	SS-123/SS-42D (0-1)	Total/NA	Solid	6010B	251087
490-79044-77	SS-122/SS-42C (0-1)	Total/NA	Solid	6010B	251168
490-79044-77 MS	SS-122/SS-42C (0-1)	Total/NA	Solid	6010B	251168
490-79044-77 MSD	SS-122/SS-42C (0-1)	Total/NA	Solid	6010B	251168
490-79044-86	SS-121A/SS-42A (0-1)	Total/NA	Solid	6010B	251087
490-79044-89	SS-120 (0-1)	Total/NA	Solid	6010B	251087
490-79044-99	SS-119 (0-1)	Total/NA	Solid	6010B	251087
490-79044-106	SS-118 (0-1)	Total/NA	Solid	6010B	251087
490-79044-115	DUP-18	Total/NA	Solid	6010B	251087
490-79044-116	DUP-19	Total/NA	Solid	6010B	251087
490-79044-117	DUP-20	Total/NA	Solid	6010B	251087
490-79044-118	DUP-21	Total/NA	Solid	6010B	251087
490-79044-119	DUP-22	Total/NA	Solid	6010B	251087
490-79044-120	DUP-23	Total/NA	Solid	6010B	251087
LCS 490-251087/2-A	Lab Control Sample	Total/NA	Solid	6010B	251087
LCS 490-251168/2-A	Lab Control Sample	Total/NA	Solid	6010B	251168
MB 490-251087/1-A	Method Blank	Total/NA	Solid	6010B	251087
MB 490-251168/1-A	Method Blank	Total/NA	Solid	6010B	251168

Prep Batch: 251454

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-94	SS-120B/SS-42 (0-1)	Total/NA	Solid	3051A	
490-79044-94 MS	SS-120B/SS-42 (0-1)	Total/NA	Solid	3051A	
490-79044-94 MSD	SS-120B/SS-42 (0-1)	Total/NA	Solid	3051A	
LCS 490-251454/2-A	Lab Control Sample	Total/NA	Solid	3051A	
LCSD 490-251454/3-A	Lab Control Sample Dup	Total/NA	Solid	3051A	
MB 490-251454/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 251487

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-97	SS-120C/SS-42B (0-1)	Total/NA	Solid	3051A	
490-79044-97 MS	SS-120C/SS-42B (0-1)	Total/NA	Solid	3051A	
490-79044-97 MSD	SS-120C/SS-42B (0-1)	Total/NA	Solid	3051A	
LCS 490-251487/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251487/1-A	Method Blank	Total/NA	Solid	3051A	

Prep Batch: 251501

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-83	SS-121 (0-1)	Total/NA	Solid	3051A	
490-79044-83 MS	SS-121 (0-1)	Total/NA	Solid	3051A	

Metals (Continued)

Prep Batch: 251501 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-83 MSD	SS-121 (0-1)	Total/NA	Solid	3051A	
LCS 490-251501/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-251501/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 251615

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-83	SS-121 (0-1)	Total/NA	Solid	6010B	251501
490-79044-83 MS	SS-121 (0-1)	Total/NA	Solid	6010B	251501
490-79044-83 MSD	SS-121 (0-1)	Total/NA	Solid	6010B	251501
490-79044-94	SS-120B/SS-42 (0-1)	Total/NA	Solid	6010B	251454
490-79044-94 MS	SS-120B/SS-42 (0-1)	Total/NA	Solid	6010B	251454
490-79044-94 MSD	SS-120B/SS-42 (0-1)	Total/NA	Solid	6010B	251454
490-79044-97	SS-120C/SS-42B (0-1)	Total/NA	Solid	6010B	251487
490-79044-97 MS	SS-120C/SS-42B (0-1)	Total/NA	Solid	6010B	251487
490-79044-97 MSD	SS-120C/SS-42B (0-1)	Total/NA	Solid	6010B	251487
LCS 490-251454/2-A	Lab Control Sample	Total/NA	Solid	6010B	251454
LCS 490-251487/2-A	Lab Control Sample	Total/NA	Solid	6010B	251487
LCS 490-251501/2-A	Lab Control Sample	Total/NA	Solid	6010B	251501
LCSD 490-251454/3-A	Lab Control Sample Dup	Total/NA	Solid	6010B	251454
MB 490-251454/1-A	Method Blank	Total/NA	Solid	6010B	251454
MB 490-251487/1-A	Method Blank	Total/NA	Solid	6010B	251487
MB 490-251501/1-A	Method Blank	Total/NA	Solid	6010B	251501

Analysis Batch: 251848

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
MB 490-251454/1-A	Method Blank	Total/NA	Solid	6010B	251454

Prep Batch: 252819

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-63	SS-124 (1-2)	Total/NA	Solid	3051A	
490-79044-65	SS-124A (0-1)	Total/NA	Solid	3051A	
490-79044-67	SS-124B (0-1)	Total/NA	Solid	3051A	
490-79044-72	SS-123A/SS-43B (0-1)	Total/NA	Solid	3051A	
490-79044-84	SS-121 (1-2)	Total/NA	Solid	3051A	
490-79044-88	SS-121B (0-1)	Total/NA	Solid	3051A	
490-79044-100	SS-119 (1-2)	Total/NA	Solid	3051A	
490-79044-102	SS-119A (0-1)	Total/NA	Solid	3051A	
490-79044-102 MS	SS-119A (0-1)	Total/NA	Solid	3051A	
490-79044-102 MSD	SS-119A (0-1)	Total/NA	Solid	3051A	
490-79044-104	SS-119B (0-1)	Total/NA	Solid	3051A	
490-79044-107	SS-118 (1-2)	Total/NA	Solid	3051A	
490-79044-109	SS-118A (0-1)	Total/NA	Solid	3051A	
490-79044-111	SS-118B (0-1)	Total/NA	Solid	3051A	
490-79044-113	SS-118C (0-1)	Total/NA	Solid	3051A	
LCS 490-252819/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-252819/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 253165

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-63	SS-124 (1-2)	Total/NA	Solid	6010B	252819
490-79044-65	SS-124A (0-1)	Total/NA	Solid	6010B	252819

Metals (Continued)

Analysis Batch: 253165 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-67	SS-124B (0-1)	Total/NA	Solid	6010B	252819
490-79044-72	SS-123A/SS-43B (0-1)	Total/NA	Solid	6010B	252819
490-79044-84	SS-121 (1-2)	Total/NA	Solid	6010B	252819
490-79044-88	SS-121B (0-1)	Total/NA	Solid	6010B	252819
490-79044-100	SS-119 (1-2)	Total/NA	Solid	6010B	252819
490-79044-102	SS-119A (0-1)	Total/NA	Solid	6010B	252819
490-79044-102 MS	SS-119A (0-1)	Total/NA	Solid	6010B	252819
490-79044-102 MSD	SS-119A (0-1)	Total/NA	Solid	6010B	252819
490-79044-104	SS-119B (0-1)	Total/NA	Solid	6010B	252819
490-79044-107	SS-118 (1-2)	Total/NA	Solid	6010B	252819
490-79044-109	SS-118A (0-1)	Total/NA	Solid	6010B	252819
490-79044-111	SS-118B (0-1)	Total/NA	Solid	6010B	252819
490-79044-113	SS-118C (0-1)	Total/NA	Solid	6010B	252819
LCS 490-252819/2-A	Lab Control Sample	Total/NA	Solid	6010B	252819
MB 490-252819/1-A	Method Blank	Total/NA	Solid	6010B	252819

Prep Batch: 261564

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79038-A-1-B MS	Matrix Spike	Total/NA	Solid	3051A	
490-79038-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	3051A	
490-79044-105	SS-119B (1-2)	Total/NA	Solid	3051A	
490-79044-110	SS-118A (1-2)	Total/NA	Solid	3051A	
490-79044-112	SS-118B (1-2)	Total/NA	Solid	3051A	
490-79044-114	SS-118C (1-2)	Total/NA	Solid	3051A	
LCS 490-261564/2-A	Lab Control Sample	Total/NA	Solid	3051A	
MB 490-261564/1-A	Method Blank	Total/NA	Solid	3051A	

Analysis Batch: 262343

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79038-A-1-B MS	Matrix Spike	Total/NA	Solid	6010B	261564
490-79038-A-1-C MSD	Matrix Spike Duplicate	Total/NA	Solid	6010B	261564
490-79044-105	SS-119B (1-2)	Total/NA	Solid	6010B	261564
490-79044-110	SS-118A (1-2)	Total/NA	Solid	6010B	261564
490-79044-112	SS-118B (1-2)	Total/NA	Solid	6010B	261564
490-79044-114	SS-118C (1-2)	Total/NA	Solid	6010B	261564
LCS 490-261564/2-A	Lab Control Sample	Total/NA	Solid	6010B	261564
MB 490-261564/1-A	Method Blank	Total/NA	Solid	6010B	261564

General Chemistry

Analysis Batch: 250659

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-1	SS-132 (0-1)	Total/NA	Solid	Moisture	
490-79044-1 DU	SS-132 (0-1)	Total/NA	Solid	Moisture	
490-79044-7	SS-131 (0-1)	Total/NA	Solid	Moisture	
490-79044-14	SS-130 (0-1)	Total/NA	Solid	Moisture	
490-79044-21	SS-129 (0-1)	Total/NA	Solid	Moisture	
490-79044-32	SS-128 (0-1)	Total/NA	Solid	Moisture	
490-79044-37	SS-127 (0-1)	Total/NA	Solid	Moisture	
490-79044-37 DU	SS-127 (0-1)	Total/NA	Solid	Moisture	

General Chemistry (Continued)

Analysis Batch: 250659 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-46	SS-126 (0-1)	Total/NA	Solid	Moisture	
490-79044-55	SS-125 (0-1)	Total/NA	Solid	Moisture	
490-79044-62	SS-124 (0-1)	Total/NA	Solid	Moisture	
490-79044-69	SS-123/SS-42D (0-1)	Total/NA	Solid	Moisture	
490-79044-69 DU	SS-123/SS-42D (0-1)	Total/NA	Solid	Moisture	
490-79044-74	SS-123B/SS-42F (0-1)	Total/NA	Solid	Moisture	
490-79044-77	SS-122/SS-42C (0-1)	Total/NA	Solid	Moisture	
490-79044-77 DU	SS-122/SS-42C (0-1)	Total/NA	Solid	Moisture	
490-79044-83	SS-121 (0-1)	Total/NA	Solid	Moisture	
490-79044-83 DU	SS-121 (0-1)	Total/NA	Solid	Moisture	
490-79044-86	SS-121A/SS-42A (0-1)	Total/NA	Solid	Moisture	
490-79044-89	SS-120 (0-1)	Total/NA	Solid	Moisture	
490-79044-94	SS-120B/SS-42 (0-1)	Total/NA	Solid	Moisture	
490-79044-94 DU	SS-120B/SS-42 (0-1)	Total/NA	Solid	Moisture	
490-79044-97	SS-120C/SS-42B (0-1)	Total/NA	Solid	Moisture	
490-79044-97 DU	SS-120C/SS-42B (0-1)	Total/NA	Solid	Moisture	
490-79044-99	SS-119 (0-1)	Total/NA	Solid	Moisture	
490-79044-106	SS-118 (0-1)	Total/NA	Solid	Moisture	
490-79044-115	DUP-18	Total/NA	Solid	Moisture	
490-79044-116	DUP-19	Total/NA	Solid	Moisture	
490-79044-117	DUP-20	Total/NA	Solid	Moisture	
490-79044-118	DUP-21	Total/NA	Solid	Moisture	
490-79044-119	DUP-22	Total/NA	Solid	Moisture	
490-79044-120	DUP-23	Total/NA	Solid	Moisture	

Analysis Batch: 252915

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-63	SS-124 (1-2)	Total/NA	Solid	Moisture	
490-79044-65	SS-124A (0-1)	Total/NA	Solid	Moisture	
490-79044-67	SS-124B (0-1)	Total/NA	Solid	Moisture	
490-79044-72	SS-123A/SS-43B (0-1)	Total/NA	Solid	Moisture	
490-79044-84	SS-121 (1-2)	Total/NA	Solid	Moisture	
490-79044-88	SS-121B (0-1)	Total/NA	Solid	Moisture	
490-79044-100	SS-119 (1-2)	Total/NA	Solid	Moisture	
490-79044-102	SS-119A (0-1)	Total/NA	Solid	Moisture	
490-79044-102 DU	SS-119A (0-1)	Total/NA	Solid	Moisture	
490-79044-102 MS	SS-119A (0-1)	Total/NA	Solid	Moisture	
490-79044-102 MSD	SS-119A (0-1)	Total/NA	Solid	Moisture	
490-79044-104	SS-119B (0-1)	Total/NA	Solid	Moisture	
490-79044-107	SS-118 (1-2)	Total/NA	Solid	Moisture	
490-79044-109	SS-118A (0-1)	Total/NA	Solid	Moisture	
490-79044-111	SS-118B (0-1)	Total/NA	Solid	Moisture	
490-79044-113	SS-118C (0-1)	Total/NA	Solid	Moisture	

Analysis Batch: 262159

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-79044-105	SS-119B (1-2)	Total/NA	Solid	Moisture	
490-79044-105 DU	SS-119B (1-2)	Total/NA	Solid	Moisture	
490-79044-110	SS-118A (1-2)	Total/NA	Solid	Moisture	
490-79044-112	SS-118B (1-2)	Total/NA	Solid	Moisture	
490-79044-114	SS-118C (1-2)	Total/NA	Solid	Moisture	

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-132 (0-1)
Date Collected: 05/18/15 16:20
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-1
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.525 g	100 mL	251269	05/26/15 17:16	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-131 (0-1)
Date Collected: 05/18/15 17:15
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-7
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.499 g	100 mL	251269	05/26/15 17:20	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-130 (0-1)
Date Collected: 05/19/15 08:15
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-14
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.522 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.522 g	100 mL	251269	05/26/15 17:24	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-129 (0-1)
Date Collected: 05/19/15 09:50
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-21
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.509 g	100 mL	251269	05/26/15 17:28	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-128 (0-1)
Date Collected: 05/19/15 10:05
Date Received: 05/22/15 08:30

Lab Sample ID: 490-79044-32
Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.496 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.496 g	100 mL	251269	05/26/15 17:32	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-127 (0-1)
Lab Sample ID: 490-79044-37
Date Collected: 05/19/15 10:30
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.502 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.502 g	100 mL	251269	05/26/15 16:30	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-126 (0-1)
Lab Sample ID: 490-79044-46
Date Collected: 05/19/15 11:35
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.518 g	100 mL	251269	05/26/15 17:36	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-125 (0-1)
Lab Sample ID: 490-79044-55
Date Collected: 05/19/15 12:10
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.497 g	100 mL	251269	05/26/15 17:49	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-124 (0-1)
Lab Sample ID: 490-79044-62
Date Collected: 05/19/15 13:00
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.505 g	100 mL	251269	05/26/15 17:53	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-124 (1-2)
Lab Sample ID: 490-79044-63
Date Collected: 05/19/15 13:05
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.509 g	100 mL	253165	06/02/15 17:39	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-124A (0-1)

Lab Sample ID: 490-79044-65
Date Collected: 05/19/15 13:25
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.521 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.521 g	100 mL	253165	06/02/15 17:44	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Client Sample ID: SS-124B (0-1)

Lab Sample ID: 490-79044-67
Date Collected: 05/19/15 13:15
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.507 g	100 mL	253165	06/02/15 17:48	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Client Sample ID: SS-123/SS-42D (0-1)

Lab Sample ID: 490-79044-69
Date Collected: 05/19/15 13:50
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.503 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.503 g	100 mL	251270	05/26/15 22:39	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-123A/SS-43B (0-1)

Lab Sample ID: 490-79044-72
Date Collected: 05/19/15 14:20
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.509 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.509 g	100 mL	253165	06/02/15 18:01	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Client Sample ID: SS-123B/SS-42F (0-1)

Lab Sample ID: 490-79044-74
Date Collected: 05/19/15 13:35
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.506 g	100 mL	251010	05/26/15 09:23	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.506 g	100 mL	251269	05/26/15 17:57	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-122/SS-42C (0-1)

Lab Sample ID: 490-79044-77
Date Collected: 05/19/15 15:20
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.507 g	100 mL	251168	05/26/15 14:16	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.507 g	100 mL	251270	05/26/15 20:57	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-121 (0-1)

Lab Sample ID: 490-79044-83
Date Collected: 05/19/15 16:00
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.518 g	100 mL	251501	05/27/15 15:04	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.518 g	100 mL	251615	05/27/15 22:24	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-121 (1-2)

Lab Sample ID: 490-79044-84
Date Collected: 05/19/15 16:05
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.498 g	100 mL	253165	06/02/15 18:05	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Client Sample ID: SS-121A/SS-42A (0-1)

Lab Sample ID: 490-79044-86
Date Collected: 05/19/15 16:15
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.499 g	100 mL	251270	05/26/15 23:08	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-121B (0-1)

Lab Sample ID: 490-79044-88
Date Collected: 05/19/15 16:30
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.519 g	100 mL	253165	06/02/15 18:09	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Client Sample ID: SS-120 (0-1)
Lab Sample ID: 490-79044-89
Date Collected: 05/20/15 09:20
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.501 g	100 mL	251270	05/26/15 23:12	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-120B/SS-42 (0-1)
Lab Sample ID: 490-79044-94
Date Collected: 05/20/15 09:35
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	251454	05/27/15 13:19	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.501 g	100 mL	251615	05/27/15 21:03	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-120C/SS-42B (0-1)
Lab Sample ID: 490-79044-97
Date Collected: 05/20/15 10:25
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.501 g	100 mL	251487	05/27/15 14:29	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.501 g	100 mL	251615	05/27/15 19:50	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-119 (0-1)
Lab Sample ID: 490-79044-99
Date Collected: 05/20/15 10:50
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.524 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.524 g	100 mL	251270	05/26/15 23:16	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 10:01	MAA	TAL NSH

Client Sample ID: SS-119 (1-2)
Lab Sample ID: 490-79044-100
Date Collected: 05/20/15 10:55
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.497 g	100 mL	253165	06/02/15 18:14	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 10:58	MAA	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-119A (0-1)

Lab Sample ID: 490-79044-102
Date Collected: 05/20/15 12:00
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.504 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.504 g	100 mL	253165	06/02/15 17:18	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Client Sample ID: SS-119B (0-1)

Lab Sample ID: 490-79044-104
Date Collected: 05/20/15 10:55
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.505 g	100 mL	253165	06/02/15 18:18	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Client Sample ID: SS-119B (1-2)

Lab Sample ID: 490-79044-105
Date Collected: 05/20/15 10:58
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	261564	07/02/15 13:17	KMS	TAL NSH
Total/NA	Analysis	6010B		1	0.510 g	100 mL	262343	07/06/15 12:20	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			262159	07/06/15 12:01	AJK	TAL NSH

Client Sample ID: SS-118 (0-1)

Lab Sample ID: 490-79044-106
Date Collected: 05/20/15 11:00
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.497 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.497 g	100 mL	251270	05/26/15 23:21	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: SS-118 (1-2)

Lab Sample ID: 490-79044-107
Date Collected: 05/20/15 11:05
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.519 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.519 g	100 mL	253165	06/02/15 18:23	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Client Sample ID: SS-118A (0-1)
Lab Sample ID: 490-79044-109
Date Collected: 05/20/15 11:50
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.499 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.499 g	100 mL	253165	06/02/15 18:27	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Client Sample ID: SS-118A (1-2)
Lab Sample ID: 490-79044-110
Date Collected: 05/20/15 11:55
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.510 g	100 mL	261564	07/02/15 13:17	KMS	TAL NSH
Total/NA	Analysis	6010B		1	0.510 g	100 mL	262343	07/06/15 12:24	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			262159	07/06/15 12:01	AJK	TAL NSH

Client Sample ID: SS-118B (0-1)
Lab Sample ID: 490-79044-111
Date Collected: 05/20/15 11:30
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.498 g	100 mL	253165	06/02/15 18:31	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Client Sample ID: SS-118B (1-2)
Lab Sample ID: 490-79044-112
Date Collected: 05/20/15 11:35
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.502 g	100 mL	261564	07/02/15 13:17	KMS	TAL NSH
Total/NA	Analysis	6010B		1	0.502 g	100 mL	262343	07/06/15 12:38	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			262159	07/06/15 12:01	AJK	TAL NSH

Client Sample ID: SS-118C (0-1)
Lab Sample ID: 490-79044-113
Date Collected: 05/20/15 12:20
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	252819	06/01/15 16:17	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.508 g	100 mL	253165	06/02/15 18:36	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			252915	06/02/15 11:57	MAA	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: SS-118C (1-2)

Lab Sample ID: 490-79044-114
Date Collected: 05/20/15 12:25
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.513 g	100 mL	261564	07/02/15 13:17	KMS	TAL NSH
Total/NA	Analysis	6010B		1	0.513 g	100 mL	262343	07/06/15 12:42	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			262159	07/06/15 12:01	AJK	TAL NSH

Client Sample ID: DUP-18

Lab Sample ID: 490-79044-115
Date Collected: 05/19/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.525 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.525 g	100 mL	251270	05/26/15 23:25	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: DUP-19

Lab Sample ID: 490-79044-116
Date Collected: 05/19/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.521 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.521 g	100 mL	251270	05/26/15 23:29	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: DUP-20

Lab Sample ID: 490-79044-117
Date Collected: 05/20/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.498 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.498 g	100 mL	251270	05/26/15 23:33	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Client Sample ID: DUP-21

Lab Sample ID: 490-79044-118
Date Collected: 05/20/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.520 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.520 g	100 mL	251270	05/26/15 23:37	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 09:43	MAA	TAL NSH

Lab Chronicle

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Client Sample ID: DUP-22

Lab Sample ID: 490-79044-119
Date Collected: 05/20/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.505 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.505 g	100 mL	251270	05/26/15 23:50	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 10:01	MAA	TAL NSH

Client Sample ID: DUP-23

Lab Sample ID: 490-79044-120
Date Collected: 05/20/15 01:01
Matrix: Solid
Date Received: 05/22/15 08:30

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3051A			0.508 g	100 mL	251087	05/26/15 11:05	ZLN	TAL NSH
Total/NA	Analysis	6010B		1	0.508 g	100 mL	251270	05/26/15 23:54	LEG	TAL NSH
Total/NA	Analysis	Moisture		1			250659	05/23/15 10:01	MAA	TAL NSH

Laboratory References:
TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Method Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Method	Method Description	Protocol	Laboratory
6010B	Metals (ICP)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH

Protocol References:

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Umicore - AL

TestAmerica Job ID: 490-79044-1
SDG: UMI-001

Laboratory: TestAmerica Nashville

All certifications held by this laboratory are listed. Not all certifications are applicable to this report.

Authority	Program	EPA Region	Certification ID	Expiration Date
A2LA	A2LA		NA: NELAP & A2LA	12-31-15
A2LA	ISO/IEC 17025		0453.07	12-31-15
Alaska (UST)	State Program	10	UST-087	07-24-16
Arizona	State Program	9	AZ0473	05-05-16
Arkansas DEQ	State Program	6	88-0737	04-25-16
California	State Program	9	2938	10-31-16
Connecticut	State Program	1	PH-0220	12-31-15
Florida	NELAP	4	E87358	06-30-16
Georgia	State Program	4	N/A	06-30-16
Illinois	NELAP	5	200010	12-09-15
Iowa	State Program	7	131	04-01-16
Kansas	NELAP	7	E-10229	10-31-15
Kentucky (UST)	State Program	4	19	06-30-16
Kentucky (WW)	State Program	4	90038	12-31-15
Louisiana	NELAP	6	30613	06-30-16
Maryland	State Program	3	316	03-31-16
Massachusetts	State Program	1	M-TN032	06-30-16
Minnesota	NELAP	5	047-999-345	12-31-15
Mississippi	State Program	4	N/A	06-30-16
Montana (UST)	State Program	8	NA	02-24-20
Nevada	State Program	9	TN00032	07-31-16
New Hampshire	NELAP	1	2963	10-09-15
New Jersey	NELAP	2	TN965	09-30-15
New York	NELAP	2	11342	03-31-16
North Carolina (WW/SW)	State Program	4	387	12-31-15
North Dakota	State Program	8	R-146	06-30-15 *
Ohio VAP	State Program	5	CL0033	07-10-17
Oklahoma	State Program	6	9412	08-31-15 *
Oregon	NELAP	10	TN200001	04-27-16
Pennsylvania	NELAP	3	68-00585	06-30-16
Rhode Island	State Program	1	LAO00268	12-30-15
South Carolina	State Program	4	84009 (001)	02-28-16
South Carolina (DW)	State Program	4	84009 (002)	12-16-17
Tennessee	State Program	4	2008	02-23-17
Texas	NELAP	6	T104704077	08-31-15 *
USDA	Federal		S-48469	10-30-16
Utah	NELAP	8	TN00032	07-31-15 *
Virginia	NELAP	3	460152	06-14-16
Washington	State Program	10	C789	07-19-15 *
West Virginia DEP	State Program	3	219	02-28-16
Wisconsin	State Program	5	998020430	08-31-15 *
Wyoming (UST)	A2LA	8	453.07	12-31-15

* Certification renewal pending - certification considered valid.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

490-79044 Chain of Custody

Cooler Received/Opened On 5/22/2015 @ 0830

1. Tracking # 6878 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 1.2 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

8/12/2015

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte

Loc: 490
79044

Cooler Received/Opened On 5/22/2015 @ 0830

1. Tracking # 68607 (last 4 digits, FedEx)

Courier: FedEx IR Gun ID 94660220

2. Temperature of rep. sample or temp blank when opened: 3.5 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: (1) Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) MDM

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used: Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) P

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) D

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) R

I certify that I attached a label with the unique LIMS number to each container (intial) R

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-J
End of Form

Revised 11/28/12

8/12/2015

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Charlotte
Loc: 490
79044

Cooler Received/Opened On: 5/22/2015 @0830

1. Tracking # 6890 (last 4 digits, FedEx)

Courier: Fed-Ex IR Gun ID: 14740456

2. Temperature of rep. sample or temp blank when opened: 1.0 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment
Cooler Receipt Form.doc

LF-1
End of Form

Revised 11/28/12

8/12/2015

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIPT FORM

Loc: 490
79044

Cooler Received/Opened On: 5/22/2015 @0830

1. Tracking # 6889 (last 4 digits, FedEx)

Courier: Fed-Ex IR Gun ID: 14740456

2. Temperature of rep. sample or temp blank when opened: 2.8 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO...NA

4. Were custody seals on outside of cooler? YES...NO...NA

If yes, how many and where: 1 Front

5. Were the seals intact, signed, and dated correctly? YES...NO...NA

6. Were custody papers inside cooler? YES...NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) _____

7. Were custody seals on containers: YES NO and Intact YES...NO...NA

Were these signed and dated correctly? YES...NO...NA

8. Packing mat'l used? Bubblewrap Plastic bag Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: Ice Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? YES...NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? YES...NO...NA

12. Did all container labels and tags agree with custody papers? YES...NO...NA

13a. Were VOA vials received? YES...NO...NA

b. Was there any observable headspace present in any VOA vial? YES...NO...NA

14. Was there a Trip Blank in this cooler? YES...NO...NA If multiple coolers, sequence # NA

I certify that I unloaded the cooler and answered questions 7-14 (intial) _____

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? YES..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used YES...NO...NA

16. Was residual chlorine present? YES...NO...NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) _____

17. Were custody papers properly filled out (ink, signed, etc)? YES...NO...NA

18. Did you sign the custody papers in the appropriate place? YES...NO...NA

19. Were correct containers used for the analysis requested? YES...NO...NA

20. Was sufficient amount of sample sent in each container? YES...NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) _____

I certify that I attached a label with the unique LIMS number to each container (intial) _____

21. Were there Non-Conformance issues at login? YES...NO Was a NCM generated? YES...NO...#_____

BIS = Broken in shipment

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hunt & Hickman, PC	Shannon Cottrill	5/21/15	281467
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 1 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Umicore - Alabama

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil		Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		6010*	** Hold	Special Instructions/ Conditions of Receipt
1	SS-132 (0-1)	5/18/15	1620				X		X							X		*Cd, Co, Ni, Mn
2	SS-132 (1-2)	5/18/15	1625				↓		↓							X	X	only
3	SS-132A (0-1)	5/18/15	1635				↓		↓							X	X	** Hold Pending
4	SS-132A (1-2)	5/18/15	1640				↓		↓							X	X	HHI Authorization
5	SS-132B (0-1)	5/18/15	1650				↓		↓							X	X	
6	SS-132B (1-2)	5/18/15	1655				↓		↓							X	X	
7	SS-131 (0-1)	5/18/15	1715				↓		↓							X		
8	SS-131 (1-2)	5/18/15	1720				↓		↓							X	X	
9	SS-131 (2-3)	5/18/15	1725				↓		↓							X	X	
10	SS-131A (0-1)	5/19/15	0745				↓		↓							X	X	
11	SS-131A (1-2)	5/19/15	0750				↓		↓							X	X	
12	SS-131B (0-1)	5/19/15	0755				↓		↓							X	X	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☒ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	5/21/15	1100	1. Received By: [signature] CMW 1.2/3.5/1.0/2.8	5/22/15	0630
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

8/12/2015

Chain of Custody Record

TAL-4124 (1007)

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

8/12/2015

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281468
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 2 of 10**
2923 S Tryon St Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State)	Carrier/Waybill Number
Unicore - AC	

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold**	Special Instructions/ Conditions of Receipt
13	SS-131 B (1-2)	5/19/15	0800				X	X						X	X	* Co, Cd, Ni, Mn
14	SS-130 (0-1)	5/19/15	0815											X		on Cg
15	SS-130 (1-2)	5/19/15	0820											X	X	** Hold pending
16	SS-130 (2-3)	5/19/15	0825											X	X	H+H approval
17	SS-130 A (0-1)	5/19/15	0850											X	X	
18	SS-130 A (1-2)	5/19/15	0855											X	X	
19	SS-130 B (0-1)	5/19/15	0840											X	X	
20	SS-130 B (1-2)	5/19/15	0835											X	X	
21	SS-129 (0-1)	5/19/15	0950											X		
22	SS-129 (1-2)	5/19/15	0955											X	X	
23	SS-129 (2-3)	5/19/15	1000											X	X	
24	SS-129 A (0-1)	5/19/15	0905											X	X	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

1. Relinquished By	Date	Time	1. Received By	Date	Time
[signature]	5/21/14	1100	[signature]	5/22/15	0830
2. Relinquished By	**Date**	**Time**	**2. Received By**	**Date**	**Time**
3. Relinquished By	**Date**	**Time**	**3. Received By**	**Date**	**Time**

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281469
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 3 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	RALPH McGEE	KEID HAYES

Project Name and Location (State)	Carrier/Waybill Number
Umicore – AC	

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hg/CV**	Special Instructions/ Conditions of Receipt
25	SS-129A (1-2)	5/19/15	0910				X	X						X	X	*Co, Cd, Ni, Mn only
26	SS-129B (0-1)	5/19/15	0920											X	X	**HgCl pending
27	SS-129B (1-2)	5/19/15	0925											X	X	H+H approval
28	SS-129C (0-1)	5/19/15	0930											X	X	
29	SS-129C (1-2)	5/19/15	0935											X	X	
30	SS-129D (0-1)	5/19/15	0940											X	X	
31	SS-129D (1-2)	5/19/15	0945											X	X	
32	SS-128 (0-1)	5/19/15	1005											X		
33	SS-128A (0-1)	5/19/15	1010											X	X	
34	SS-128A (1-2)	5/19/15	1015											X	X	
35	SS-128B (0-1)	5/19/15	1020											X	X	
36	SS-128B (1-2)	5/19/15	1025											X	X	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: [signature]	5/21/15	1100	1. Received By: [signature]	5/22/15	0530
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hunt & Hickman, PC	Shannon Cottrill	5/21/15	281470
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 4 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Umicore – AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold**	MS/MSD	Special Instructions/ Conditions of Receipt
37 SS-127 (0-1)	5/19/15	1030				X	X						X		X	*Co, Cd, Ni, Mn only
38 SS-127 (1-2)	5/19/15	1035				↓	↓						X	X		**Hold pending
39 SS-127 (2-3)	5/19/15	1040				↓	↓						X	X		H+H approval
40 SS-127 A (0-1)	5/19/15	1055				↓	↓						X	X		
41 SS-127 A (1-2)	5/19/15	1100				↓	↓						X	X		
42 SS-127 B (0-1)	5/19/15	1105				↓	↓						X	X		
43 SS-127 B (1-2)	5/19/15	1130				↓	↓						X	X		
44 SS-127 C (0-1)	5/19/15	~~1050~~ 1045				↓	↓						X	X		
45 SS-127 C (1-2)	5/19/15	1050				↓	↓						X	X		
46 SS-126 (0-1)	5/19/15	1135				↓	↓						X			
47 SS-126 (1-2)	5/19/15	1140				↓	↓						X	X		
48 SS-126 (2-3)	5/19/15	1145				↓	↓						X	X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By: [signature]	5/21/15	1100	1. Received By: [signature]	5/22/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hunt & Hickman, PC	Shannon Cottrill	5/21/15	281471
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 5 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Keno Hayes

Project Name and Location (State): Umicore - AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 **79044**

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold **	Special Instructions/ Conditions of Receipt
49	SS-126 A (0-1)	5/19/15	1150				X	X						X	X	*Co, Cd, Ni, Mn only
50	SS-126 A (1-2)	5/19/15	1155											X	X	** Hold pending
51	SS-126 B (0-1)	5/19/15	1110											X	X	H+H approval
52	SS-126 B (1-2)	5/19/15	1115											X	X	
53	SS-126 C (0-1)	5/19/15	1120											X	X	
54	SS-126 C (1-2)	5/19/15	1125											X	X	
55	SS-125 (0-1)	5/19/15	1210											X		
56	SS-125 (1-2)	5/19/15	1215											X	X	
57	SS-125 (2-3)	5/19/15	1220											X	X	
58	SS-125A (0-1)	5/19/15	1200											X	X	
59	SS-125A (1-2)	5/19/15	1205											X	X	
60	SS-125B (0-1)	5/19/15	1225											X	X	

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

1. Relinquished By	Date	Time	1. Received By	Date	Time
[signature]	5/21/15	1100	[signature]	5/21/15	0830
2. Relinquished By	**Date**	**Time**	**2. Received By**	**Date**	**Time**
3. Relinquished By	**Date**	**Time**	**3. Received By**	**Date**	**Time**

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hunt & Hickman, PC	Shannon Cottrill	5/21/15	281472
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 6 of 10**
2923 S Tryon St. Ste. 100	704-586-0007		
City / State / Zip Code	**Site Contact**	**Lab Contact**	
Charlotte / NC / 28203	Randy McKee	Ken Hughes	
Project Name and Location (State)	**Carrier/Waybill Number**		
Unicone - AL			
Contract/Purchase Order/Quote No.			
UMI-001			

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Air	Aqueous	Sed.	Soil	Containers & Preservatives: Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold**	MS/MSD	Special Instructions/ Conditions of Receipt
61	SS-125B (1-2)	5/19/15	1230				X	X						X	X		*Co, Cd, Ni, Mn only
62	SS-124 (0-1)	5/19/15	1300				↓	↓						X			*Hold pending
63	SS-124 (1-2)	5/19/15	1305											X	X		H+H approval
64	SS-124 (2-3)	5/19/15	1310											X	X		
65	SS-124A (0-1)	5/19/15	1325											X	X		
66	SS-124A (1-2)	5/19/15	1330											X	X		
67	SS-124B (0-1)	5/19/15	1315											X	X		
68	SS-124B (1-2)	5/19/15	1320											X	X		
69	SS-123/SS-42D (0-1)	5/19/15	1350											X		X	
70	SS-123/SS-42D (1-2)	5/19/15	1355											X	X		
71	SS-123/SS-42D (2-3)	5/19/15	1400											X	X		
72	SS-123A/SS-43B (0-1)	5/19/15	1420				↓	↓						X	X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By	5/21/15	1100	1. Received By (TAN)	5/22/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281474
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 7 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Rupa McGee	Ken Hayes

Project Name and Location (State): Umicore - AC

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold**	MS/MSD	Special Instructions/ Conditions of Receipt
73	SS-123A / SS-43B (1-2)	5/19/15	1425				X	X						X	X		*Co, Cd, Ni, Mn only
74	SS-123B / SS-42F (0-1)	5/19/15	1335				↓	↓						X			* Hold pending
75	SS-123B / SS-42F (1-2)	5/19/15	1340				↓	↓						X	X		H+H approval
76	SS-123B / SS-42F (2-3)	5/19/15	1345				↓	↓						X	X		
77	SS-122 / SS-42C (0-1)	5/19/15	1520				↓	↓						X		X	
78	SS-122 / SS-42C (1-2)	5/19/15	1525				↓	↓						X	X		
79	SS-122 / SS-42C (2-3)	5/19/15	1530				↓	↓						X	X		
80	SS-122A (0-1)	5/19/15	1540				↓	↓						X	X		
81	SS-122A (1-2)	5/19/15	1545				↓	↓						X	X		
82	SS-122B (0-1)	5/19/15	1445				↓	↓						X	X		
83	SS-121 (0-1)	5/19/15	1600				↓	↓						X		X	
84	SS-121 (1-2)	5/19/15	1605				↓	↓						X	X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By	5/21/15	1100	1. Received By	5/22/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281475
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 8 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Unicoi - AL

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	6010*	Hold*	MS/MSD	Special Instructions/ Conditions of Receipt
85	SS-121 (2-3)	5/19/15	1610				X	X						X	X		*Co, Cd, Ni, Mn only
86	SS-121A / SS-42A (0-1)	5/19/15	1615											X			** Hold pending
87	SS-121A / SS-42A (1-2)	5/19/15	1620											X	X		HH approval
88	SS-121B (0-1)	5/19/15	1630											X	X		
89	SS-120 (0-1)	5/20/15	0920											X			
90	SS-120 (1-2)	5/20/15	0925											X	X		
91	SS-120 (2-3)	5/20/15	0930											X	X		
92	SS-120A (0-1)	5/20/15	0910											X	X		
93	SS-120A (1-2)	5/20/15	0915											X	X		
94	SS-120B / SS-42 (0-1)	5/20/15	0935											X		X	
95	SS-120B / SS-42 (1-2)	5/20/15	0940											X	X		
96	SS-120B / SS-42 (2-3)	5/20/15	0945											X	X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

1. Relinquished By	Date	Time	1. Received By	Date	Time
[signature]	5/21/15	1100	[signature] TAN	5/22/15	0830
2. Relinquished By	**Date**	**Time**	**2. Received By**	**Date**	**Time**
3. Relinquished By	**Date**	**Time**	**3. Received By**	**Date**	**Time**

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

[redacted]

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hunt & Hickman, PC	Shannon Cottrill	5/21/15	281476
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 9 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McGee	Ken Hayes

Project Name and Location (State): Unicoue - AC

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Gold*	Hold**	MS/MSD	Special Instructions/ Conditions of Receipt
97	SS-120C/SS-42B (0-1)	5/20/15	1025				X	X						X		X	*Co, Cd, Ni, Mn only
98	SS-120C/SS-42B (1-2)	5/20/15	1030				↓	↓						X	X		** Hold pending
99	SS-119 (0-1)	5/20/15	1050											X			H+H approval
100	SS-119 (1-2)	5/20/15	1055											X	X		
101	SS-119 (2-3)	5/20/15	1100											X	X		
102	SS-119A (0-1)	5/20/15	1200											X	X	X	
103	SS-119A (1-2)	5/20/15	1205											X	X		
104	SS-119B (0-1)	5/20/15	1055											X	X		
105	SS-119B (1-2)	5/20/15	1058											X	X		
106	SS-118 (0-1)	5/20/15	1100											X			
107	SS-118 (1-2)	5/20/15	1105											X	X		
108	SS-118 (2-3)	5/20/15	1110				↓	↓						X	X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: Ralph McGee	5/21/15	1100	1. Received By: [illegible]	5/21/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Chain of Custody Record

Temperature on Receipt _____

Drinking Water? Yes ☐ No ☑

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TAL-4124 (1007)

Client	Project Manager	Date	Chain of Custody Number
Hart & Hickman, PC	Shannon Cottrill	5/21/15	281477
Address	**Telephone Number (Area Code)/Fax Number**	**Lab Number**	**Page 10 of 10**
2923 S Tryon St. Ste 100	704-586-0007		

City	State	Zip Code	Site Contact	Lab Contact
Charlotte	NC	28203	Ralph McKee	Ken Hayes

Project Name and Location (State): Unicove - AC

Carrier/Waybill Number:

Contract/Purchase Order/Quote No.: UMI-001

Analysis (Attach list if more space is needed): Loc: 490 79044

	Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Air	Aqueous	Sed.	Soil	Unpres.	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH		GC/O*	Hold**	Special Instructions/ Conditions of Receipt
108	SS-118A (0-1)	5/20/15	1150				X	X							X	X	*Co, Cd, Mn, Ni only
110	SS-118A (1-2)	5/20/15	1155				X	X							X	X	*Hold pending
111	SS-118B (0-1)	5/20/15	1130				X	X							X	X	H+H approval
112	SS-118B (1-2)	5/20/15	1135				X	X							X	X	
113	SS-118C (0-1)	5/20/15	1220				X	X							X	X	
114	SS-118C (1-2)	5/20/15	1225				X	X							X	X	
115	DUP-18	5/19/15	—				X	X							X		
116	DUP-19	5/19/15	—				X	X							X		
117	DUP-20	5/20/15	—				X	X							X		
118	DUP-21	5/20/15	—				X	X							X		
119	DUP-22	5/20/15	—				X	X							X		
110	DUP-23	5/20/15	—				X	X							X		

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☑ Disposal By Lab ☑ Archive For 6 Months (A fee may be assessed if samples are retained longer than 1 month)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☑ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other _____

QC Requirements (Specify):

	Date	Time		Date	Time
1. Relinquished By	5/21/15	1100	1. Received By	5/22/15	0830
2. Relinquished By			2. Received By		
3. Relinquished By			3. Received By		

Comments

DISTRIBUTION: WHITE - Returned to Client with Report; CANARY - Stays with the Sample; PINK - Field Copy

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 490-79044-1
SDG Number: UMI-001

Login Number: 79044
List Number: 1
Creator: Buckingham, Paul

List Source: TestAmerica Nashville

Question	Answer	Comment
Radioactivity wasn't checked or is </= background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <6mm (1/4").	N/A	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Appendix C

Borings Logs (Soil Borings and Monitoring Wells)

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER SS-24

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER SS-44B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER SS-44C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-44D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2							Moist, medium, brown gray silty SAND		2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS; DUP-16 collected at 2-3' BGS

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BORING NUMBER SS-44E

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-44F

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-44G

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2							Moist, medium, brown gray silty SAND		2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-45A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
		GB		0	0		Moist, medium, brown silty SAND		
1							Saturated, medium, brown silty SAND		1
		GB		0	0				
2							Very moist, slightly firm, brown sandy SILT		2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-45B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Slightly moist, stiff, red brown CLAY		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-45C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-45D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, medium, brown silty SAND		
		GB		0	0				
1									1
		GB		0	0				
2									2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-45E

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Slightly moist, stiff, red brown CLAY		
		GB		0	0				
1									1
		GB		0	0				
2							Moist, medium, brown silty SAND		2
		GB		0	0				
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-57

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, tan brown silty SAND		
1							Very moist, medium, orange silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-58

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, tan brown silty SAND		
1							Very moist, medium, orange silty SAND Refusal on rock at 2.25' BGS		1
		GB							
2		GB							2
							Bottom of borehole at 2.3 feet.		
3									3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 2.25 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.25' BGS

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BORING NUMBER SS-59

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Very moist, medium, orange brown silty SAND with gravel		
		GB							
1									1
		GB							
2							Saturated, medium, orange brown silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-59A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Very moist, medium, orange brown silty SAND with gravel		
		GB							
1									1
		GB							
2							Saturated, medium, orange brown silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-60

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, brown fine to coarse silty SAND with gravel Refusal at 2.5' BGS		0
		GB							
1									1
		GB							
2		GB							2
							Bottom of borehole at 2.5 feet.		
3									3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 2.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.5' BGS; DUP-17 collected at 0' to 1' BGS

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BORING NUMBER SS-60A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB							
1							Very moist, medium, orange silty SAND		1
		GB							
2							Saturated, medium, orange silty SAND		2
		GB					Refusal at 2.5' BGS		
							Bottom of borehole at 2.5 feet.		
3									3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 2.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.5' BGS

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BORING NUMBER SS-60B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, orange brown silty SAND		0
		GB							
1							Saturated, medium, brown silty SAND with gravel		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-61

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, tan brown silty SAND		0
		GB							
1									1
		GB							
2							Saturated, medium, orange fine to coarse silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-61A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, brown silty SAND		
1		GB							1
2		GB					Saturated, slightly firm, orange sandy SILT with gravel		2
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-62

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Very moist, loose, tan brown silty SAND		
		GB							
1									1
		GB							
2							Saturated, loose, red orange silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS; MS/MSD collected at 0' to 1' BGS

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BORING NUMBER SS-62A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, loose, brown orange silty SAND		
1							Moist, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-63

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, medium, orange brown silty SAND		0
		GB							
1							Saturated, medium, orange brown silty SAND		1
		GB							
2							Saturated, medium, orange brown silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-63A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, tan brown silty SAND		0
		GB							
1									1
		GB							
2							Saturated, medium, orange brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-64

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, loose, dark brown silty SAND with gravel		
		GB							
1									1
		GB					Saturated, medium, orange silty SAND with gravel		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-64A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, dark brown silty SAND with gravel		0
		GB							
1									1
		GB							
2							Moist, medium, orange silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-65

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, red orange brown silty SAND		0
		GB							
1									1
		GB							
2							Moist, slightly firm, orange brown silty SAND with gravel		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-66

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, dark brown silty SAND with gravel		0
		GB							
1							Moist, medium, orange brown silty SAND with gravel		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-67

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, slightly firm, dark brown sandy SILT		0
		GB							
1							Moist, slightly firm, orange brown sandy SILT with gravel		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-67A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, slightly firm, brown orange sandy SILT		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-67B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, slightly firm, orange brown sandy SILT		
1							Saturated, medium, brown orange silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-67C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, loose, orange brown silty SAND		
		GB							
1									1
		GB							
2							Moist, medium, brown orange silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-67D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/24/14
BORING COMPLETED: 11/24/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-68

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Saturated, medium, brown silty SAND		
		GB							
1									1
		GB							
							Saturated, medium, orange brown silty SAND		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-68A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, brown silty SAND		
1							Saturated, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-69

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, loose, brown silty SAND with gravel		0
		GB							
1							Saturated, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-69A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, orange brown silty SAND with gravel		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-70

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, loose, tan brown silty SAND with gravel		0
		GB							
1							Saturated, medium, brown silty SAND		1
		GB							
2							Saturated, medium, tan brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-71

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, dark brown silty SAND		
1							Saturated, slightly firm, dark brown sandy SILT		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-71A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, slightly firm, brown sandy SILT		
1							Very moist, slightly firm, brown sandy SILT		1
		GB							
2							Saturated, slightly firm, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-72

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, slightly firm, brown sandy SILT		
1							Very moist, slightly firm, brown sandy SILT		1
		GB							
2							Saturated, slightly firm, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-72A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, slightly firm, brown sandy SILT		
		GB							
1							Very moist, slightly firm, brown sandy SILT		1
		GB							
2							Saturated, slightly firm, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-73

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, orange brown fine to coarse silty SAND		0
		GB							
1							Moist, medium, brown orange silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-74

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, black fine to coarse gravelly SAND		0
		GB							
1									1
							Very moist, medium, gray brown silty SAND		
		GB							
2							Saturated, medium, gray brown silty SAND		2
		GB							
3									3
		GB							
4							Saturated, medium, tan brown silty SAND		4
		GB							
5							Bottom of borehole at 5.0 feet.		5
6									6

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

Samples collected at 0' to 1', 1' to 2', 2' to 3', 3' to 4', and 4' to 5' BGS; DUP-15 collected at 1' to 2' BGS

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BORING NUMBER SS-75

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, black fine to coarse silty gravelly SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Very moist, medium, gray brown silty SAND		3
		GB							
4							Saturated, medium, gray brown silty SAND		4
		GB							
5							Bottom of borehole at 5.0 feet.		5
6									6

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', 2' to 3', 3' to 4', and 4' to 5' BGS

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BORING NUMBER SS-76

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL with gravel		0
							Very moist, slightly firm, brown sandy SILT Refusal on concrete rip-rap at 2' BGS		
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-78

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, dark brown silty SAND		
1							Saturated, medium, dark brown silty SAND		1
		GB							
2									2
		GB							
3							Saturated, medium, brown orange fine to coarse silty SAND		3
		GB							
4									4
		GB							
5							Bottom of borehole at 5.0 feet.		5
6									6

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', 2' to 3', 3' to 4', and 4' to 5' BGS

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BORING NUMBER SS-78A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Very moist, slightly firm, brown sandy SILT		
		GB							
1									1
		GB							
2							Saturated, slightly firm, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-79

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, loose, brown, fine to coarse silty SAND with gravel		0
		GB							
1							Saturated, medium, orange brown silty SAND Refusal on rock at 3'BGS		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-79A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, slightly firm, dark brown sandy SILT		
1									1
		GB					Very moist, medium, orange brown silty SAND		
2							Saturated, medium, orange brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-80

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, slightly firm, brown sandy SILT		
1									1
		GB					Saturated, slightly firm, brown sandy SILT Refusal on rock at 2' BGS		
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-80A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, slightly firm, dark brown sandy SILT		
1							Saturated, slightly firm, dark brown sandy SILT		1
		GB							
2							Saturated, medium, orange brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/21/14
BORING COMPLETED: 11/21/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-82

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0		GB					Moist, slightly firm, brown sandy SILT		0
1		GB					Saturated, medium, orange brown silty SAND Refusal on rock at 2' BGS		1
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-82A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, slightly firm, brown sandy SILT		
		GB							
1							Saturated, medium, brown orange silty SAND Refusal on rock at 2.5' BGS		1
		GB							
2									2
		GB							
							Bottom of borehole at 2.5 feet.		
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.5'

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BORING NUMBER SS-82B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0		GB					Moist, slightly firm, brown, sandy SILT		0
1		GB					Saturated, medium, orange brown silty SAND Rock at 3' BGS		1
2		GB							2
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-87

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, dark brown silty SAND		
		GB							
1									1
		GB					Saturated, medium, dark brown silty SAND		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-87A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, dark brown silty SAND		
		GB							
1									1
		GB							
2							Saturated, medium, dark brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-88

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, slightly firm, dark brown sandy SILT		0
		GB							
							Saturated, slightly firm, dark brown sandy SILT		
1									1
		GB							
2							Saturated, medium, orange brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-88A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
		GB					Very moist, soft, orange brown sandy SILT		
1							Saturated, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-89

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Very moist, medium, orange brown silty SAND		
		GB							
1							Saturated, medium, orange brown silty SAND		1
							Refusal on rock at 2.5' BGS		
		GB							
2									2
		GB							
							Bottom of borehole at 2.5 feet.		
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.5'

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BORING NUMBER SS-90

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, orange brown silty SAND		
1							Saturated, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-90A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, orange brown silty SAND		
1							Saturated, medium, orange brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-91

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, loose, dark brown silty SAND		0
		GB							
1							Saturated, loose, dark brown silty SAND		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-92

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0		GB					Moist, loose, dark brown silty SAND Refusal on rip-rap at 1' BGS		0
1							Bottom of borehole at 1.0 feet.		1
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-93

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, loose, brown orange silty SAND		
		GB							
1							Saturated, loose, brown orange silty SAND		1
		GB							
2									2
		GB					Saturated, slightly firm, orange brown SILT		
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-93A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, loose, brown silty SAND		
		GB							
1									1
		GB							
2							Saturated, medium, orange fine silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-94

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, dark brown silty SAND		
		GB							
1									1
		GB					Saturated, medium, dark brown silty SAND		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-94A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, dark brown silty SAND		
		GB							
1									1
		GB							
2							Saturated, medium, dark brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-95

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-95A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, loose, brown orange silty SAND		
		GB							
1							Saturated, medium, brown orange silty SAND		1
							Refusal on rock at 2' BGS		
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-95B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND		0
							Refusal on rock at 2.5' BGS		
		GB							
1									1
		GB							
2									2
		GB							
							Bottom of borehole at 2.3 feet.		
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2.25 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 2.25'

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BORING NUMBER SS-95C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND Refusal on rock at 2' BGS		0
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-96

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown orange silty SAND		0
		GB							
1									1
		GB							
2							Saturated, medium, brown silty SAND		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-96A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, medium, brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-97

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, slightly loose, tan brown silty SAND with gravel		
1									1
		GB							
2							Moist, slighly firm, orange brown fine to coarse sandy clayey SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS; DUP-14 collected at 0' to 1' bgs

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BORING NUMBER SS-98

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS; MS/MSD collected at 0' to 1' BGS

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BORING NUMBER SS-98A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, tan brown silty SAND		
1									1
		GB							
2							Moist, slightly firm, orange brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-99

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, medium, tan brown silty SAND		
1							Very moist, medium, tan brown sandy SILT		1
		GB							
2							Saturated, medium, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-99A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, slightly dense, tan brown silty SAND		
1							Very moist, slightly dense, tan brown sandy SILT		1
		GB							
2							Saturated, slightly dense, brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-100

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, medium, tan brown silty SAND		
1									1
		GB					Moist, firm, brown sandy SILT		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-100A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, medium, tan brown silty SAND		
1									1
		GB					Moist, firm, brown sandy SILT		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-101

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, tan brown silty SAND		
1									1
		GB							
							Saturated, firm, orange browm sandy SILT		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-101A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, grey brown silty SAND		
1									1
		GB							
							Moist, firm, orange brown, sandy clayey SILT		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-101B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, tan brown silty SAND		
1									1
		GB							
							Saturated, firm, orange brown sandy SILT		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-102

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, loose, tan brown silty SAND		
1							Moist, slightly firm, brown sandy SILT		1
		GB							
2							Moist, firm, orange brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-102A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, loose, tan brown silty SAND		
1							Moist, slightly firm, brown sandy SILT		1
		GB							
2							Moist, firm, orange brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-103

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Very moist, medium, brown, silty SAND		
1									1
		GB					Moist, firm, orange brown, sandy SILT		
2							Moist, slightly firm, brown orange, sandy clayey SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-104

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Slightly moist, slightly firm, dark brown sandy SILT		
		GB							
1									1
							Moist, dense, tan brown sandy clayey SILT, with partially weathered rock		
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-104A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Slightly moist, slightly firm, dark brown sandy SILT		
		GB							
1									1
							Moist, dense, tan brown sandy clayey SILT and partially weathered rock		
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-105

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Slightly moist, slightly firm, dark brown sandy SILT		
1									1
		GB					Moist, firm, tan brown sandy clayey SILT and partially weathered rock		
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-105A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Slightly moist, slightly firm, dark brown sandy SILT		
		GB							
1									1
							Moist, firm, tan brown, sandy clayey SILT and partially weathered rock		
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-106

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND Refusal on rock at 2' BGS		
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-107

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND Refusal on rock at 2' BGS		
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-107A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND Refusal on rock at 2' BGS		
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-108

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND Refusal on rock at 2' BGS		
		GB							
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-108A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND Refusal on rock at 1.5' BGS		
		GB							
1									1
		GB							
							Bottom of borehole at 1.5 feet.		
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 1.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 1.5'

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BORING NUMBER SS-109

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, brown silty SAND Refusal on rock at 2' BGS		
1									1
2							Bottom of borehole at 2.0 feet.		2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-109A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, brown silty SAND Refusal on rock at 1.75' BGS		
1									1
							Bottom of borehole at 1.8 feet.		
2									2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 1.75 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 1.75'

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BORING NUMBER SS-110

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, dark brown silty SAND Refusal on rock at 1' BGS		
1							Bottom of borehole at 1.0 feet.		1
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-110A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, dark brown silty SAND Refusal on rock at 1.5' BGS		
		GB							
1									1
		GB							
							Bottom of borehole at 1.5 feet.		
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 1.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 1.5'

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BORING NUMBER SS-111

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, dark brown silty SAND Refusal of rock at 1' BGS		
1							Bottom of borehole at 1.0 feet.		1
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-111A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB					Moist, medium, dark brown silty SAND, with partially weathered rock Refusal of rock at 2' BGS		
1									1
		GB							
2							Bottom of borehole at 2.0 feet.		2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/20/14
BORING COMPLETED: 11/20/14
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-112

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
		GB							
1									1
		GB							
							Bottom of borehole at 1.5 feet.		
2									2
3									3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 1.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 1.5'

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BORING NUMBER SS-113

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-113A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, tan brown silty SAND		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-114

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Saturated, loose, fine to coarse well-graded gravelly SAND Refusal on rock at 1.5' BGS		0
		GB							
1		GB							1
							Bottom of borehole at 1.5 feet.		
2									2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 1.5 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 1.5'

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BORING NUMBER SS-114A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, medium, tan brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-114B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, medium, tan brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-115

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Moist, medium, brown silty SAND		0
		GB							
1									1
		GB							
2									2
		GB							
							Saturated, medium, brown silty SAND		
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-115A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Organic TOPSOIL		0
							Moist, medium, brown silty SAND		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/22/14
BORING COMPLETED: 11/22/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-116

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
		GB					Moist, stiff, red brown CLAY		
1							Moist, slightly firm, brown sandy SILT		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS; MS/MSD collected at 0' to 1' BGS

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BORING NUMBER SS-116A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, slightly firm, tan brown sandy SILT		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-116B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
		GB					Slightly moist, stiff, red brown CLAY		
1									1
		GB							
2							Moist, slightly firm, tan brown sandy SILT		2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-116C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Moist, slightly firm, orange brown, sandy SILT		
		GB							
1									1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-117

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Slightly moist, stiff, red brown CLAY		0
		GB							
1							Moist, firm, brown sandy SILT		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-117A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Slightly moist, stiff, red brown CLAY		0
		GB							
1							Moist, firm, brown sandy SILT		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-117B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Very moist, organic TOPSOIL		0
							Slightly moist, stiff, red brown CLAY		
		GB							
1									1
							Slightly moist, stiff, orange brown CLAY		
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-117C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	WELL DIAGRAM	DEPTH (ft)
0							Slightly moist, stiff, red brown CLAY		0
		GB							
1							Moist, firm, brown sandy SILT		1
		GB							
2									2
		GB							
3							Bottom of borehole at 3.0 feet.		3
4									4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 11/23/14
BORING COMPLETED: 11/23/14
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-118

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, orange brown fine to medium SAND with silt		0
1						Moist, medium, orange brown silty SAND		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-118A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1						Very moist, medium, orange brown silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-118B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, medium, brown sitly SAND		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-118C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Miost, slightly firm orange brown sandy SILT		0
1						Moist, medium, brown silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-119

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1						Moist, medium, tan silty SAND with clay		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-119A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, orange brown silty SAND		0
1						Moist, medium, tan silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-119B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1						Moist, medium, brown orange silty SAND with clay		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-120

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, orange brown sandy SILT with clay		0
1								1
2						Moist, slightly firm, brown orange sandy SILT		2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-120A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, orange brown sandy SILT with clay		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-120B/SS-42

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT with gravel		0
1						Moist, medium, brown orange silty SAND with clay		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-120C/SS-42B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, orange brown sandy SILT with clay and gravel		0
1						Moist, slightly firm, brown sandy SILT		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/20/15
BORING COMPLETED: 5/20/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-121

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
						Moist, slightly firm, orange brown sandy SILT		
1								1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-121A/SS-42A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-121B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1						Bottom of borehole at 1.0 feet.		1
2								2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-122/SS-42C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1						Moist, medium, orange brown silty SAND		1
2						Moist, medium, brown orange silty SAND		2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-122A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1						Moist, medium, brown silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-122B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1						Bottom of borehole at 1.0 feet.		1
2								2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-123/SS-42D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, medium, brown silty SAND		0
1						Moist, medium, orange brown silty SAND		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-123A/SS-43B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-123B/SS-42F

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, brown silty SAND		0
1						Moist, medium, orange brown silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-124

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, medium, tan grey fine to medium SAND		0
1								1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-124A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-124B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-125

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1								1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-125A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-125B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-126

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, tan sandy SILT		0
1						Very moist, medium, orange and tan silty SAND		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-126A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, medium, tan silty SAND		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-126B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1						Very moist, slightly firm, orange and tan sandy SILT		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-126C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, orange brown sandy SILT		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-127

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Saturated, medium, tan fine to medium SAND		0
1						Very moist, medium, tan silty SAND		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-127A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Saturated, slightly firm, tan sandy SILT		0
						Very moist, slightly firm, tan sandy SILT		
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-127B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, tan sandy SILT		0
1						Very moist, slightly firm, orange and tan sandy SILT		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-127C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Saturated, medium, tan fine to medium SAND		0
1						Very moist, medium, orange and tan silty SAND		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-128

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Saturated, medium, tan fine to medium SAND		0
1						Bottom of borehole at 1.0 feet.		1
2								2

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 1 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1'

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BORING NUMBER SS-128A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT with organics		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-128B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, slightly firm, brown sandy SILT with organics		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-129

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, medium, tan fine to medium SAND with gravel		0
1						Saturated, medium, orange tan fine to coarse SAND with gravel		1
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-129A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1								1
						Very moist, medium, orange brown fine to medium SAND with silt and rock fragments		
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-129B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Saturated, medium, light brown tan fine silty SAND		0
1						Saturated, medium, orange brown fine to medium SAND with silt and rock fragments		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-129C

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, tan fine to medium SAND with silt and rock fragments		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-129D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Moist, medium, tan fine to medium SAND with silt and rock fragments		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-130

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1								1
						Saturated, medium, brown fine silty SAND		
2								2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-130A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
						Saturated, medium, brown fine silty SAND		
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-130B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1								1
						Saturated, medium, brown silty SAND		
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-131

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, firm, brown silty SAND		0
1								1
2						Very moist, firm, dark brown, silty SAND		2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/18/15
BORING COMPLETED: 5/18/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1', 1' to 2', and 2' to 3' BGS

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BORING NUMBER SS-131A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT with organics		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-131B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown, sandy SILT with organics		0
1								1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/19/15
BORING COMPLETED: 5/19/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-132

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, dark brown SILT with fine sand		0
1						Saturated, slightly firm, dark brown SILT with fine sand		1
2						No Recovery		2
3						Bottom of borehole at 3.0 feet.		3
4								4

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/18/15
BORING COMPLETED: 5/18/15
TOTAL DEPTH: 3 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2' BGS

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BORING NUMBER SS-132A

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown sandy SILT		0
1								1
						Saturated, slightly firm, brown sandy SILT		
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/18/15
BORING COMPLETED: 5/18/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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BORING NUMBER SS-132B

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION	BORING DIAGRAM	DEPTH (ft)
0						Very moist, slightly firm, brown SILT		0
1						Saturated, slightly firm, brown sandy SILT		1
2						Bottom of borehole at 2.0 feet.		2
3								3

DRILLING CONTRACTOR: H&H
DRILL RIG/ METHOD: Hand Auger
SAMPLING METHOD: Grab
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 5/18/15
BORING COMPLETED: 5/18/15
TOTAL DEPTH: 2 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:
Samples collected at 0' to 1' and 1' to 2'

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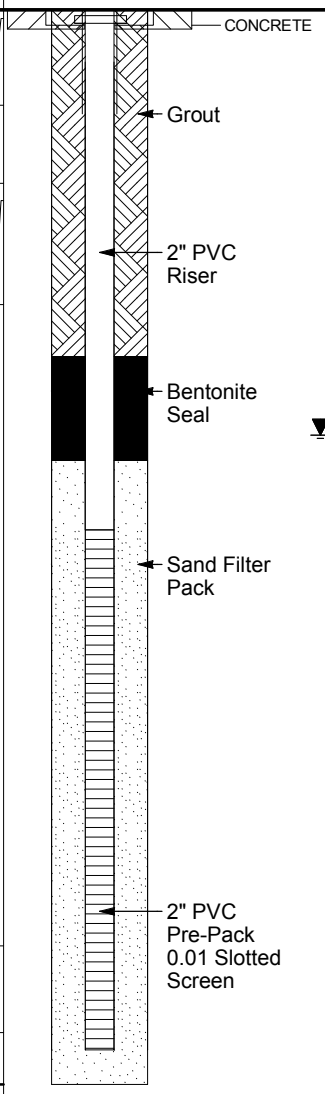
BORING NUMBER MW-1

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, firm, brown clayey SILT
						Very moist, firm, orange brown sandy clayey SILT
5						Saturated, slightly stiff, brown orange sandy CLAY
						Hollow Stem Auger Refusal at 5.5' BGS - Switch to Air Rotary
						Drill Chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
						Heavy drill chatter with white dust and white sand - Arenite
10						
15						
20						
25						
						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
30						Heavy drill chatter with white dust and white to light grey rock fragments - Arenite to Greywacke
						Bottom of borehole at 31.0 feet.
35						

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/11/15
BORING COMPLETED: 6/11/15
TOTAL DEPTH: 31 ft.
TOP OF CASING ELEV: 1020.52 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 5' BGS.

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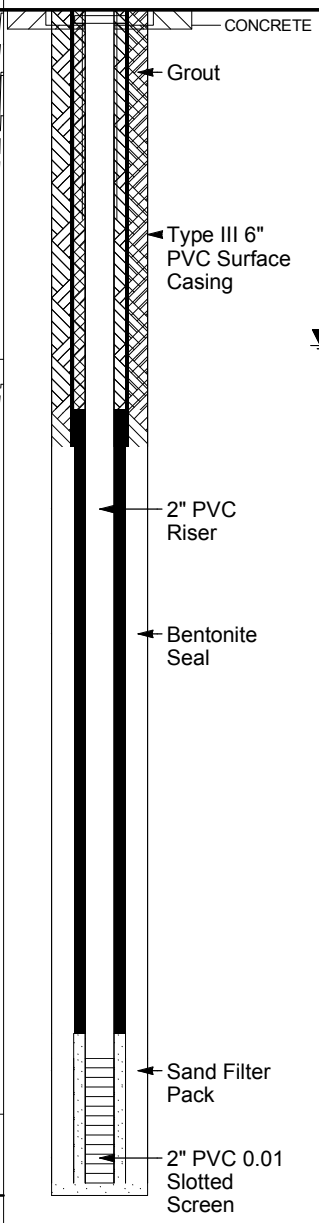
BORING NUMBER MW-1D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown clayey SILT
						Very moist, firm, orange brown sandy clayey SILT
						Saturated, slightly stiff, brown orange sandy CLAY Hollow Stem Auger Refusal at 5.25' BGS - Switch to Air Rotary
10						Drill Chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
20						
30						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with white dust and white to light grey rock fragments - Thinly laminated light grey to white Arenite interbedded with dark grey to black Greywacke lenses
40						
50						
60						
70						
80						
90						Light drill chatter with black dust and black rock fragments - Shale
						Bottom of borehole at 95.0 feet.
100						

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/10/15
BORING COMPLETED: 6/11/15
TOTAL DEPTH: 95 ft.
TOP OF CASING ELEV: 1020.26 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 5' BGS.

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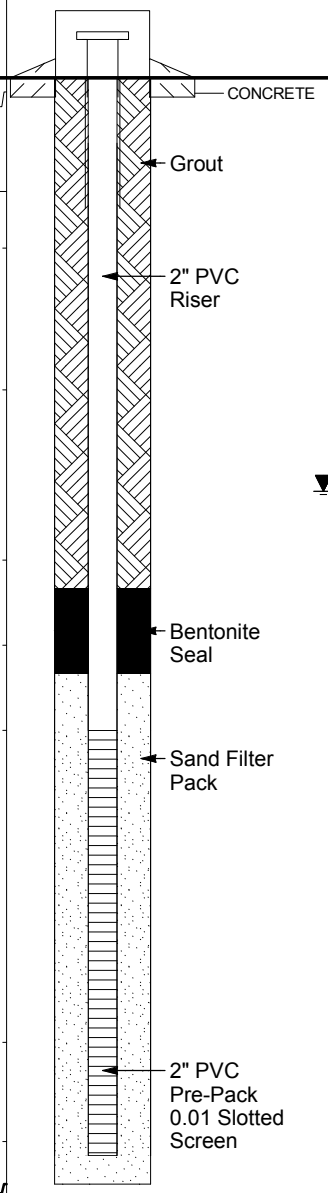
BORING NUMBER MW-3R

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT Hollow Stem Auger refusal at 4' BGS - Switch to Air Rotary
5						Light drill chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
						Drill chatter with light brown and orange dust and light brown and orange fine grain sand - Arenite
10						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
15						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
20						Several breaks in drill chatter with dark grey to black dust and dark grey to black rock fragments - possible fractured Greywacke with Shale lens - not water bearing
25						Heavy drill chatter with grey dust and grey sand with grey rock fragments - Arenite
30						
35						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with grey sand with grey rock fragments - Greywacke
40						Bottom of borehole at 39.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/15/15
BORING COMPLETED: 6/15/15
TOTAL DEPTH: 39 ft.
TOP OF CASING ELEV: 990.27 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 4' BGS. Refusal on weathered sandstone at 4' BGS.

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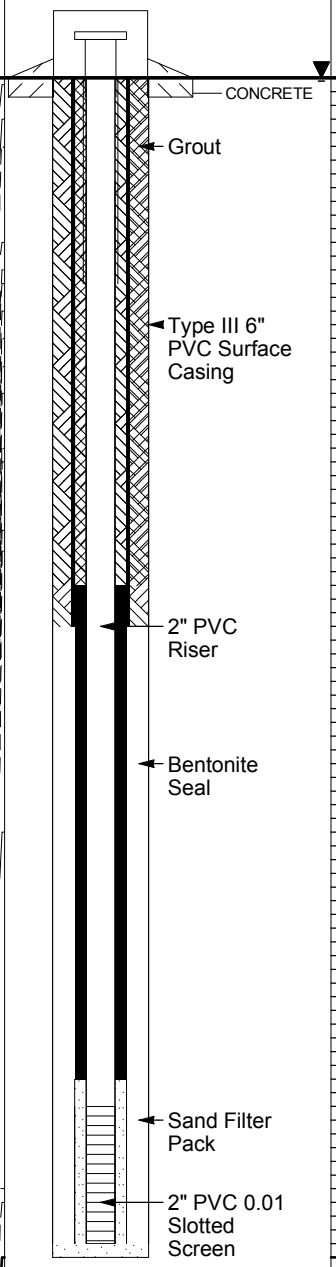
BORING NUMBER MW-3DR

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT Hollow Stem Auger refusal at 3ft BGS - Switch to Air Rotary
						Light drill chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
10						Drill chatter with light brown and orange dust and light brown and orange fine grain sand - Arenite
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
						Break in drill chatter with brown dust and brown sand
20						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
						Several breaks in drill chatter with dark grey to black dust and dark grey fragments - possible fractured Arenite/Greywacke
						Heavy drill chatter with white to light grey dust and white to light grey rock fragments - Arenite
30						Several breaks in drill chatter with dark grey to black dust and dark grey to black rock fragments - possible weathered Greywacke
						Heavy drill chatter with white to light grey dust and white to light grey rock fragments - Arenite
40						Break in drill chatter with light grey and brown sand - water bearing fracture
						Heavy drill chatter with deminishing grey dust and grey rock fragments - Arenite/Greywacke
50						Several breaks in drill chatter with dark grey to black dust and dark grey to black rock fragments - Greywacke with Shale lens - water bearing fracture
						Heavy drill chatter with white to light grey dust and white sand with white and grey rock fragments - Arenite
						Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
60						Light drill chatter with black dust and black rock fragments - Shale
70						
80						Break in drill chatter with black rock fragments - water bearing fracture
						Heavy drill chatter with dark grey sand and rock fragments - Greywacke
90						Bottom of borehole at 86.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/14/15
BORING COMPLETED: 6/15/15
TOTAL DEPTH: 86 ft.
TOP OF CASING ELEV: 991.07 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 3' BGS. Refusal on weathered sandstone at 3' BGS. Monitoring well is artesian.

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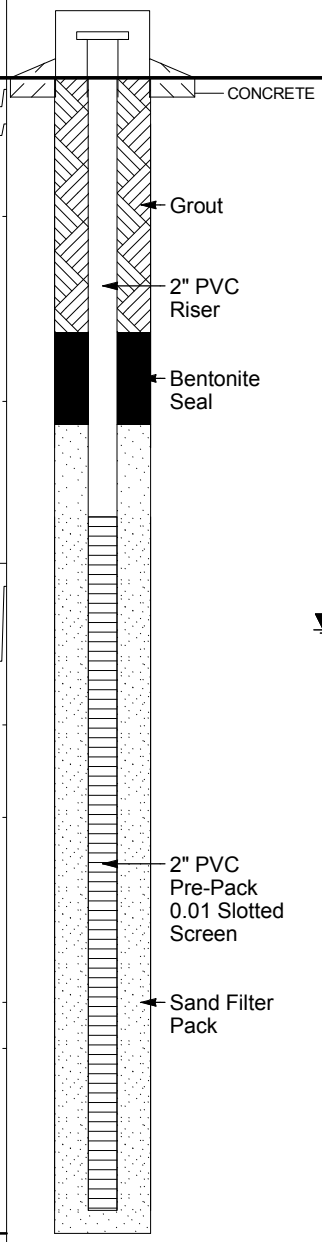
BORING NUMBER MW-5R

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT
						Moist, medium, tan brown silty SAND
						Slightly moist, medium, brown orange fine to medium SAND with trace silt
5						
						Slightly moist, hard, orange pink and brown fine to medium SAND with trace clayey silt and partially weathered sandstone fragments
10						Slightly moist, very hard, brown orange semi-lithified weathered quartz sandstone DPT refusal at 10.5' BGS - Switch to HSA HSA refusal at 11' BGS - Switch to air rotary
						Heavy drill chatter with biege to white dust and tan fine grain quartz sand - Arenite
						Break in drill chatter with beige silty sand - possible fracture
15						
						Heavy drill chatter with biege to white dust and tan fine grain quartz sand - Arenite
20						Break in drill chatter with beige silty sand - possible fracture
						Heavy drill chatter with tan fine grain quartz sand - Arenite
25						Bottom of borehole at 25.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / DPT/HSA/Air Rotary
SAMPLING METHOD: Macro-Core®
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/6/14
BORING COMPLETED: 12/6/14
TOTAL DEPTH: 25 ft.
TOP OF CASING ELEV: 1003.21 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 5' BGS

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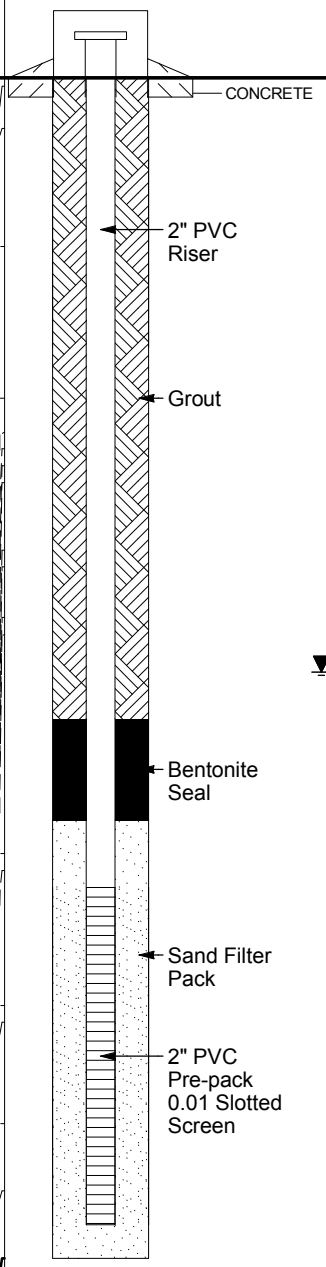
BORING NUMBER MW-7R

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Saturated, slightly firm, brown sandy SILT
						Very moist, medium, orange brown silty SAND
5						Slightly moist, hard, orange pink and beige layers of fine to medium SAND with trace silt, clay, and sandstone fragments DPT Refusal @ 9.5' BGS - Switch to HSA
10						Slightly moist, orange semi-lithified weathered quartz sandstone HSA Refusal @ 10.5' BGS - Switch to Air Rotary
						Heavy drill chatter with orange dust and and orange fine grain sand - Arenite
						Break in drill chatter with white to beige dust and white to beige fine grain sand - possible fracture
15						Drill chatter on softer material with white dust and white fine grain quartz sand - Arenite
						Heavy drill chatter with brown orange dust and brown orange fine grain quartz sand - Arenite
						Break in drill chatter with tan to brown dust and tan to brown fine grain quartz sand - possible fracture
20						Heavy drill chatter with tan to brown dust and tan to brown fine grain quartz sand - Arenite
						Break in drill chatter with grey dust and grey to black fine grain sand and rock fragments - possible fracture
						Heavy drill chatter with grey dust and grey sand - Arenite
						Break in drill chatter with orange brown dust and orange brown fine grain quartz sand - possible fracture
25						Heavy drill chatter with grey dust and grey fine grain sand with grey rock fragments - Arenite
						Break in drill chatter with grey dust and grey sand - possible fracture
						Heavy drill chatter with grey dust and grey sand with grey rock fragments - Arenite
30						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments - water bearing fractures
						Heavy drill chatter with white to light grey dust and white sand with white and grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / DPT/HSA/Air Rotary
SAMPLING METHOD: Macro-Core®
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/6/14
BORING COMPLETED: 12/7/14
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV: 1003.57 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 5' BGS

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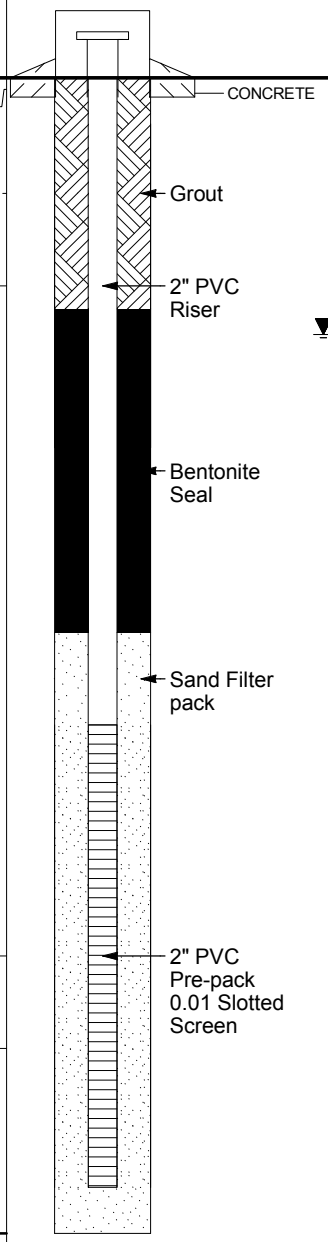
BORING NUMBER MW-8

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Very moist, slightly firm, dark brown sandy SILT
						Saturated, slightly firm, orange brown sandy SILT HSA Refusal at 4.5 ft bgs - Switch to air rotary
5						Heavy drill chatter with light grey dust and light grey rock fragments - Arenite
10						
15						
20						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with white to light grey dust and white sand with white and grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
25						Bottom of borehole at 25.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Drill Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/4/14
BORING COMPLETED: 12/4/14
TOTAL DEPTH: 25 ft.
TOP OF CASING ELEV: 999.73 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 4.5' BGS; Sample collected for TOC at 4' to 4.5' BGS

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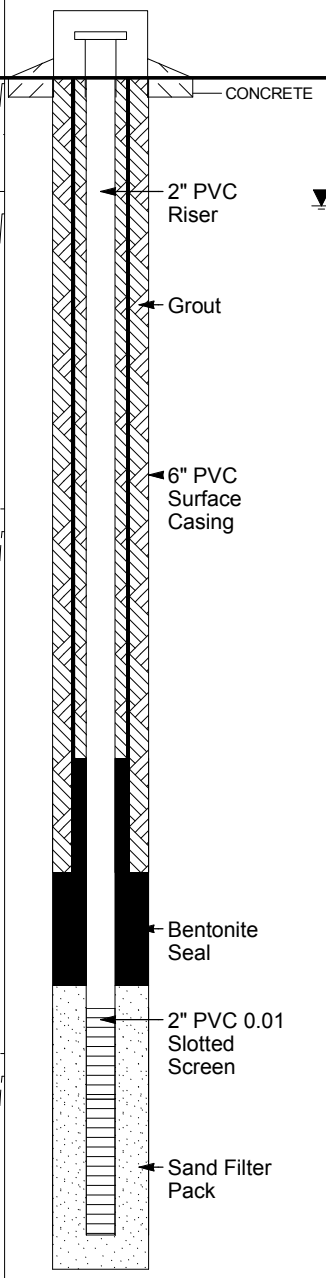
BORING NUMBER MW-8D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, dark brown sandy SILT
						Saturated, slightly firm, orange brown sandy SILT
						Saturated, medium hard, orange silty medium to coarse SAND HSA Refusal at 6 ft bgs - Switch to air rotary
						Heavy drill chatter with white to light grey dust and light grey rock fragments - Arenite
10						
20						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with white to light grey dust and white sand with white and grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
30						
40						Break in drill chatter with dark grey to black dust and black rock fragments - Shale
						Heavy drill chatter with dark grey sand and rock fragments - Greywacke
50						
						Bottom of borehole at 53.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Drill Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/3/14
BORING COMPLETED: 12/4/14
TOTAL DEPTH: 53 ft.
TOP OF CASING ELEV: 999.35 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 6' BGS; Sample collected for TOC at 5' to 6' BGS

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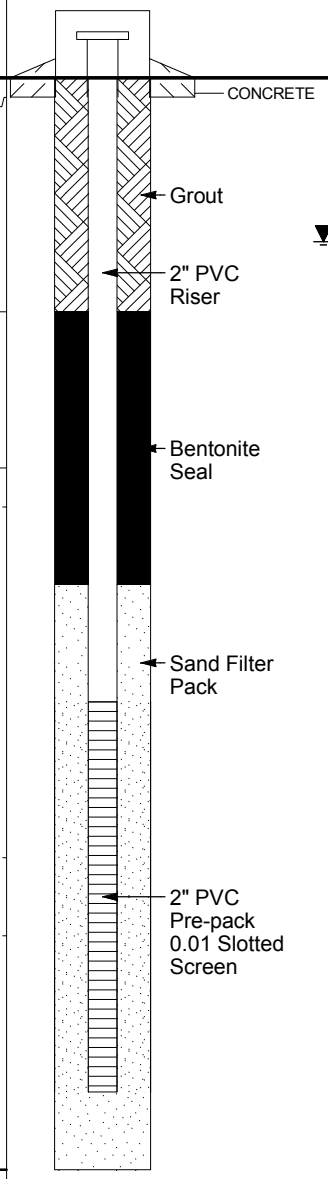
BORING NUMBER MW-9

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0.0						Organic TOPSOIL
						Very moist, brown sandy SILT with partially weathered sandstone fragments HSA refusal at 3 ft bgs - Switch to Air Rotary
2.5						Light drill chatter on brown and orange weathered sandstone cobbles and boulders
5.0						Drill chatter on tan weathered quartz sandstone
						Heavy drill chatter with white to light grey dust and grey fine grain sand with grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
7.5						
10.0						Break in drill chatter with brown sand - water bearing fracture
						Heavy drill chatter with white to light grey dust and grey fine grain sand with grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
12.5						
						Bottom of borehole at 14.0 feet.
15.0						

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Drill Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/7/14
BORING COMPLETED: 12/7/14
TOTAL DEPTH: 14 ft.
TOP OF CASING ELEV: 988.67 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 3' BGS; Sample collected for TOC at 2.5' to 3' BGS

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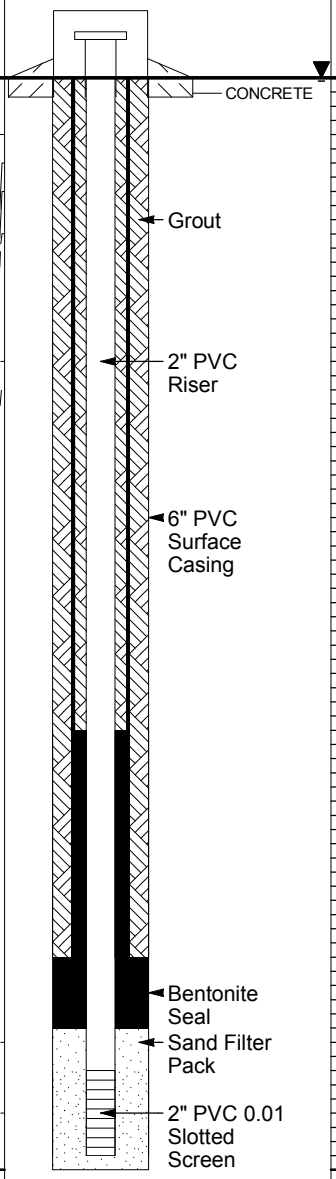
BORING NUMBER MW-9D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Moist, medium, brown silty SAND
						Very moist, medium, orange brown silty sand with weathered sandstone fragments
						HSA refusal at 3 ft bgs - Switch to air rotary
5						Light drill chatter on light grey sandstone cobbles and boulders
						Drill chatter on tan weathered quartz sandstone
						Heavy drill chatter with white dust and white rock fragments - Arenite
10						Break in drill chatter with orange brown dust and orange brown fine grain sand - water bearing fracture
						Heavy drill chatter with white to light grey rock fragments - Thinly laminated light grey Arenite interbedded with grey to dark grey Greywacke lenses
15						Heavey drill chatter wih light grey to white dust and light grey rock fragments after advancing through surface casing at 32' BGS
20						
25						
30						
35						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with grey to dark grey rock fragments - Greywacke
40						Bottom of borehole at 38.5 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geo Lab
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Drill Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 12/2/14
BORING COMPLETED: 12/5/14
TOTAL DEPTH: 38.5 ft.
TOP OF CASING ELEV: 987.03 ft.
DEPTH TO WATER:

Remarks:
Hand Auger to 3' BGS; Sample collected for TOC at 2.5' to 3' BGS. Monitoring well is artesian.

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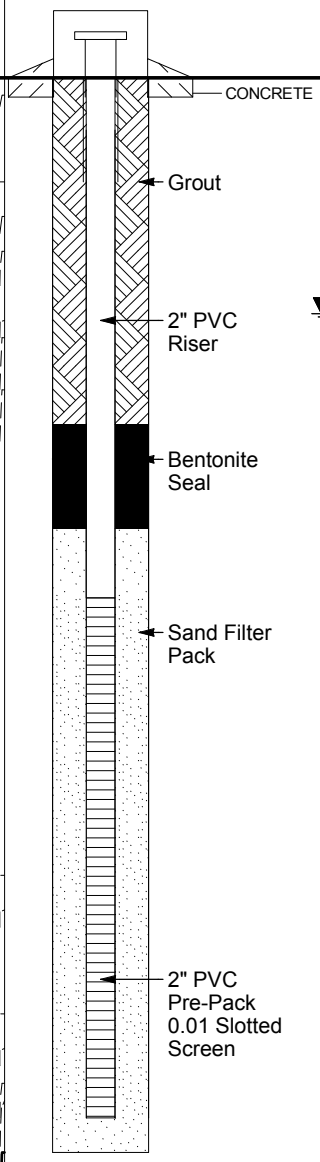
BORING NUMBER MW-10

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT Hollow Stem Auger refusal at 3ft BGS - Switch to Air Rotary
						Light drill chatter on brown and orange weathered quartz sandstone cobbles and boulders
5						Light drill chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
						Break in drill chatter with brown orange dust and brown orange sand - possible fracture
10						Heavy drill chatter with orange and brown dust and orange and brown sand - Arenite
						Heavy drill chatter with white dust and white sand with white rock fragments - Thinly laminated white to light grey Arenite
15						
20						
						Break in drill chatter with brown orange dust and brown orange sand - possible fracture
25						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
						Break in drill chatter with brown orange dust and brown orange sand - possible fracture
						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
30						Break in drill chatter with brown orange dust and brown orange sand - possible fracture
						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
35						Bottom of borehole at 31.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/16/15
BORING COMPLETED: 6/16/15
TOTAL DEPTH: 31 ft.
TOP OF CASING ELEV: 992.11 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 3' BGS. Refusal on weathered sandstone at 3' BGS.

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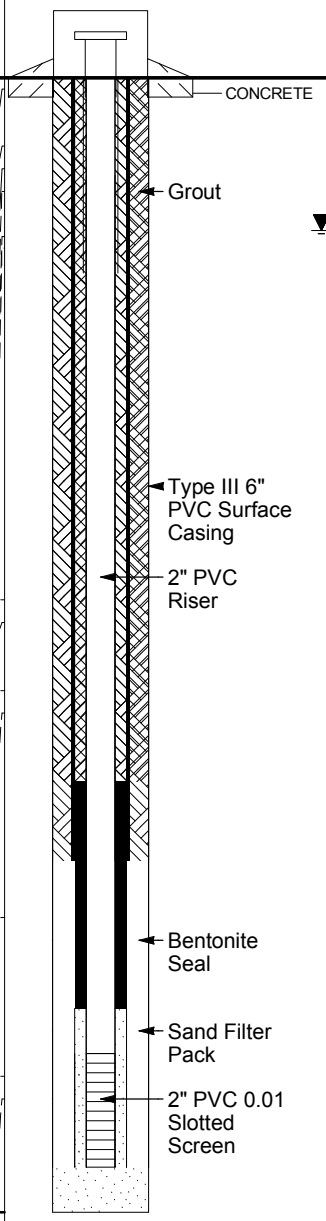
BORING NUMBER MW-10D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT Hollow Stem Auger refusal at 3ft BGS - Switch to Air Rotary
						Light drill chatter on brown and orange weathered sandstone cobbles and boulders
						Light drill chatter on brittle, semi-lithified, brown orange weathered quartz sandstone
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
10						Break in drill chatter with brown orange dust and brown orange sand - possible fracture
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
20						
						Break in drill chatter with grey and brown sand - possible fracture
						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite
						Break in drill chatter with dark grey to black rock fragments - water bearing fracture
30						Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments - Arenite Heavy drill chatter with light grey dust and light grey sand with light grey rock fragments after advancing through
						Light drill chatter with black dust and black rock fragments - Greywacke with Shale
40						
						Several breaks in drill chatter, grey to dark grey dust with dark grey to black rock fragments - fractured Greywacke with Shale fragments
						Heavy drill chatter with white to light grey dust and white sand with white and grey rock fragments - Thinly laminated light grey Arenite interbedded with dark grey Greywacke lenses
50						Bottom of borehole at 50.0 feet.

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/13/15
BORING COMPLETED: 6/16/15
TOTAL DEPTH: 50 ft.
TOP OF CASING ELEV: 992.06 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 3' BGS. Refusal on weathered sandstone at 3' BGS.

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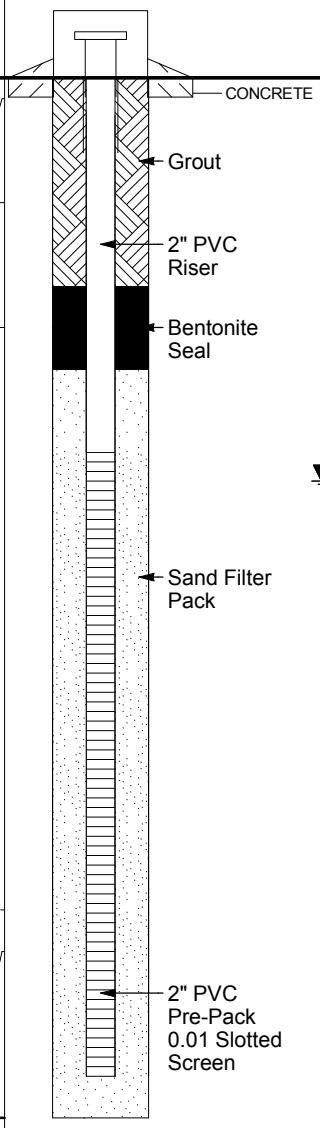
BORING NUMBER MW-11

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT
						Light drill chatter on brown and orange weathered quartz sandstone cobbles and boulders
5						
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
10						
15						
20						Break in drill chatter with dark grey rock fragments - water bearing fracture
						Heavy drill chatter with grey dust and grey sand with grey rock fragments - Greywacke
25						Bottom of borehole at 25.0 feet.
30						

BORING DIAGRAM



DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/17/15
BORING COMPLETED: 6/17/15
TOTAL DEPTH: 25 ft.
TOP OF CASING ELEV: 982.94 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 3' BGS. Refusal on weathered sandstone at 3' BGS.

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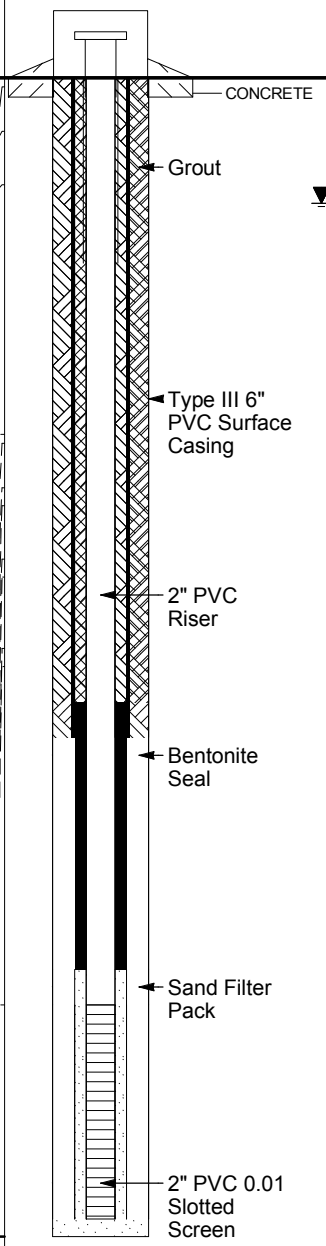
BORING NUMBER MW-11D

PROJECT: Umicore CSM NA
JOB NUMBER: UMI-001
LOCATION: Arab, Alabama

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Organic TOPSOIL
						Moist, slightly firm, brown sandy SILT
						Light drill chatter on brown and orange weathered sandstone cobbles and boulders
						Heavy drill chatter with white dust and white sand with white rock fragments - Arenite
10						
20						Break in drill chatter with dark grey rock fragments - possible fracture
						Heavy drill chatter with grey dust and grey sand with grey rock fragments - Arenite
						Break in drill chatter with dark grey rock fragments - possible fracture
30						Heavy drill chatter with grey dust and grey sand with grey rock fragments - Arenite
						Break in drill chatter with tan to brown orange sand and rock fragments - possible fracture
						Softer rock, drill chatter with tan to biege dust and tan to biege sand with tan to biege rock fragments - Arenite
						Break in drill chatter with dark grey rock fragments - water bearing fracture
40						Heavy drill chatter with grey rock fragments - Greywacke
						Heavy drill chatter with grey dust and grey rock fragments after advancing through the surface casing at 37' BGS - Greywacke
50						
						Drill chatter with dark grey to black dust and black rock fragments - Shale
60						
						Bottom of borehole at 65.0 feet.
70						

BORING DIAGRAM



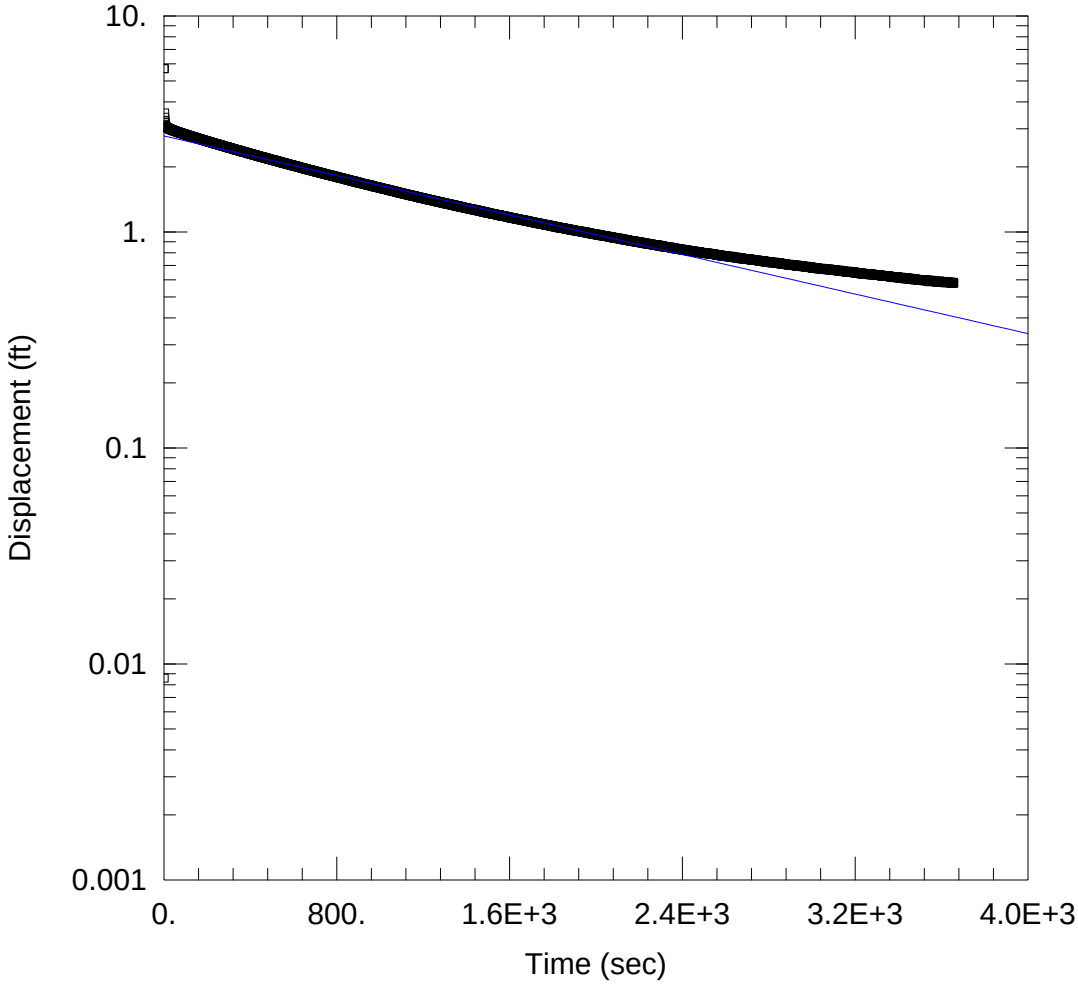
DRILLING CONTRACTOR: Geologic Exploration
DRILL RIG/ METHOD: 7822 DT / HSA/Air Rotary
SAMPLING METHOD: Cuttings
LOGGED BY: RWM
DRAWN BY: RWM

BORING STARTED: 6/12/15
BORING COMPLETED: 6/17/15
TOTAL DEPTH: 65 ft.
TOP OF CASING ELEV: 982.92 ft.
DEPTH TO WATER:

Remarks:
Hand Cleared to 3' BGS. Refusal on weathered sandstone at 3' BGS.

Appendix D

Slug Test Data



WELL TEST ANALYSIS

Data Set: S:\...\MW-1.aqt
Date: 01/15/16 Time: 14:42:43

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-1
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 1.

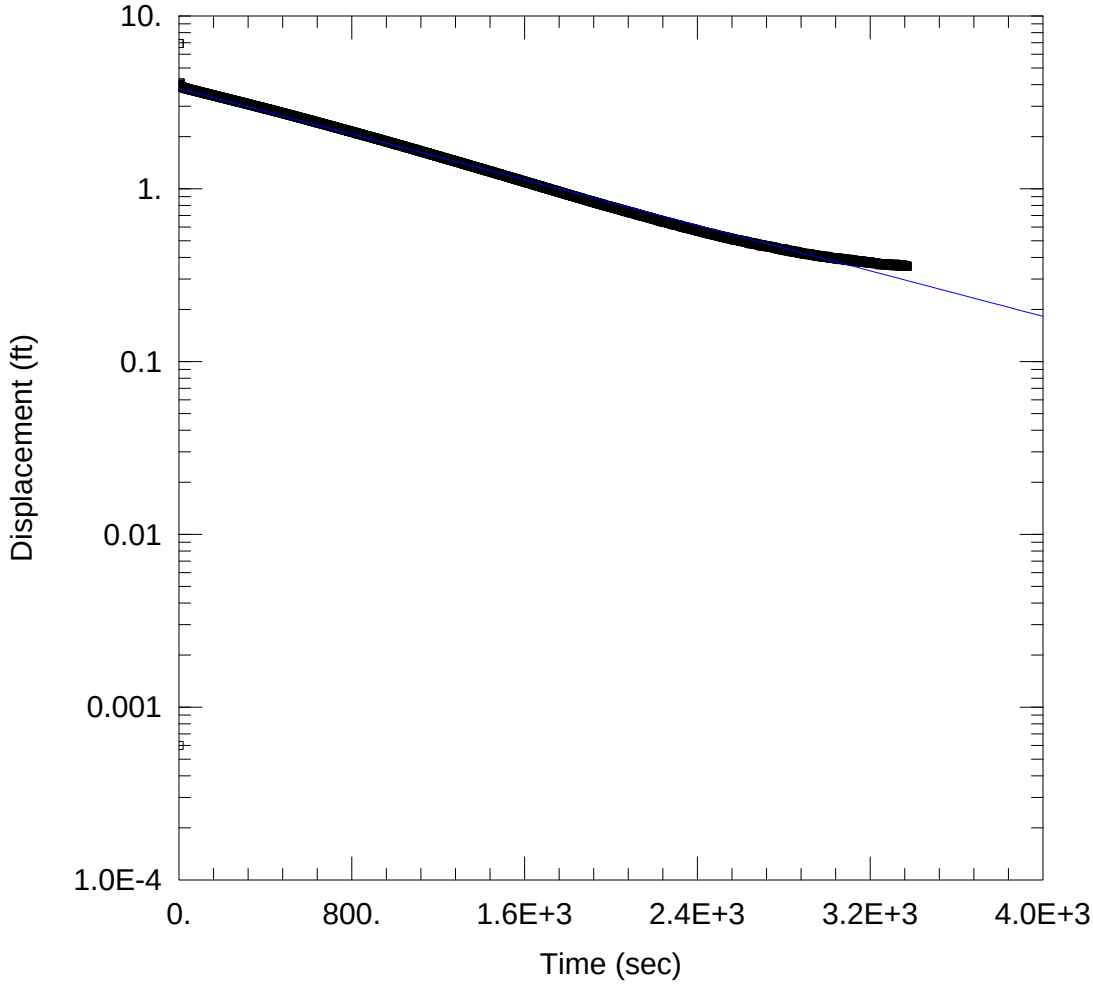
WELL DATA (MW-1)

Initial Displacement: 5.705 ft
Total Well Penetration Depth: 30. ft
Casing Radius: 0.167 ft
Static Water Column Height: 17.73 ft
Screen Length: 15. ft
Well Radius: 0.333 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.1159 ft/day
y0 = 2.783 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-1D.aqt
Date: 01/15/16 Time: 14:57:48

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-1D
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 150. ft
Anisotropy Ratio (Kz/Kr): 1.

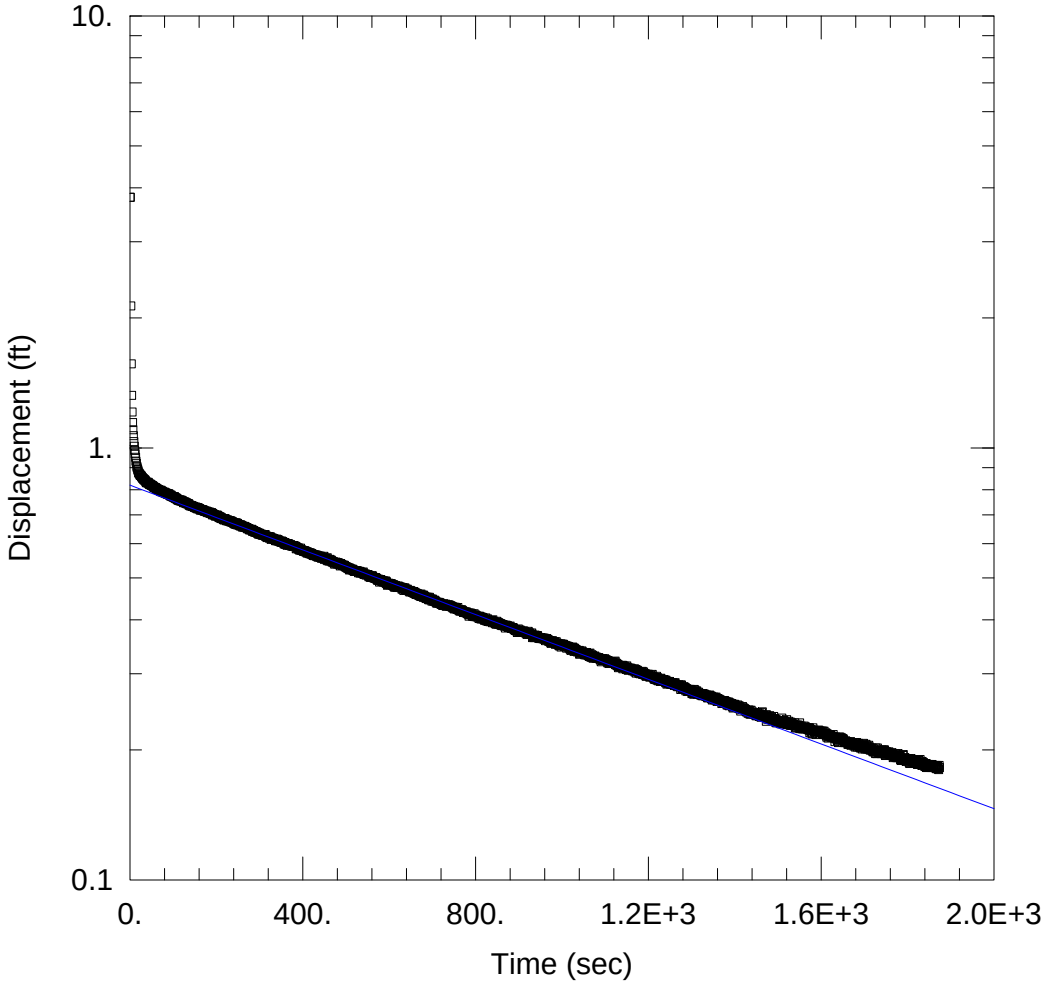
WELL DATA (MW-1D)

Initial Displacement: 6.92 ft
Total Well Penetration Depth: 94. ft
Casing Radius: 0.167 ft
Static Water Column Height: 67.09 ft
Screen Length: 10. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.3238 ft/day
y0 = 3.797 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.2.aqt
Date: 01/15/16 Time: 14:43:39

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-2
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 100. ft Anisotropy Ratio (Kz/Kr): 1.

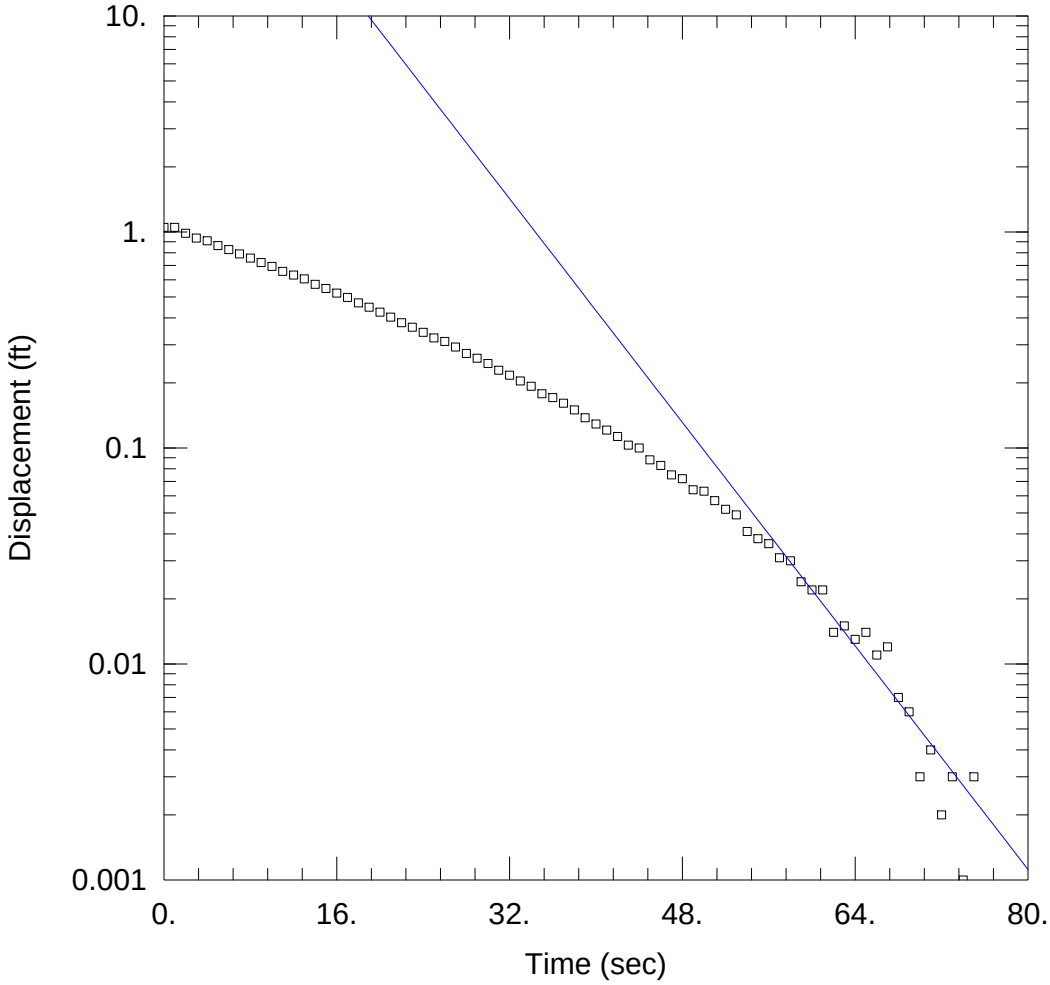
WELL DATA (MW-2)

Initial Displacement: 3.803 ft
Total Well Penetration Depth: 20. ft
Casing Radius: 0.083 ft
Static Water Column Height: 10.27 ft
Screen Length: 10.5 ft
Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.05845 ft/day y0 = 0.8199 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.2D.aqt
Date: 01/15/16 Time: 15:00:36

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-2D
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 150. ft Anisotropy Ratio (Kz/Kr): 1.

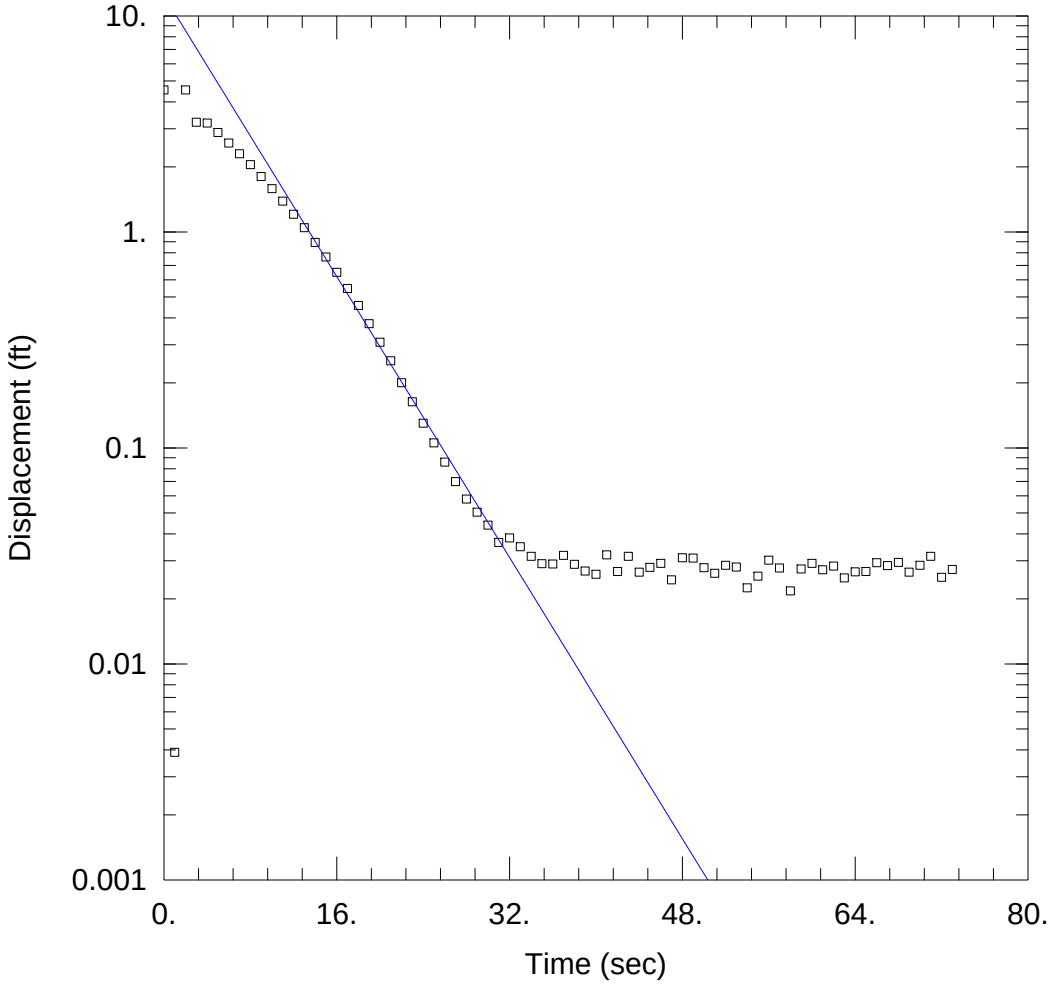
WELL DATA (MW-2D)

Initial Displacement: 1.05 ft
Total Well Penetration Depth: 90. ft
Casing Radius: 0.167 ft
Static Water Column Height: 68.34 ft
Screen Length: 25.4 ft
Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 24.49 ft/day
y0 = 167.1 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-3DR.aqt
Date: 01/15/16 Time: 15:01:56

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-3DR
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 150. ft
Anisotropy Ratio (Kz/Kr): 1.

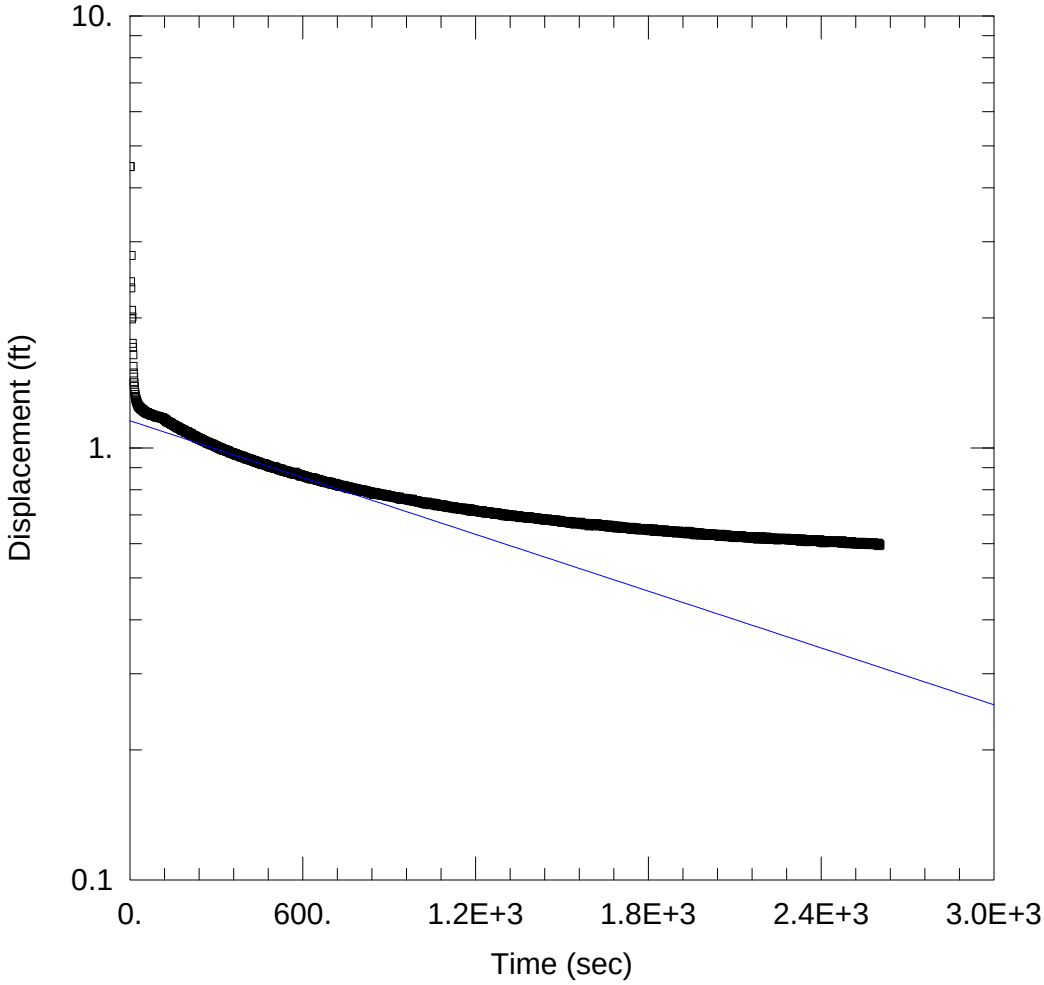
WELL DATA (MW-3DR)

Initial Displacement: 4.545 ft
Total Well Penetration Depth: 88. ft
Casing Radius: 0.167 ft
Static Water Column Height: 85. ft
Screen Length: 10. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 79.11 ft/day
y0 = 12.41 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.5R.aqt
Date: 01/15/16 Time: 14:45:44

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-5R
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 100. ft Anisotropy Ratio (Kz/Kr): 1.

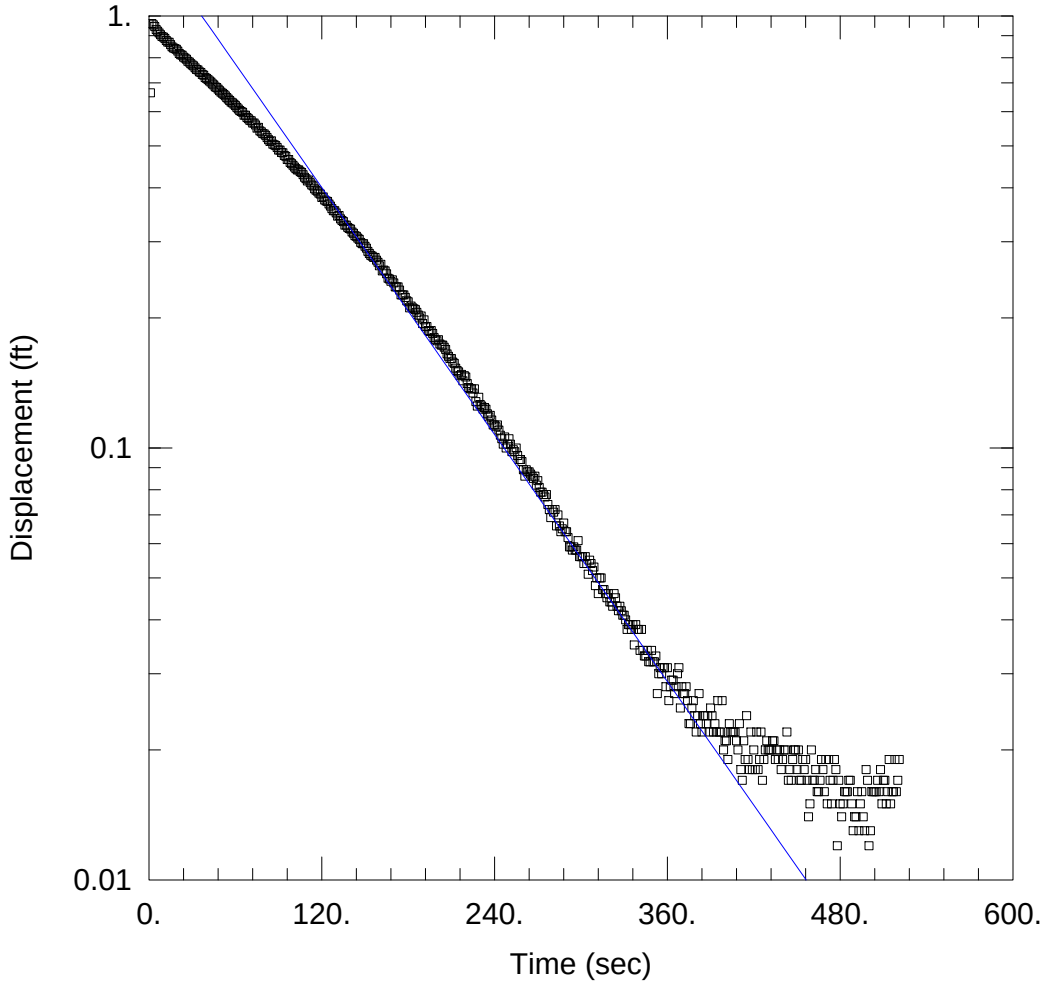
WELL DATA (MW-5R)

Initial Displacement: 4.479 ft Static Water Column Height: 12.78 ft
Total Well Penetration Depth: 24.5 ft Screen Length: 15. ft
Casing Radius: 0.167 ft Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.1074 ft/day y0 = 1.156 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.7D.aqt
Date: 01/15/16 Time: 15:15:56

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-7D
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 150. ft Anisotropy Ratio (Kz/Kr): 1.

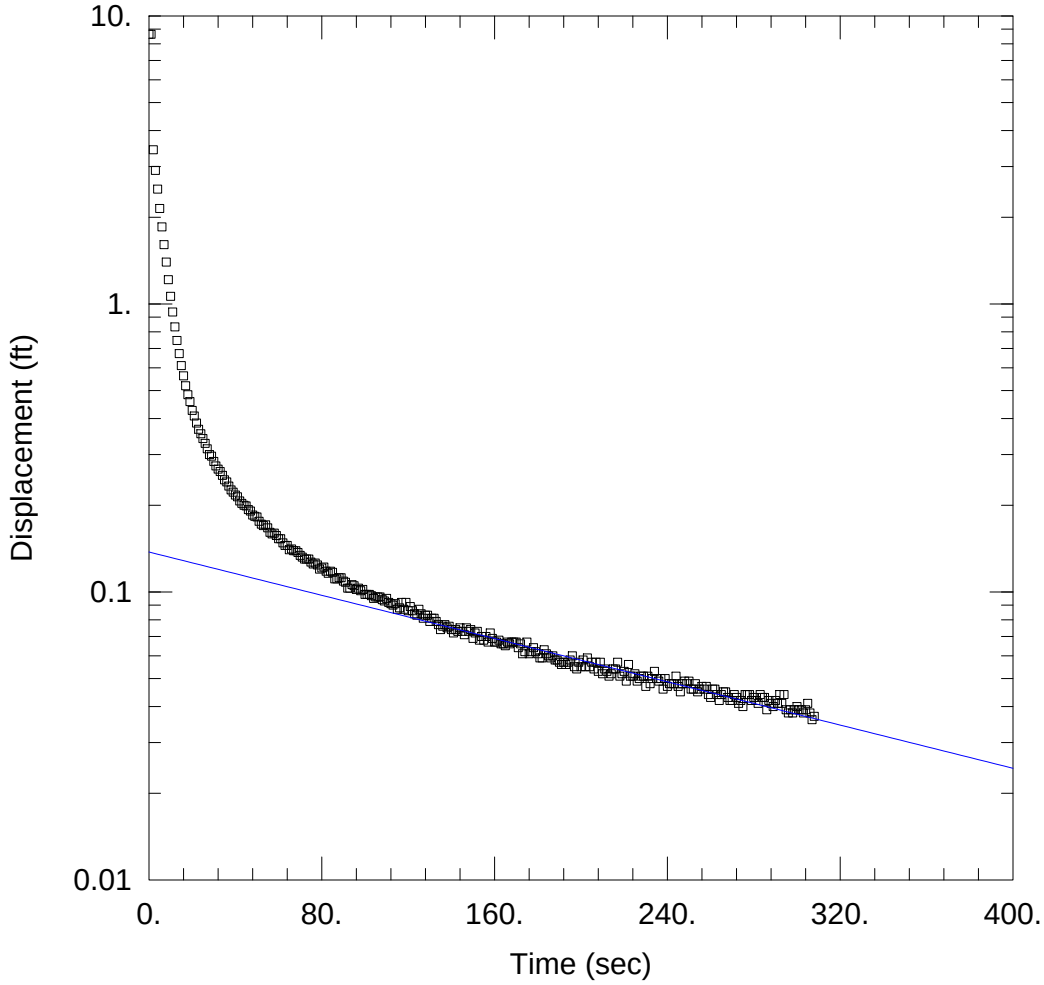
WELL DATA (MW-7D)

Initial Displacement: 0.96 ft
Total Well Penetration Depth: 73. ft
Casing Radius: 0.167 ft
Static Water Column Height: 47.66 ft
Screen Length: 26.5 ft
Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.684 ft/day y0 = 1.495 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.7R.aqt
Date: 01/15/16 Time: 14:46:54

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-7R
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 100. ft Anisotropy Ratio (Kz/Kr): 1.

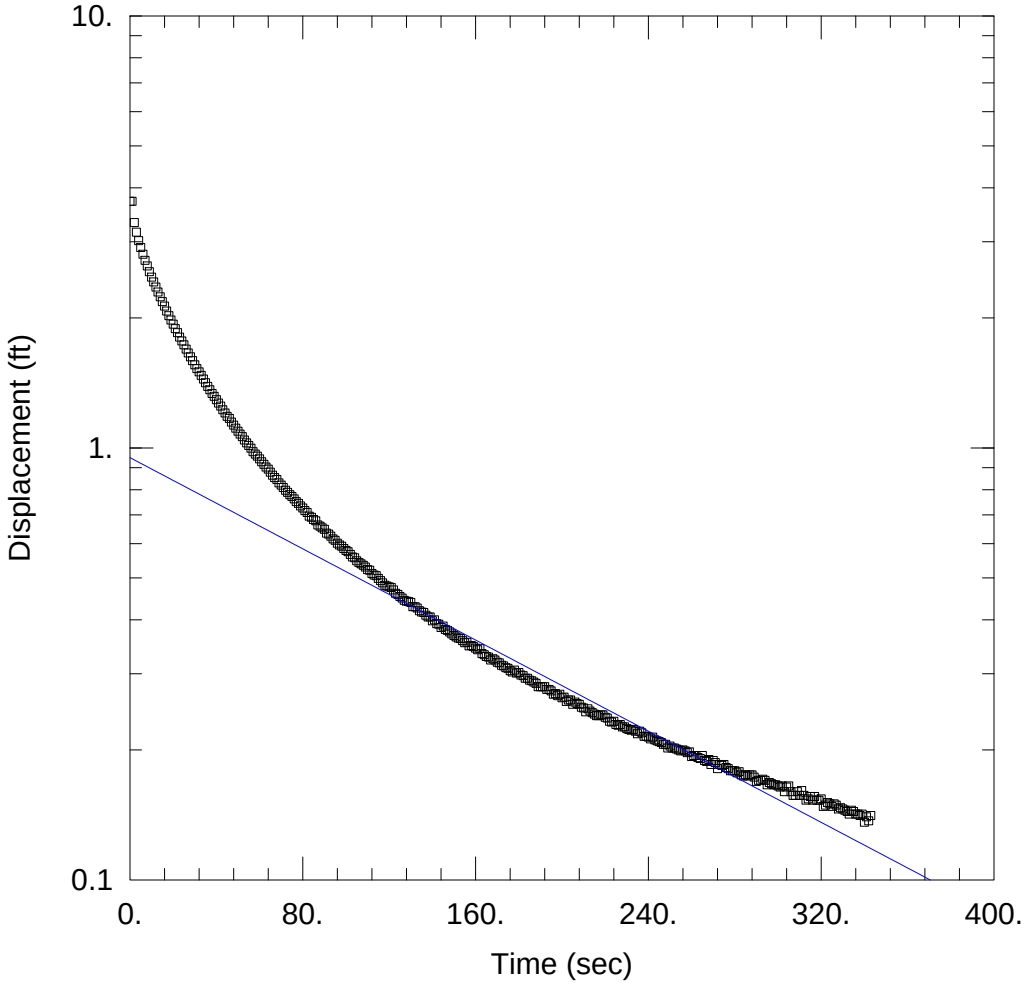
WELL DATA (MW-7R)

Initial Displacement: 8.635 ft Static Water Column Height: 16.39 ft
Total Well Penetration Depth: 34. ft Screen Length: 10. ft
Casing Radius: 0.083 ft Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.3305 ft/day y0 = 0.1375 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.8.aqt
Date: 01/15/16 Time: 14:48:03

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-8
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 100. ft Anisotropy Ratio (Kz/Kr): 1.

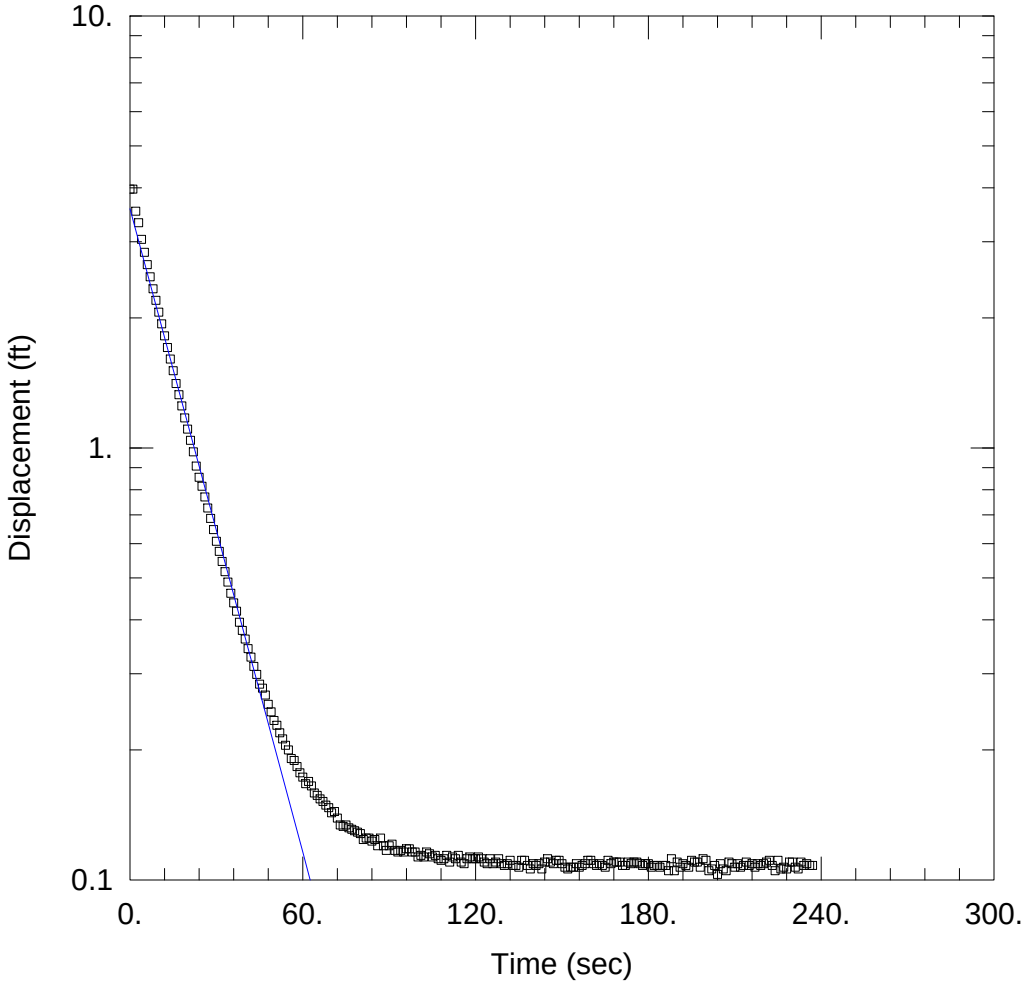
WELL DATA (MW-8)

Initial Displacement: 3.724 ft Static Water Column Height: 18.73 ft
Total Well Penetration Depth: 24. ft Screen Length: 10. ft
Casing Radius: 0.167 ft Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 1.783 ft/day y0 = 0.9495 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW.8D.aqt
Date: 01/15/16 Time: 15:08:11

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-8D
Test Date: 12/11/2014

AQUIFER DATA

Saturated Thickness: 150. ft Anisotropy Ratio (Kz/Kr): 1.

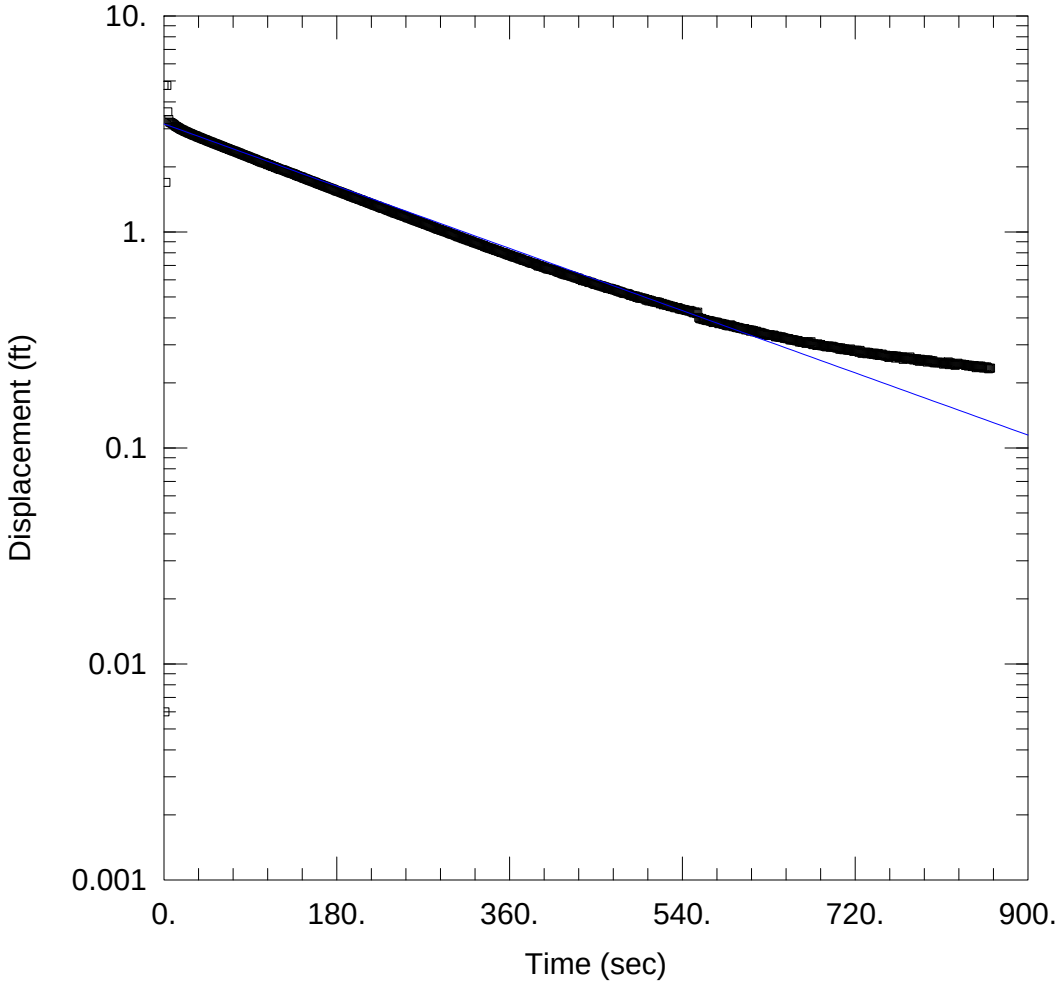
WELL DATA (MW-8D)

Initial Displacement: 3.973 ft
Total Well Penetration Depth: 51. ft
Casing Radius: 0.083 ft
Static Water Column Height: 45.28 ft
Screen Length: 10. ft
Well Radius: 0.333 ft

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 4.53 ft/day y0 = 3.577 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-10.aqt
Date: 01/15/16 Time: 14:50:07

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-10
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 1.

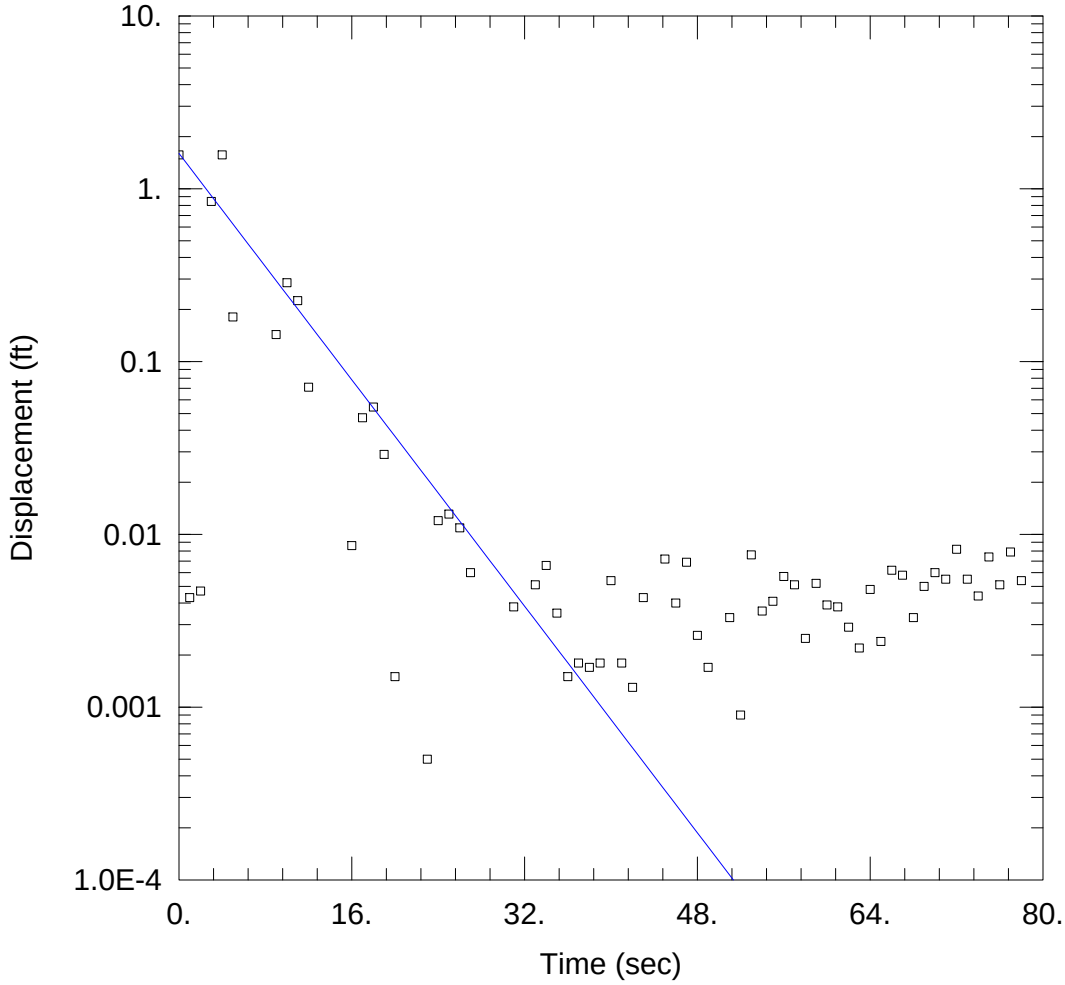
WELL DATA (MW-10)

Initial Displacement: 4.769 ft
Total Well Penetration Depth: 33. ft
Casing Radius: 0.167 ft
Static Water Column Height: 17.2 ft
Screen Length: 15. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.9884 ft/day
y0 = 3.162 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-10D.aqt
Date: 01/15/16 Time: 15:09:52

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-10D
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 150. ft
Anisotropy Ratio (Kz/Kr): 1.

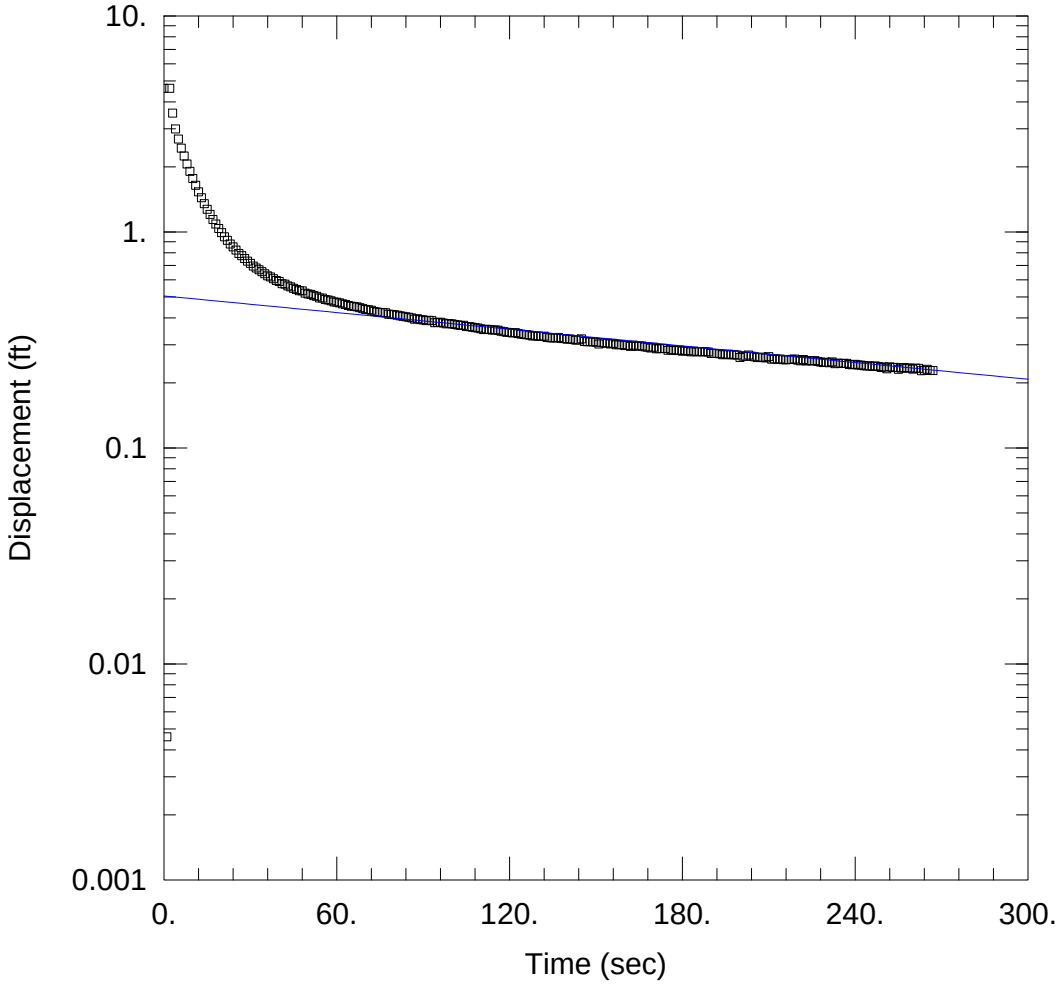
WELL DATA (MW-10D)

Initial Displacement: 1.569 ft
Total Well Penetration Depth: 51. ft
Casing Radius: 0.167 ft
Static Water Column Height: 41.28 ft
Screen Length: 5. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 128.6 ft/day
y0 = 1.601 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-11.aqt
Date: 01/15/16 Time: 14:51:15

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-11
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 100. ft
Anisotropy Ratio (Kz/Kr): 1.

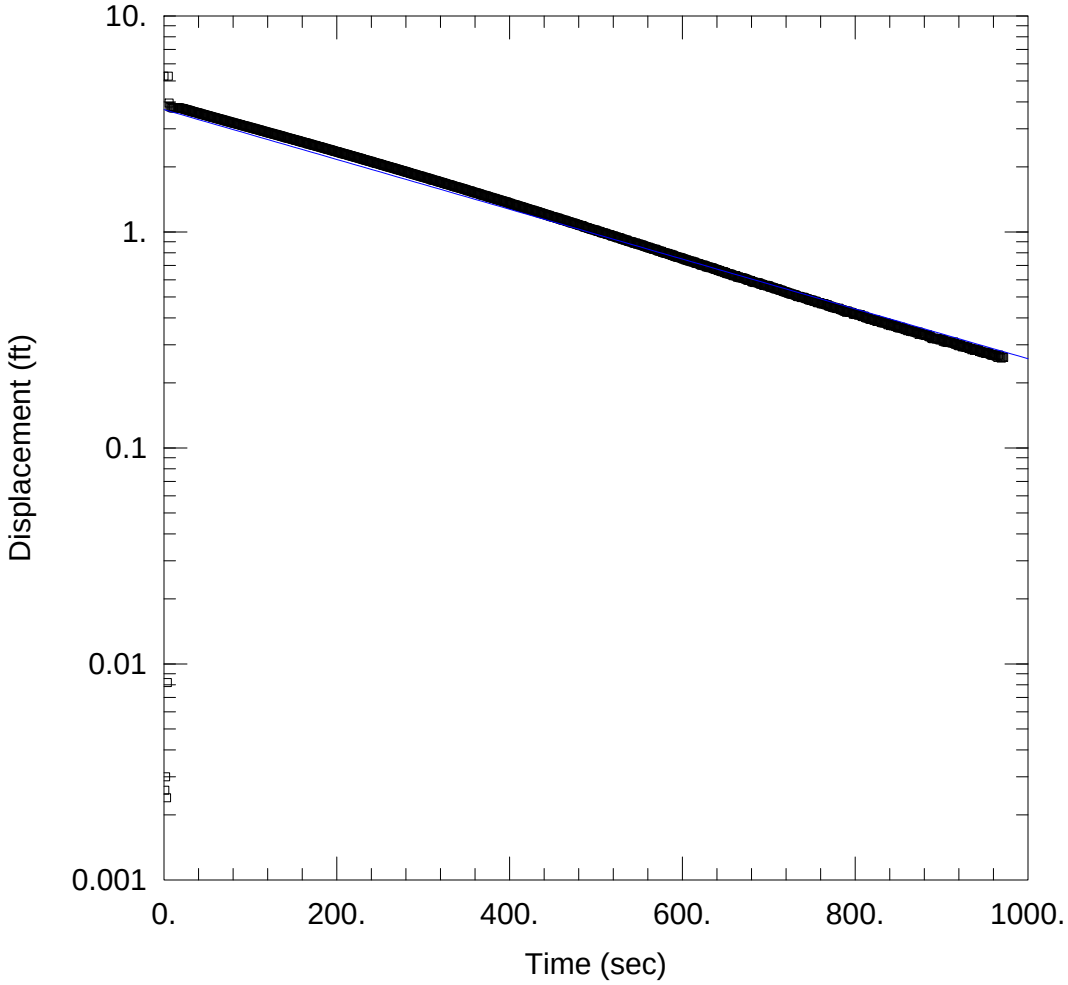
WELL DATA (MW-11)

Initial Displacement: 4.623 ft
Total Well Penetration Depth: 27. ft
Casing Radius: 0.167 ft
Static Water Column Height: 14.31 ft
Screen Length: 15. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.7725 ft/day
y0 = 0.5055 ft



WELL TEST ANALYSIS

Data Set: S:\...\MW-11D.aqt
Date: 01/15/16 Time: 15:11:10

PROJECT INFORMATION

Company: Hart & Hickman, PC
Client: Umicore
Project: UMI-001
Location: Arab, Alabama
Test Well: MW-11D
Test Date: 06/23/2015

AQUIFER DATA

Saturated Thickness: 150. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (MW-11D)

Initial Displacement: 5.257 ft
Total Well Penetration Depth: 67. ft
Casing Radius: 0.167 ft
Static Water Column Height: 56.97 ft
Screen Length: 12. ft
Well Radius: 0.167 ft
Gravel Pack Porosity: 0.

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.9365 ft/day
y0 = 3.682 ft

Appendix E

Groundwater Sampling Forms

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-2

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 20.15' Depth to Water (ft): 9.74 Well Diameter: 2"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 18' ft.

Weather Conditions: PARTLY SUNNY 50s°F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1115	10.10	—	200mL/min	3.80	16.70	294	6.15	157.5	1.72
1120	10.11	—	↓	2.69	16.61	295	6.15	159.3	1.66
1125	10.12	—	↓	2.03	16.57	295	6.14	161.5	1.69
1130	10.12	—	↓	1.81	16.60	296	6.15	161.6	1.71

Other Sample Parameters:

Sampled at: 1135 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 BA 250 mL PLASTIC (HNO_3) FOR 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-2D

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 90.07 Depth to Water (ft): 20.65 Well Diameter: 4"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 80' ft.

Weather Conditions: PARTLY SUNNY 50s °F NOTES: 80'

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1122	20.65	—	200ml/min	5.00	16.25	305	9.88	-15.0	2.39
1127	20.65	—	↓	4.70	16.69	309	9.88	-13.1	1.53
1132	20.65	—	↓	4.49	16.94	314	9.88	-10.3	1.89
1137	20.65	—	↓	4.36	16.98	321	9.88	-9.1	1.96

Other Sample Parameters:

Sampled at: 1140 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL (HNO_3) PLASTIC FOR 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-3D

Well Location: ARAB, AL

Date: 12/8/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 67' Depth to Water (ft): 13.59 Well Diameter: 6"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 64' ft.

Weather Conditions: PARTLY SUNNY 50's °F NOTES: * MS/MSD COLLECTED

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1310	13.65	—	200 mL/min	3.60	14.52	1741	5.02	245.7	239
1315	13.66	—	↓	3.25	14.43	1724	5.02	253.7	92.6
1320	13.66	—	↓	3.14	14.31	1663	5.01	259.0	86.0
1325	13.66	—	100 mL/min	3.13	14.28	1645	5.00	264.6	116
1330	13.66	—	↓	3.12	14.23	1644	5.00	266.8	57.8
1335	13.66	—	↓	3.11	14.30	1648	5.00	268.3	63.7
1340	13.66	—	↓	3.06	14.17	1639	5.00	270.1	85.5
1345	13.66	—	↓	3.00	14.23	1641	5.01	270.9	79.8
1355	13.67	—	50 mL/min	2.95	14.26	1657	5.08	267.5	66.1
1425	13.63	—	↓	2.98	12.80	1641	5.01	276.2	53.2
1445	13.63	—	↓	3.17	12.71	1644	4.99	278.6	7.66

Other Sample Parameters: ____

Sampled at: 1450 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered: ____

Sample Parameter Containers (Types, Number of Containers, Preservatives): 3 EA 250 mL PLASTIC (HNO_3) FOR 6010 PLUS MS/MSD*

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-4

Well Location: Arab, AL

Date: 12/9/14

Facility Name: Umicore CSM NA Facility

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 25.35 (TOC)

Depth to Water (ft): 15.12

Well Diameter: 2"

Sampling Personnel: BRK, RWM

Type of Pump: PERISTALTIC

Tubing Material: Poly

Pump/Tubing set at: 20' ft.

Weather Conditions: PARTLY SUNNY Hi 30's + 50's

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0835	15.72	—	200 ml/min	3.92	15.63	395	5.83	129.7	3.24
0840	15.77	—	↓	3.02	15.54	394	5.83	141.0	2.95
0845	15.81	—		3.00	15.53	390	5.81	150.3	1.81
0850	15.80	—		2.97	15.53	382	5.80	155.9	1.31
0855	15.80	—		2.99	15.53	383	5.81	160.0	1.33

Other Sample Parameters:

Sampled at: 0900

Parameters taken with: YSI ~~Pro Plus~~ 556

Sample Delivered to: TA by Fed Ex at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL PLASTIC (HNO_3) FOR METALS

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:10/17/2014

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-5R

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 27.35 (TOC) Depth to Water (ft): 11.77' Well Diameter: 2"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 19 ft.

Weather Conditions: PARTLY SUNNY 50° F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1205	12.15	—	200ml/min	1.91	16.54	1283	4.85	188.7	50.5
1210	12.15	—		1.97	16.39	1286	4.79	195.4	44.3
1215	12.15	—		1.75	16.30	1289	4.77	201.2	28.0
1220	12.15	—		1.70	16.26	1291	4.76	206.5	17.7
1225	12.15	—		1.75	16.20	1291	4.74	210.2	14.5
1230	12.15	—		1.73	16.20	1294	4.73	214.0	10.6
1235	12.15	—		1.74	16.20	1295	4.73	218.1	7.61

Other Sample Parameters:

Sampled at: 1240 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250ML PLASTIC (HNO_3) FOR 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-5D

Well Location: ARAB, AL

Date: 12/8/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 71' Depth to Water (ft): 25.72 Well Diameter: 4"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 68' ft.

Weather Conditions: PARTLY CLOUDY 40-50° F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1515	25.68	—	200mL/min	2.64	14.00	821	6.10	14.3	134
1520	25.68	—		2.10	14.22	843	6.11	-0.9	114
1525	25.68	—		1.57	14.17	835	6.12	-4.0	99.2
1530	25.68	—		1.03	14.83	859	6.11	-16.3	63.4
1535	25.68	—		1.00	14.80	850	6.11	-15.7	58.4
1540	25.68	—		0.53	14.77	859	6.11	-12.5	61.2
1545	25.68	—		0.85	14.24	865	6.11	-22.1	58.5
1550	25.68	—		0.67	13.40	870	6.12	-24.4	56.4
1600	25.69	—		0.64	12.73	868	6.13	-24.5	50.2
1610	25.69	—		0.45	13.75	846	6.13	-19.6	16.6
1620	25.69	—		0.40	13.79	855	6.12	-19.0	14.7
1630	25.69	—		0.43	13.80	854	6.10	-7.2	9.86

Other Sample Parameters:

Sampled at: 1635 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL PLASTIC (HNO_3) FOR COD

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-6

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 25.80 Depth to Water (ft): 18.38 Well Diameter: 4"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 23 ft.

Weather Conditions: OVERCAST MID 40's F NOTES: * VERY HIGH CONDUCTIVITY

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1305	18.53	—	200ml/min	2.90	14.59	14,136	6.50	115.3	2.08
1310	18.58	—	↓	1.38	14.66	14,280	6.48	117.7	1.75
1315	18.60	—	↓	1.12	14.51	14,332	6.48	118.8	1.91
1320	18.64	—	↓	1.23	14.48	14,290	6.48	112.1	1.77

Other Sample Parameters: ____

Sampled at: 1325 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered: ____

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-6D

Well Location: ARAB, AL

Date: 12/11/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 68' Depth to Water (ft): 27.50' Well Diameter: 4"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: ~~PERISTA~~ BLADDER Tubing Material: POLYETHYLENE Pump/Tubing set at: 60' ft.

Weather Conditions: PARTLY SUNNY HI 20' F NOTES: * PULLED TUBING UP TO 50' @ 940 *

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0740	27.72	—	200ml/min	3.42	15.33	721	5.99	24.4	>1000
0745	27.72	—		1.51	15.98	802	5.89	12.9	814
0750	27.73	—		0.62	16.21	817	5.86	5.5	278
0755	27.73	—		0.54	16.25	778	5.89	-1.3	164
0800	27.74	—		0.46	16.29	720	5.93	-10.2	129
0805	27.74	—		0.59	16.30	655	6.00	-17.5	107
0810	27.75	—		0.38	16.29	614	6.01	-23.7	90.8
0820	27.75	—		0.34	16.32	538	6.07	-34.8	64.1
0830	27.76	—		0.34	16.32	517	6.09	-38.0	55.7
0840	27.78	—		0.27	16.35	514	6.11	-41.2	46.3
0910	27.83	—		0.24	16.37	510	6.14	-47.2	45.8
0940	27.88	—		0.29	16.31	504	6.16	-51.2	35.0

Other Sample Parameters: ____

Sampled at: 1000 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered: ____

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250ml PLASTIC (HNO_3) FOR 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-6D

Well Location: ARAB, AL

Date: 12/11/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 68' Depth to Water (ft): 27.50 Well Diameter: 4"

Sampling Personnel: BRK, RWM

Type of Pump: BLADDER Tubing Material: POLYETHYLENE Pump/Tubing set at: 60 ft.

Weather Conditions: PARTLY SUNNY HI 20'S F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0945	27.89	—	200ml/min	0.26	16.26	500	6.17	-56.4	22.6
0950	27.89	—	↓	0.22	16.29	496	6.17	-59.3	14.1
0955	27.92	—		0.24	16.20	498	6.20	-62.4	4.08

Other Sample Parameters:

Sampled at: 1000 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at .

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-7R

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): — Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 34 Depth to Water (ft): 17.33 Well Diameter: 2"

Sampling Personnel: BRK, RWM, ,

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 30' ft.

Weather Conditions: PARTLY SUNNY 50's °F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1150	17.35	—	200ml/min	1.66	14.91	451	6.05	8.7	202
1155	17.35	—		1.41	14.92	452	6.04	8.0	148
1200	17.35	—		0.92	14.83	445	6.03	1.9	105
1205	17.36	—		0.76	14.89	440	6.03	-1.1	64.8
1210	17.36	—		0.70	14.87	435	6.04	-2.3	50.6
1215	17.36	—		0.62	14.72	430	6.05	-3.3	34.3
1220	17.36	—		0.68	14.62	419	6.04	-1.2	14.0
1225	17.36	—		0.64	14.74	419	6.04	23.6	10.3
1230	17.36	—		0.61	14.68	418	6.04	24.1	9.45

Other Sample Parameters:

Sampled at: 1235 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at .

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 ml PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-7D

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: —

Total Well Depth (ft): 72.90 Depth to Water (ft): 24.98 Well Diameter: 4"

Sampling Personnel: BRK, RWM, ,

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 70' ft.

Weather Conditions: PARTLY SUNNY MID 30'S F NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0900	25.09	—	200ml/min	2.39	11.65	480	6.76	7.3	53.0
0905	25.09	—		1.84	11.82	507	6.69	-0.6	48.1
0910	25.10	—		1.24	12.27	511	6.55	6.1	50.3
0915	25.10	—		0.97	12.66	511	6.49	2.0	49.7
0920	25.10	—		0.80	12.73	520	6.48	-0.9	45.2
0925	25.10	—		0.82	12.86	519	6.47	-3.6	40.1
0930	25.10	—		0.61	13.07	519	6.46	-5.3	30.3
0940	25.10	—		0.46	13.34	523	6.46	-10.3	21.4
0950	25.10	—		0.55	13.33	522	6.46	-7.6	8.13

Other Sample Parameters:

Sampled at: 0955 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at .

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250ml PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-8

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 28.00' Depth to Water (ft): 5.55 Well Diameter: 2"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 23.0 ft.

Weather Conditions: PARTLY CLOUDY 45°F NOTES: * DUP-1 COLLECTED *

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1418	7.71	—	200ml/min	0.91	15.19	215	6.38	-48.8	14.6
1423	7.71	—	↓	0.49	14.98	217	6.37	-51.1	13.7
1428	7.71	—	↓	0.47	14.88	217	6.37	-52.7	12.2
1433	7.71	—	↓	0.44	14.85	218	6.36	-52.7	11.5
1438	7.71	—	↓	0.40	14.79	218	6.36	-50.9	9.37

Other Sample Parameters:

Sampled at: 1445 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 2 EA 250 ml PLASTIC (HNO_3) FOR 6010

* DUP-1 COLLECTED *

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-8D

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 55.35 Depth to Water (ft): 5.64 Well Diameter: 2"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 50' ft.

Weather Conditions: SUNNY 50's F NOTES: ____

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1335	5.67	—	200 ml/min	0.97	16.51	286	6.33	-24.3	2.01
1340	5.67	—	↓	0.64	16.26	279	6.36	-32.9	1.83
1345	5.67	—		0.66	16.20	267	6.33	-32.0	4.17
1350	5.67	—		0.60	16.14	267	6.31	-33.2	2.20
1355	5.67	—		0.60	16.13	264	6.31	-33.4	1.00

Other Sample Parameters: ____

Sampled at: 1400 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered: ____

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 ml PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-9

Well Location: ARIAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ——

Total Well Depth (ft): 13' Depth to Water (ft): 1.92' Well Diameter: 2"

Sampling Personnel: BRK, RWM, ,

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 11' ft.

Weather Conditions: CLEAR MID 50'S F. NOTES: * ARTESIAN

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1320	1.92	—	200ml/min	3.86	14.14	346	6.04	94.0	14.4
1325	1.92	—	↓	1.85	14.24	347	6.02	95.9	6.02
1330	1.92	—	↓	1.61	14.31	348	6.02	94.8	5.33
1335	1.92	—	↓	1.72	14.28	346	6.02	96.1	7.17

Other Sample Parameters:

Sampled at: 1340 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250mL PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-9D

Well Location: ARAB, AL

Date: 12/9/14

Facility Name: UMICORE

Top of Casing Elevation (ft msl): —— Casing Material: PVC Volume of Water Per Well Volume: ____

Total Well Depth (ft): 38' Depth to Water (ft): 0.21' Well Diameter: 2"

Sampling Personnel: BRK, RWM, ____, ____

Type of Pump: PERISTALTIC Tubing Material: POLYETHYLENE Pump/Tubing set at: 36' ft.

Weather Conditions: PARTLY CLOUDY 50's F NOTES: * ARTESIAN

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1345	0.22	—	200ml/min	2.39	14.24	192	6.63	-15.7	46.0
1350	0.22	—	↓	1.74	14.20	192	6.67	-43.3	20.1
1355	0.22	—	↓	0.80	14.27	192	6.75	-63.2	11.1
1400	0.22	—	↓	0.63	14.29	191	6.77	-68.4	7.29

Other Sample Parameters: ____

Sampled at: 1405 Parameters taken with: YSI 556 + HANNA TURBIDITY METER

Sample Delivered to: TA by FEDEX at ____.

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered: ____

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 GA 250ML PLASTIC (HNO_3) FOR 6010

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-1

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 30

Depth to Water (ft): 12.27

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 22 ft.

Weather Conditions: sunny, upper 90s

NOTES: MS/MSD taken

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0930	12.33	—	200mL/min	3.58	20.2	228.3	6.81	13.4	57.5
0940	12.34	—		3.19	20.2	121.5	6.40	21.4	29.6
0945	12.34	—		3.11	20.5	104.8	6.43	20.4	24.5
0950	12.34	—		2.88	20.4	103.5	6.39	22.6	20.1
0955	12.34	—		2.65	20.5	103.2	6.39	22.4	20.7
1000	12.34	—		2.54	20.2	103.5	6.39	22.8	20.1
1005	12.34	—		2.81	20.5	103.2	6.39	21.5	19.3
1010	12.34	—		2.86	20.4	103.4	6.34	24.7	17.4
1015	12.34	—		2.88	20.4	103.6	6.34	23.2	16.8
1020	12.34	—		2.82	20.5	102.8	6.35	22.8	16.3
1030	12.34	—		2.79	20.6	102.3	6.35	20.9	16.6
1040	12.34	—		2.81	20.6	102.6	6.34	20.0	12.7

Other Sample Parameters:

Sampled at: 1105

Parameters taken with: YSI

Sample Delivered to: TestAmerica by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives):

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SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-1 CONTINUED

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 30

Depth to Water (ft): 26.27

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 22 ft.

Weather Conditions: sunny, upper 90s

NOTES: MS/MSD taken

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1050	12.34	—	200 mL/min	2.80	20.3	102.8	6.34	19.6	11.8
1100	12.34	—		2.77	20.2	102.2	6.37	17.7	9.93

Other Sample Parameters:

Sampled at:

Parameters taken with: YSI

Sample Delivered to: TestAmerica by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 3 ea 250 mL Plastic w/ Nitric Acid for 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-1D

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 94

Depth to Water (ft): 26.91

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 80' ft.

Weather Conditions: sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
0950	26.70	—	200 mL/min	4.20	22.76	1115	12.46	-110.5	276
1000	26.71	—		4.84	18.43	1652	12.85	-113.0	106
1010	26.71	—		4.05	18.31	1552	12.82	-133.4	32.0
1020	26.72	—		3.88	18.36	1186	12.70	-141.2	22.8
1030	26.72	—		2.80	18.24	715	12.35	-148.9	14.6
1040	26.73	—		2.60	18.44	504	12.01	-148.3	10.9
1045	26.73	—		2.53	18.52	423	11.79	-141.5	9.88
1050	26.74	—		2.56	18.56	361	11.56	-138.6	12.0
1055	26.76	—		2.46	18.38	328	11.36	-137.9	10.6
1100	26.76	—		2.24	18.35	300	11.15	-127.6	11.0
1105	26.77	—		1.93	18.60	278	10.91	-132.8	13.6
1110	26.78	—		1.77	18.69	275	10.88	-134.9	10.3
1115	26.79			1.48	18.83	270	10.82	-137.5	9.76

Other Sample Parameters:

Sampled at: 1120

Parameters taken with: YSI

Sample Delivered to: Test America by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 ea 250 mL Plastic w/ Nitric Acid for 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-3R

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 40.5

Depth to Water (ft): 14.58

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 34' ft.

Weather Conditions: sunny, upper 90s

NOTES: * DUP-1 collected

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1440	14.55	—	200ml/min	0.88	18.4	607.3	6.64	-0.8	12.0
1445	14.55	—	↓	0.66	18.1	593.4	6.44	12.3	7.62
1450	14.55	—		0.61	18.3	594.7	6.42	12.8	6.94
1455	14.56	—		0.52	18.3	582.7	6.42	13.9	6.10
1500	14.56	—		0.49	18.4	571.9	6.41	15.5	5.35
1505	14.57	—		0.48	18.4	569.1	6.41	16.2	4.23

Other Sample Parameters:

Sampled at: 1510

Parameters taken with: YSI

Sample Delivered to: TestAmerica by courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 2 EA 250ml PLASTIC w/ NITRIC ACID for 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-3DR

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 88

Depth to Water (ft): 0.98

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 85' ft.

Weather Conditions: Sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1435	0.98	—	200 mL/min	1.07	17.91	240	7.84	-96.5	8.13
1440	0.98	—	↓	0.74	19.87	241	7.65	-86.7	9.37
1445	0.98	—		0.74	19.79	241	7.62	-103.8	8.84
1450	0.98	—		0.69	19.74	241	7.58	-107.8	4.31

Other Sample Parameters:

Sampled at: 1455

Parameters taken with: YSI

Sample Delivered to: TestAmerica by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 ea 250m Plastic w/ Nitric Acid for 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-10

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 33

Depth to Water (ft): 6.80

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 26' ft.

Weather Conditions: sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1325	6.77	—	200 ml/min	1.21	19.9	557.6	7.90	-84.1	14.8
1330	6.76	—		0.40	19.0	553.4	7.73	-72.1	11.0
1335	6.76	—		0.38	19.8	549.5	7.69	-70.2	6.32
1340	6.76	—		0.36	18.8	547.3	7.68	-67.5	4.45
1345	6.76	—		0.35	19.1	545.8	7.65	-67.4	2.90
1350	6.76	—		0.32	19.4	541.9	7.63	-66.5	3.04

Other Sample Parameters:

Sampled at: 1355

Parameters taken with: YSI

Sample Delivered to: Test America by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 mL Plastic w/ Nitric Acid for 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-10D

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 51

Depth to Water (ft): 6.72

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 49' ft.

Weather Conditions: Sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1320	3.00	–	200 mL/min	2.52	19.99	446	7.91	-49.7	216
1330	3.00	–		1.73	18.70	446	7.62	-56.1	27.4
1335	3.00	–		1.49	18.92	446	7.64	-49.9	24.7
1340	3.00	–		1.46	18.52	449	7.64	-54.1	12.4
1345	3.00	–		1.39	18.52	447	~~7.59~~ 7.59	-52.9	11.6
1350	3.00	–		1.30	19.05	448	7.67	-45.9	10.8
1355	3.00	–		1.09	18.93	449	7.68	-53.2	9.2

Other Sample Parameters:

Sampled at: 1400

Parameters taken with: YSI

Sample Delivered to: TestAmerica by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 ea 250 mL Plastic w/ Nitric Acid for 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-11

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 27

Depth to Water (ft): 9.69

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 20' ft.

Weather Conditions: sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1145	9.65	—	200 ml/min	1.44	20.7	367.6	7.94	-108.4	34.9
1150	9.65	—		0.70	20.1	364.1	8.08	-106.7	5.51
1155	9.65	—		0.54	20.3	358.2	8.05	-105.2	6.98
1200	9.65	—		0.43	19.8	359.1	8.08	-105.1	5.84
1205	9.65	—		0.40	20.0	356.2	8.04	-105.3	5.45
1210	9.65	—		0.38	20.4	354.3	8.01	-104.5	3.99
1215	9.65	—		0.36	20.5	353.1	8.01	-104.4	3.19
1220	9.65	—		0.35	20.2	352.1	7.99	-104.4	4.36

Other Sample Parameters:

Sampled at: 1230

Parameters taken with: YSI

Sample Delivered to: TestAmerica by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 ea 250 ml Plastic w/ Nitric Acid for 6010

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

LOW-FLOW GROUNDWATER SAMPLING RECORD

Job No: UMI-001

Well ID: MW-11D

Well Location: Arab, AL

Date: 6/21/15

Facility Name: Umicore

Top of Casing Elevation (ft msl): —

Casing Material: PVC

Volume of Water Per Well Volume: —

Total Well Depth (ft): 67

Depth to Water (ft): 7.03

Well Diameter: 2 in

Sampling Personnel: BRK, RWM

Type of Pump: Peristaltic

Tubing Material: Polyethylene / Silicon

Pump/Tubing set at: 61' ft.

Weather Conditions: sunny, upper 90s

NOTES:

GROUNDWATER SAMPLING PARAMETERS

Time	Water Level	Volume Pumped	Pumping Rate	DO (mg/l)	Temp. (°C)	S. Cond. (µS/cm)	pH (SU)	ORP (mV)	Turbidity (NTU)
1140	6.99	–	200 mL/min	2.32	20.61	252	8.80	-72.9	282
1145	6.99	–		1.30	21.56	251	8.08	-64.7	193
1150	6.99	–		1.23	22.28	250	7.98	-70.3	164
1200	7.00	–		0.94	21.20	247	7.62	-72.6	54.4
1210	7.00	–		1.05	21.08	246	7.54	-82.3	25.6
1220	7.00	–		0.81	21.00	246	7.53	-92.5	15.3
1225	7.00	–		0.75	21.23	245	7.47	-98.2	13.0
1230	7.00	–		0.72	20.99	244	7.47	-104.9	9.72

Other Sample Parameters:

Sampled at: 1235

Parameters taken with: YSI

Sample Delivered to: Test America by Courier at

Field Filtration: ( ) Yes (X) No If yes, which sample parameters were field filtered:

Sample Parameter Containers (Types, Number of Containers, Preservatives): 1 EA 250 ml Plastic w/ Nitric Acid for 6010

File: S:\AAA-Master Templates\Forms-Groundwater\Low Flow Groundwater Sampling Record
Date:12/15/2014

Appendix F

Human Health Risk Management Evaluation Report

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

HSWMR

Hazardous Substance & Waste Management Research, Inc.

2976 Wellington Circle West
Tallahassee, Florida 32309
Phone: (850) 681-6894
Fax: (850) 906-9777
e-mail: staff@hswmr.com

4 March 2016

Mr. Shannon Cottrill
Hart Hickman
2923 South Tryon Street, Suite 100
Charlotte, NC 28203

Re: Focused Risk Evaluation for Umicore CSM NA Facility, Arab, Alabama

Dear Mr. Cottrill:

This letter report represents a health-based evaluation for constituents of potential interest in soil at the Umicore CSM NA Facility in Arab, Alabama ("the Site"). Specifically, this letter report addresses the site soil concentrations of cadmium, cobalt, manganese, and nickel in relation to potential human health impacts that may be associated with realistic site-specific exposure conditions. As appropriate, potentially applicable Risk-based Target Levels (RBTLs) are presented for substances that are identified as human health constituents of potential concern (COPCs) during the initial screening process.

Data Characterization and Identification of COPCs

This risk evaluation relies on site assessment activities that have been conducted at the Site from February 2012 through May 2015. Complete details for those assessment activities are provided in the *Property Assessment Report and Work Plan Addendum* (PAR; H&H, 2014) and the *Property Assessment Report and Cleanup Plan* (PARCP; H&H, 2016). It is understood that the February 2012 soil samples from 0-2 inches below land surface (bls) and from 12 to 15 inches bls were deemed to be inconsistent with the Alabama Department of Environmental Management (ADEM) guidelines for soil sample collection. Subsequent sampling efforts duplicated the locations of the 2012 samples and included samples from 0-1 foot bls, as well as deeper intervals of interest. Those latter samples are summarized on Table 1 and Table 2 in Attachment A to this letter report. The analytes of interest shown on Tables 1 and 2, cadmium, cobalt, manganese, and nickel, are those that H&H (2014) identified as having at least one concentration exceeding either the ADEM-recommended human health default screening level (the USEPA Regional Screening Level in this case) or the ADEM (2008) soil-to-groundwater leaching-based concentration. For exposure assessment purposes,

Table 1 presents sample results for locations that are inside the security fence, and Table 2 presents sample results for locations that are outside the security fence but inside the facility property boundary. Figure 1 in Attachment B to this letter report shows a sample location map and Site features, including the location of the security fence.

Samples from each of the two areas of interest may further be broken down into surface soil samples and subsurface soil samples. Consistent with ADEM (2008) definitions, the risk evaluation will define surface soil as those soils from ground surface to a depth of one foot (0 to 1 foot bls), and subsurface soil as those soils from 1 foot bls to the water table. For the subsequent exposure evaluation in this letter report, the surface soil interval represents soils that have the reasonable likelihood of being encountered directly by various individuals on a routine basis. The subsurface soils (>1 foot bls) would be encountered much less frequently and only by specialized receptors such as construction and maintenance workers. Because it typically is not possible to be exposed to subsurface soil without also being exposed first to surface soil, for the risk evaluation "subsurface soil" is defined as all soils from ground surface to the water table, or to the deepest available sample results.

Deeper soils also are of primary interest in terms of evaluating potential leachability to groundwater. The PARCP (H&H, 2016) addresses groundwater characterization and exposure, potential soil-to-groundwater leaching, and the groundwater-to-surface water exposure pathway. Thus, groundwater, surface water, and soil leachability have not been evaluated in this letter report.

Tables 3 and 4 in Attachment A to this letter report present summary statistical analyses for surface and subsurface soils collected from inside the fence and outside the fence, respectively. Because environmental soil samples typically are not homogeneous even within the same boring and same depth interval, all duplicate analyses (e.g., samples with “DUP” identifier on Tables 1 and 2) were included as separate sample results. Prior to calculating the summary statistics, testing for and removal of statistical outlier concentrations was performed, consistent with USEPA (2013a) guidance on use of the ProUCL version 5.0 statistical software program (USEPA, 2013b). Also presented on Tables 3 and 4 are the USEPA (2015a) Regional Screening Levels (RSLs) for industrial land use. As stated in the PAR (H&H, 2014), it is anticipated that the facility will enact a restrictive covenant to ensure that no unrestricted use (residential) occurs on-site. Thus, the industrial RSLs are appropriate screening levels for identification of Constituents of Potential Concern (COPCs) at the Site.

As shown on Table 3 (inside the fence statistics), cadmium, manganese, and nickel in surface and subsurface soil, and cobalt in subsurface soil, all have mean and 95% upper confidence limit (UCL) of the mean concentrations that are well

below their respective default USEPA RSLs. The 95% UCL of the mean is a statistical calculation that represents a refined, conservative interpretation of the mean, and that value typically is used in exposure assessments and risk evaluations. Use of the 95% UCL as a representation of the mean, as well as use of the ProUCL software, is in accord with ADEM (2008) guidance. With respect to cobalt in surface soil inside the security fence at the Site, it is identified as an initial COPC because the 95% UCL concentration exceeds the RSL.

Regarding the area of interest outside the security fence but inside the facility property boundary, Table 4 also shows that cadmium, manganese, and nickel in surface and subsurface soil, and cobalt in subsurface soil, all have mean and 95% upper confidence limit (UCL) of the mean concentrations that are well below their respective default RSLs. However, due to a slight exceedance of the RSL for cobalt (95% UCL of 422 mg/kg vs RSL of 350 mg/kg), cobalt is identified as a COPC for surface soil outside the fence.

Thus, cobalt in surface soil is identified as the sole COPC for the inside the fence and the outside the fence areas of interest. Due to widespread collocation of impacts, risk management decisions that are recommended for cobalt also will address the other analytes of interest.

Exposure Point Concentration

Knowledge of the mere presence of substances in soils is not sufficient to conclude that such substances pose a health risk. In any exposure evaluation, determining the appropriate Exposure Point Concentration (EPC) is vital to establishing whether conditions represent a potential risk to human health. Those EPCs are subsequently compared with health-based site-specific cleanup levels to assist in making site-specific decisions.

For soil evaluation, the EPC is identified based on calculation of a mean concentration from relevant data in the area of concern. That mean concentration is considered representative of a potential central tendency exposure (CTE). As briefly explained previously, in order to evaluate upper bound or reasonable maximum exposure (RME) that a potential receptor may encounter, treatment of the mean is extended in a conservative, protective way by estimating the 95% Upper Confidence Limit (UCL) of the mean. Use of the 95% UCL is consistent with ADEM (2008) guidance. Tables 3 and 4 in Attachment A to this letter report present the mean (CTE EPC) and 95% UCL (RME EPC) concentrations for the only COPC, cobalt, as well as the other analytes of interest in surface soil from inside the fence and outside the fence, respectively. The EPCs were developed using the USEPA (2013a) ProUCL version 5.0 statistical package, consistent with ADEM (2008) guidance.

Prior to calculation of the mean and 95% UCL concentrations, USEPA recommends evaluating the data sets for statistical outliers, and recommends that the outliers be removed. As explained in the ProUCL Users Guide (USEPA, 2013b),

> *The inclusion of outliers in the computation of the various decision statistics tends to yield inflated values of those decision statistics, which can lead to incorrect decisions. Often inflated statistics computed using a few outliers tend to represent those outliers rather than representing the main dominant population of interest (e.g., reference area). It is suggested to identify outliers, observations coming from population(s) other than the main dominant population, before computing the decision statistics needed to address project objectives.*

An uncertainty section is presented later in which the outlier removal process is further put into perspective, and in which selected statistical summaries are presented without exclusion of outliers.

Exposure Assessment

Constituents of Potential Concern (COPCs) were identified by a screening comparison of Exposure Point Concentrations (EPCs) versus conservative default industrial RSLs. Those RSLs are based on an assumption of daily exposure to workers, five days per week for 25 years (USEPA, 2015b). Although some areas of the inside the fence area of interest may have such exposures, that type of exposure is not occurring at all areas of the Site, and it is unlikely to occur in the future. Thus, this exposure and risk evaluation recommends reasonable site-specific adjustments to selected components of the default calculation. Such an approach is consistent with development of Risk-based Target Levels (RBTLs) for a Risk Management-2 Evaluation (RM-2) as described in the ADEM (2008) guidance. For the RM-2 evaluation at this Site, four potential receptors are considered; the adolescent trespasser, the adult trespasser, the adult maintenance worker, and the adult construction worker. The adolescent and adult trespassers are only applicable to the "outside the fence" area of interest because the fenced area at the Site is secured and monitored on a 24 hour, seven days per week basis.

Adolescent Trespasser

It is assumed that the adolescent trespasser may be exposed to outside the fence surface soil from 0 to 1 foot bls via simultaneous incidental ingestion, dermal contact, and inhalation of particulates. Cobalt, the only COPC for surface soil, does not volatilize appreciably from soil. It is assumed that the adolescent trespasser may access the site one hour per day for two days per week for a period of ten years (exposure frequency (EF) 100 days/year;

exposure duration (ED) 10 years) from age 7 to 17. The 100 days/year exposure frequency is considered conservative for the wooded, mostly inaccessible area of interest at the Site, which is surrounded by low density residential, agricultural, and commercial/industrial properties. All other assumptions for the adolescent trespasser are consistent with ADEM (2008) default assumptions for Risk Management-1 Evaluations (RM-1). The complete set of assumptions, as well as the RBTL algorithm, is presented on Figure 2 in Attachment B to this letter report.

Adult Trespasser

As with the adolescent trespasser, it is assumed that the adult trespasser may be exposed to outside the fence surface soil from 0 to 1 foot bls via simultaneous incidental ingestion, dermal contact, and inhalation of particulates. It conservatively is assumed that the adult trespasser may access the site one hour per day for two days per week for a period of thirty years (exposure frequency (EF) 100 days/year; exposure duration (ED) 30 years). The 100 days/year exposure frequency is considered conservative for the wooded, mostly inaccessible area of interest at the Site. All other assumptions for the adult trespasser are consistent with ADEM (2008) default assumptions for RM-1 evaluations. The complete set of assumptions, as well as the RBTL algorithm, is presented on Figure 2 in Attachment B to this letter report.

Adult Maintenance Worker

For the adult maintenance worker, it is assumed that such an individual will access the impacted areas of the Site for four hours per day for one day per week for 25 years (EF of 50 days/year and ED of 25 years) during routine outdoor activities such as landscaping and trash pickup. It further is assumed that the maintenance worker may ingest 150 mg/day soil, twice the default ADEM RM-1 assumption for commercial workers, since the maintenance worker may have more intense exposure than a typical indoor worker. All other assumptions for the adult maintenance worker are consistent with ADEM (2008) default assumptions for RM-1 evaluations.

Adult Construction Worker

For the construction worker scenario, it is assumed that incidental ingestion, dermal contact, and exposure via inhalation of particulates could occur for five days per week during a trenching or building footer construction project (exposure duration of 4 months; ED 0.33 year; EF 80 days per year (5 days per week for 16 weeks)). The soil ingestion rate and all other exposure

assumptions are consistent with the ADEM RM-1 construction worker assumptions (see Figure 2 in Attachment B).

Development of Risk-based Target Levels

Based on the previously described exposure scenarios, Figure 2 in Attachment B to this letter report presents the algorithm and a complete set of exposure assumptions for development of Risk-based Target Levels (RBTLs) for cobalt, the only COPC identified for the Site. The algorithm and the majority of assumptions are based on ADEM procedures for developing default RBTLs. For the adolescent and adult trespasser and the construction worker scenarios, site-specific considerations dictate modification to the default exposure frequency and duration assumptions. As shown on Figure 2, exposure is assumed to occur to each receptor via ingestion, dermal contact, and inhalation. For the inhalation route, cobalt is not expected to volatilize significantly from soil, so only inhalation of particulate-bound cobalt is considered for that route.

Table 5 in Attachment A presents the RBTLs from Attachment B, as well as the default industrial USEPA RSL, and the recommended Exposure Point Concentrations (EPCs; 95% UCL of mean) from the statistical analysis for inside the fence and outside the fence areas of interest.

As shown on Table 5, the inside the fence cobalt maximum concentration (1,740 mg/kg) and the proposed Exposure Point Concentration (EPC; 95% UCL; 844 mg/kg) exceed the default industrial RSL (350 mg/kg) and the adult construction worker RBTL (538 mg/kg). The inside the fence mean concentration of 394 mg/kg nominally exceeds the default industrial RSL only. For the outside the fence evaluation, the mean (297 mg/kg) and EPC (422 mg/kg) are lower than each of the potentially applicable target levels (see Table 5 in Attachment B). The maximum concentration of 1,750 mg/kg exceeds the RBTLs, but routine exposure to a single elevated concentration location is unlikely under the assumed exposure scenarios and based on the Site characteristics.

"Hot spot" Removal / Virtual Remediation

Because the inside the fence EPC exceeds at least one of the potentially applicable target levels, it is appropriate to consider "hot spot" removal via a virtual remediation exercise. In virtual remediation (VR), the selected sample results (e.g., the most elevated concentrations in decreasing order) are replaced iteratively in the data set with reasonable values based on an assumption of excavation followed by backfilling with clean fill. It also demonstrates the conservative nature of the exposure point concentrations (EPCs). That is, if the

receptor does not spend any time in the highest concentration areas, the VR estimates suggest what the true EPC may be for that receptor.

Removal of the two highest concentration locations inside the fenceline and replacement with a surrogate clean fill concentration of 5 mg/kg (approximately twice the lowest concentration reported on-site, and consistent with site background; H&H, 2014) yields a 95% UCL concentration of approximately 400 mg/kg. That value is below the construction worker RBTL of 538 mg/kg but slightly greater than the default industrial worker RSL of 350 mg/kg. Replacement of the three highest concentration locations results in a 95% UCL concentration of approximately 300 mg/kg, which does not exceed either the construction worker RBTL or the default industrial RSL. All locations for consideration of "hot spot" removal are in close proximity to each other (SS-118, SS-118A, and SS-118C) in the wastewater treatment plant area. The VR exercise demonstrates that significant widespread risks are not present at the inside the fence area of the Site, and that considerable concentration reduction can be achieved with limited effort.

Conclusions

Based on the available applicable soil sample results, the known site characterisitics, and reasonable site-specific exposure assumptions, the area outside the fenceline at the Umicore CSM NA Facility, as well as all of the subsurface soils at the Site, do not pose a significant risk to reasonably anticipated receptors. For the area inside the fenceline, based on the available cobalt analytical results in surface soil, the conservative exposure point concentration exceeds the cobalt site-specific Risk-based Target Levels for a long-term daily worker (default industrial worker) and a short-term construction worker. Because of the built-in protectiveness of the RBTLs, and because the receptors are unlikely to receive all of their daily soil ingestion from the impacted area, it is unlikely that the RBTL exceedance represents a significant risk. However, as demonstrated by the virtual remediation exercise, with minimal focused effort, considerable concentration and risk reduction can be achieved, yielding a site condition which meets risk-based goals. This evaluation and the associated conclusions are based on the understanding that there is an intent to impose a restrictive covenant or similar instrument excluding unrestricted, residential use at the Site.

Uncertainty Evaluation

In all risk evaluations there are several areas of uncertainty that have the potential to underestimate or overestimate the actual risk at a site. It is standard practice to err on the side of human health protection and to employ assumptions that tend to overestimate the risk (e.g., toxicity guidance values

with built in protective modifying factors and uncertainty factors, conservative estimates for ingestion rate) while minimizing assumptions that tend to underestimate the risk. In the current evaluation, one source of potential uncertainty that may result in an underestimation of risk is the practice of identification and removal of statistical outliers from the data sets. As noted previously, this practice is recommended by USEPA (2013a) in order to prevent the decision-making statistics (e.g., the EPCs) from being unduly influenced by values that are not representative of the population (the data set) as a whole. Attachment C to this letter report presents the ProUCL output files, including outlier tests and graphs, and the UCL calculations following removal of the outliers. Attachment D presents tables and ProUCL output files for this uncertainty evaluation in which outliers are not removed.

At the outset, it is noted that for the single COPC identified in the risk evaluation (cobalt in surface soil), no outliers were identified in either of the areas of interest, so this uncertainty section does not apply to the conclusions and recommendations for cobalt in surface soil.

Tables D-1 and D-2 in Attachment D present summary statistics for all of the analytes of interest from inside the fence and outside the fence, respectively, and they show the number of outliers that were identified and removed for purposes of the risk evaluation. Tables D-1 and D-2 also show the summary statistics if outliers are not removed.

As shown on Table D-1 for the inside the fence area of interest, cadmium in surface soil and cobalt in subsurface soil are the analytes of interest for which outliers were removed (yellow highlighted rows). If no outliers had been removed, cadmium still would not have been identified as a COPC in surface soil. However, if outliers had not been removed for cobalt in subsurface soil, cobalt would be identified as a COPC. Recall that "subsurface soil" in the risk evaluation consists of all samples from surface to the water table (or to the deepest samples available). It is noted that the three sample results that were removed as outliers all are in the 0 to 1 (surface) interval. Thus, any risk management decisions that are taken for the identified risks from cobalt in surface soil will address any theoretical risk posed by cobalt in subsurface soil.

For the area of interest outside the fenceline, Table D-2 shows that all analytes of interest from both surface soil and subsurface soil had at least two outliers removed for the main risk evaluation. The uncertainty evaluation, which includes all outliers in the statistical summary, continues to demonstrate that cadmium, manganese, and nickel are not COPCs for surface or subsurface soil outside the fenceline, and confirms that cobalt is a COPC in surface soil outside the fenceline, but with a notably higher 95% UCL concentration. In addition, cobalt also is identified as a COPC for subsurface soil outside the fenceline in the

uncertainty evaluation (see Table D-2). It is triggered as a COPC in subsurface soil because the 95% UCL of 454 mg/kg exceeds the default industrial RSL of 350 mg/kg. However, that subsurface soil concentration does not exceed the lowest (most restrictive) potentially applicable subsurface soil RBTL of 538 mg/kg (adult construction worker). Therefore, because the RSL is not applicable to subsurface soil, and because the 95% UCL is below the construction worker RBTL, risks attributable to cobalt in subsurface soil outside the fence are not significant.

Thus, for cadmium, manganese, and nickel in surface soil outside the fenceline, and for all analytes of interest in subsurface soil outside the fenceline, the conclusion of the risk evaluation does not change if outlier concentrations are not removed. For cobalt in surface soil outside the fenceline, a virtual remediation exercise similar to that which was done in the formal risk evaluation, demonstrates that removal and replacement of the three most elevated concentrations (6,650 mg/kg at SS-75; 4,260 mg/kg at SS-58; 3,530 mg/kg at SS-14A) will result in an acceptable 95% UCL. Such an effort is not required to meet USEPA and ADEM risk based guidelines, but is provided as a risk management option for discussion purposes.

Attachment A to this letter report contains the associated tables, Attachment B contains the RBTL figure, Attachment C presents the risk evaluation ProUCL output files, Attachment D contains the uncertainty evaluation tables and ProUCL output files, and Attachment E contains cited references from the text, tables, and figures.

Once you have had an opportunity to review this information, please call Doug Covert or me at (850) 681-6894 to discuss how we may further assist you.

Regards,

Christopher M. Teaf, Ph.D.
President & Director of Toxicology

CMT/djc

Attachments (5)

ATTACHMENT A

Tables

Table 1

Soil Analytical Results
Inside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-42				SS-42B			SS-118			
Analytes of Interest	SS-42 0-1' 5/30/13	DUP-1 0-1' 5/30/13	SS-42 1-2' 5/30/13	SS-42 2-3' 5/30/13	SS-42B 0-1' 9/16/13	SS-42B 1-2' 9/16/13	SS-42B 2-3' 9/16/13	SS-118 0-1' 5/20/15	SS-118 DUP-22 0-1' 5/20/15	SS-118 1-2' 5/20/15	SS-118 DUP-23 1-2' 5/20/15
Cadmium	--	--	--	--	--	--	--	52.4	41.4	6.66	1.74
Cobalt	22.3	27.4	6.67	2.74	14	2.28 U	--	927	763	89.8	23.9
Manganese	88.1	60.3	--	--	--	--	--	338	325	146	128
Nickel	30.5	17.4	--	--	--	--	--	500	491	45.7	14.1

	SS-118A			SS-118B		SS-118C		SS-119			SS-119A
Analytes of Interest	SS-118A 0-1' 5/20/15	DUP-24 0-1' 5/20/15	SS-118A 1-2' 5/20/15	SS-118B 0-1' 5/20/15	SS-118B 1-2' 5/20/15	SS-118C 0-1' 5/20/15	SS-118C 1-2' 5/20/15	SS-119 0-1' 5/20/15	DUP-21 0-1' 5/20/15	SS-119 1-2' 5/20/15	SS-119A 0-1' 5/20/15
Cadmium	37	287	8.08	8.7	1.15 U	97	2.9	11.5	23.3	1.14 U	4.12
Cobalt	397	1730	47.3	267	34.7	1740	4.45	133	316	8.65	21.6
Manganese	--	--	--	--	--	--	--	268	321	--	--
Nickel	--	--	--	--	--	--	--	158	306	--	--

	SS-119B		SS-120		SS-120B/SS-42	SS-120C/SS-42B	SS-121B
Analytes of Interest	SS-119B 0-1' 5/20/15	SS-119B 1-2' 5/20/15	SS-120 0-1' 5/20/15	DUP-20 0-1' 5/20/15	SS-120B/SS-42 0-1' 5/20/15	SS-120C/SS-42B 0-1' 5/20/15	SS-121B 0-1' 5/19/15
Cadmium	14.7	1.13 U	3.81	3.7	1.22	2.63	1.08 U
Cobalt	142	--	91.7	80.9	18.6	10.8	--
Manganese	--	--	201	158	68.7	150	--
Nickel	--	--	95	73.4	15.4	15.4	--

All results expressed in mg/kg
-- Sample not analyzed for the noted analyte.
U Indicates that the analyte was not detected above the noted detection limit.

Table 2

Soil Analytical Results
Outside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-01A			SS-06			SS-06A			SS-06B			SS-06C	SS-11			SS-11A		
	SS-01A	SS-01A	SS-01A	SS-06	SS-06	SS-06	SS-06A	SS-06A	SS-06A	SS-06B	SS-06B	SS-06B	SS-06C	SS-11	SS-11	SS-11	SS-11A	SS-11A	SS-11A
	0-1'	1-2'	2-3'	0-1'	2-3'	5-6'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	0-1'	2-3'	4-5'	0-1'	1-2'	2-3'
Analytes of Interest	6/3/13	6/3/13	6/3/13	6/1/13	6/1/13	6/1/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/1/13	6/1/13	6/1/13	6/2/13	6/2/13	6/2/13
Cadmium	9.93	7.52	--	4.47	1.39 U	--	17.9	2.38	--	4.35	--	--	2.44	5.55	1.27 U	--	7.02	--	--
Cobalt	914	868	86.3	635	7.61	3.3	281	29.3	33.6	1000	157	46.6	32.6	650	39.1	2.36 U	869	180	90.3
Manganese	700	887	114	537	50.2	--	1070	83.3	--	1480	365	--	132	1070	60.7	--	1080	153	--
Nickel	414	337	--	34.5	10.9	--	90.6	--	--	118	--	--	--	518	23.5	--	126	--	--

	SS-11B			SS-11C	SS-14				SS-14A/18D			SS-14B			SS-14C	SS-14D	SS-17		
	SS-11B	SS-11B	SS-11B	SS-11C	SS-14	SS-14	SS-14	SS-14	SS-14A/18D	SS-14A/18D	SS-14A/18D	SS-14B	SS-14B	SS-14B	SS-14C	SS-14D	SS-17	SS-17	SS-17
	0-1'	1-2'	2-3'	1-2'	0-1'	2-3'	5-6'	6-7'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	1-2'	0-1'	2-3'	4-5'
Analytes of Interest	6/4/13	6/4/13	6/4/13	6/2/13	6/1/13	6/1/13	6/1/13	6/1/13	6/4/13	6/3/13	6/4/13	6/4/13	6/4/13	6/4/13	6/2/13	6/3/13	6/1/13	6/1/13	6/1/13
Cadmium	--			--	8.45	1.22 U	--	--	15.1	3.81	--	6.05	4.63	--	--	--	1.31 U	--	--
Cobalt	1170	358	43.1	20.6	1380	29	6.49	3.43	3530	661	954	2090	90.5	327	9.2	12.8	84.5	23.8	4.32
Manganese	2570	988	158	237	1480	62.4	--	--	3150	726	906	3910	177	--	72.7	99	1650	211	--
Nickel	924	719	45.1	5.98	1080	17.4	--		205	101	--	1400	19.2	--	6.34	9.32	21.4	5.9	--

	SS-17A			SS-17B			SS-17C			SS-17E	SS-18			SS-18A			SS-18B		
	SS-17A	SS-17A	SS-17A	SS-17B	SS-17B	SS-17B	SS-17C	SS-17C	SS-17C	SS-17E	SS-18	SS-18	SS-18	SS-18A	SS-18A	SS-18A	SS-18B	SS-18B	SS-18B
	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	0-1'	2-3'	4-5'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'
Analytes of Interest	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/4/13	6/1/13	6/1/13	6/1/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.05	--	--
Cobalt	795	46.1	52.9	176	18.8	30.7	94.2	43.1	21.9	193	990	14	150	210	8.52	66.5	381	31.5	268
Manganese	948	69.6	--	1280	375	--	109	--	--	335	950	51.1	--	1420	44.5	--	370	63.7	--
Nickel	100	--	--	20	--	--	31.2	--	--	--	75.3	6.29	--	28.4	--	--	16.3	--	--

	SS-18C	SS-22			SS-22A			SS-22B			SS-24			SS-24A	SS-24B	SS-25		
	SS-18C	SS-22	SS-22	SS-22	SS-22A	SS-22A	SS-22A	SS-22B	SS-22B	SS-22B	SS-24	SS-24	SS-24	SS-24A	SS-24B	SS-25	SS-25	SS-25
	1-2'	0-1'	2-3'	3-4'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	1-2'	0-1'	2-3'	5-6'
Analytes of Interest	6/2/13	6/1/13	6/1/13	6/1/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	11/22/14	11/22/14	11/22/14	6/1/13	6/1/13	5/31/13	5/31/13	5/31/13
Cadmium	--	--	--	--	--	--	--	--	--	--	2.67	--	--	--	--	--	--	--
Cobalt	4.82	134	35.2	17.4	1430	384	462	138	98.8	161	499	517	616	149	112	97.4	18.4	5.01
Manganese	84.1	678	502	348	2130	186	--	747	560	650	--	--	--	608	508	267	91.9	--
Nickel	--	27.8	--	--	156	58.4	--	15.6	--	--	--	--	--	24	16.6	33.4	4	--

All results expressed in mg/kg -- Sample not analyzed for the noted analyte. U Indicates that the analyte was not detected above the noted detection limit.

Table 2

Soil Analytical Results
Outside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-25A			SS-25B			SS-25C			SS-25D	SS-25E	SS-25F	SS-25G		SS-26		SS-26A		
	SS-25A	SS-25A	SS-25A	SS-25B	SS-25B	SS-25B	SS-25C	SS-25C	SS-25C	SS-25D	SS-25E	SS-25F	SS-25G	SS-25G	SS-26	SS-26	SS-26A	SS-26A	SS-26A
	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	1-2'	1-2'	1-2'	0-1'	1-2'	0-1'	2-3'	0-1'	1-2'	2-3'
Analytes of Interest	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/3/13	6/1/13	6/1/13	5/31/13	5/31/13	6/1/13	6/1/13	6/1/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	15.9	90.6	126	27.7	34	10.9	75.7	49.3	23	90.1	195	32	88.4	72.9	499	2.49 U	1590	149	78
Manganese	94	--	--	144	--	--	407	--	--	--	--	--	--	--	137	3.74 U	2650	606	376
Nickel	8.86	--	--	9.09	--	--	5.9	--	--	--	--	--	--	--	372	2.49 U	425	24.7	--

	SS-26B			SS-26C	SS-26D		SS-26E	SS-26F		SS-27	SS-27A	SS-27B	SS-27C	SS-27D	SS-27E	SS-27F	SS-27G	SS-27H
	SS-26B	SS-26B	SS-26B	SS-26C	SS-26D	SS-26D	SS-26E	SS-26F	SS-26F	SS-27	SS-27A	SS-27B	SS-27C	SS-27D	SS-27E	SS-27F	SS-27G	SS-27H
	0-1'	1-2'	2-3'	1-2'	0-1'	1-2'	1-2'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	1-2'	0-1'	0-0.5'
Analytes of Interest	5/31/13	5/31/13	5/31/13	6/1/13	5/31/13	5/31/13	6/3/13	6/1/13	6/1/13	6/1/13	6/1/13	6/1/13	6/1/13	6/1/13	6/1/13	6/4/13	6/1/13	6/1/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	246	49.5	15.2	29.1	11.8	3.25	35.6	804	160	120	46.1	34	2470	251	394	25.6	192	347
Manganese	427	342	--	102	129	--	42.5	--	--	724	153	206	1150	471	459	--	373	--
Nickel	8.54	--	--	6.61	--	--	5.1	--	--	24.9	14.9	9.56	698	51.7	55.9	--	--	--

	SS-28							SS-28A			SS-28B		SS-28C	SS-28D	SS-31		
	SS-28	DUP-9	SS-28	DUP-10	SS-28	DUP-11	SS-28	SS-28A	SS-28A	SS-28A	SS-28B	SS-28B	SS-28C	SS-28D	SS-31	DUP-12	SS-31
	0-1'	0-1'	2-3'	2-3'	5-6'	5-6'	8-9'	0-1'	1-2'	2-3'	0-1'	1-2'	1-2'	1-2'	0-1'	0-1'	1-2'
Analytes of Interest	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/1/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13	6/3/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	171	223	6.64	5.78	6.34	3.74	2.17 U	2170	142	104	11.4	5.58	4.42	2.33 U	145	147	32.3
Manganese	245	323	57.7	142	--	34.4	--	2060	156	--	60.2	--	76.5	--	46.8	47.2	--
Nickel	17.5	17.5	3.65	5.32	--	3.74	--	97	--	--	7.92	--	--	--	5.47	4.66	--

	SS-31A			SS-31B		SS-31C	SS-31D	SS-31E	SS-32				SS-32A			SS-33			SS-33A
	SS-31A	SS-31A	SS-31A	SS-31B	SS-31B	SS-31C	SS-31D	SS-31E	SS-32	DUP-6	SS-32	SS-32	SS-32A	SS-32A	SS-32A	SS-33	DUP-5	SS-33	SS-33A
	0-1'	1-2'	2-3'	0-1'	1-2'	1-2'	1-2'	1-2'	0-1'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	1-2'
Analytes of Interest	6/3/13	6/3/13	6/3/13	6/2/13	6/2/13	6/4/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	17.3	8.2	2.18 U	35	2.30 U	63.5	2.26 U	10.8	24.2	29	28.6	2.26 U	207	85.5	14.9	57.2	52.5	3.46	2.17 U
Manganese	45.8	--	--	147	--	--	--	--	164	209	--	--	--	--	--	277	225	--	--
Nickel	4.36	--	--	20.3	--	--	--	--	6.34	4.27	--	--	--	--	--	7.08	6.03	--	--

All results expressed in mg/kg -- Sample not analyzed for the noted analyte. U Indicates that the analyte was not detected above the noted detection limit.

Table 2

Soil Analytical Results
Outside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-33B	SS-33C	SS-34				SS-35				SS-35A	SS-36			SS-37			
	SS-33B	SS-33C	SS-34	DUP-8	SS-34	SS-34	SS-35	DUP-7	SS-35	SS-35	SS-35A	SS-36	SS-36	SS-36	SS-37	DUP-3	SS-37	SS-37
	1-2'	1-2'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'	1-2'	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'
Analytes of Interest	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	19.4	5.89	22.4	26.8	13.6	10.9	604	356	140	67.9	73.9	99.4	93.7	52.4	183	315	260	184
Manganese	--	--	36.1	63.1	--	--	1330	546	383	--	394	75.7	--	--	427	660	290	--
Nickel	--	--	116	194	--	--	66.6	67.1	--	--	--	36.3	--	--	20.6	27.7	--	--

	SS-38			SS-39				SS-41			SS-42A		SS-42C		SS-42D			SS-42E
	SS-38	SS-38	SS-38	SS-39	DUP-4	SS-39	SS-39	SS-41	SS-41	SS-41	SS-42A	SS-42A	SS-42C	SS-42C	SS-42D	DUP-13	SS-42D	SS-42E
	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'
Analytes of Interest	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/2/13	6/1/13	6/1/13	6/1/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	9/17/13	9/16/13	9/16/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	588	406	230	573	529	177	233	12.3	156	70.7	347	4.36	34.4	4.27	331	255	2.17 U	2.85
Manganese	1200	530	321	960	900	122	--	45.1	--	--	--	--	--	--	64.1	54.4	--	--
Nickel	65.1	--	--	38.2	28.7	--	--	3.91	--	--	--	--	--	--	20.1	17.5	--	--

	SS-42F			SS-43			SS-43A			SS-43B		SS-43C		SS-43D		SS-44		
	SS-42F	SS-42F	SS-42F	SS-43	SS-43	SS-43	SS-43A	SS-43A	SS-43A	SS-43B	SS-43B	SS-43C	SS-43C	SS-43D	SS-43D	SS-44	SS-44	SS-44
	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	2-3'
Analytes of Interest	9/17/13	9/17/13	9/17/13	5/31/13	5/31/13	5/31/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	9/16/13	5/31/13	5/31/13	5/31/13
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	34	6.59	4.67	493	47.4	2.68	3.52	38.3	3.64	6.45	2.98	3.32	2.14 U	19.9	2.20 U	9.6	50.3	13.8
Manganese	97.5	--	--	616	92.2	--	74.7	64	--	136	53.4	70.5	24.4	111	--	187	338	--
Nickel	6.36	--	--	551	39.9	--	6.7	49.9	--	12.5	5.5	7.07	2.76	26.1	--	19.3	30.7	--

	SS-44A			SS-44B		SS-44C		SS-44D				SS-44E	SS-44F	SS-44G	SS-45		SS-45A	SS-45B
	SS-44A	SS-44A	SS-44A	SS-44B	SS-44B	SS-44C	SS-44C	SS-44D	SS-44D	SS-44D	DUP-16	SS-44E	SS-44F	SS-44G	SS-45	SS-45	SS-45A	SS-45B
	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	2-3'	2-3'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'
Analytes of Interest	5/31/13	5/31/13	5/31/13	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	5/31/13	5/31/13	11/23/14	11/23/14
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	422	46.6	27.5	356	5.97	294	25.8	368	52.5	9.04	14	7.26	77.2	235	986	109	97.7	4.99
Manganese	953	98.7	--	--	--	--	--	--	--	--	--	--	--	--	1110	63.8	--	--
Nickel	579	50.2	--	295	--	418	--	355	--	11.4	13.8	--	--	--	611	70.3	58.1	6.24

All results expressed in mg/kg -- Sample not analyzed for the noted analyte. U Indicates that the analyte was not detected above the noted detection limit.

Table 2

Soil Analytical Results
Outside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-45C		SS-45E	SS-57		SS-58			SS-59		SS-59A	SS-60			SS-60A	SS-60B	SS-61		SS-61A
	SS-45C	SS-45C	SS-45E	SS-57	SS-57	SS-58	SS-58	SS-58	SS-59	SS-59	SS-59A	SS-60	DUP-17	SS-60	SS-60A	SS-60B	SS-61	SS-61	SS-61A
	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	1-2'	2-2.25'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'
Analytes of Interest	11/23/14	11/23/14	11/23/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	619	70.1	41.5	414	24	4260	297	10.1	811	44.9	110	316	329	100	2.97	23.1	576	47.2	52.6
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	568	49.3	22.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	SS-62	SS-63	SS-63A	SS-64	SS-65	SS-66		SS-67	SS-68	SS-69		SS-69A		SS-70	SS-71	SS-72	SS-73
	SS-62	SS-63	SS-63A	SS-64	SS-65	SS-66	SS-66	SS-67	SS-68	SS-69	SS-69	SS-69A	SS-69A	SS-70	SS-71	SS-72	SS-73
	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'
Analytes of Interest	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/24/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14
Cadmium	--	--	--	--	2.24	16.1	1.92	0.982	6.81	26.9	2.70 U	20.4	2.37	1.09	2.05	--	--
Cobalt	16.6	115	22.6	105	53.9	125	--	28.7	27	469	21.7	70.8	--	122	73.6	8.9	78.2
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	SS-74						SS-75				SS-76	SS-78	SS-79	SS-80	SS-82	SS-87			SS-87A
	SS-74	SS-74	DUP-15	SS-74	SS-74	SS-74	SS-75	SS-75	SS-75	SS-75	SS-76	SS-78	SS-79	SS-80	SS-82	SS-87	SS-87	SS-87	SS-87A
	0-1'	1-2'	1-2'	2-3'	3-4'	4-5'	0-1'	1-2'	2-3'	3-4'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	2-3'	0-1'
Analytes of Interest	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/21/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14
Cadmium	3.6	16.7	14.1	14.2	8.04	0.601 U	32	10.7	2.46	3.27	1.17 U	1.35 U	1.34 U	6.55 U	1.29 U	--	--	--	--
Cobalt	675	890	624	652	231	--	6650	1130	325	157	19.4	7.92	11.8	14.1	7.22	1360	329	204	169
Manganese	987	--	803	--	--	--	6990	2330	--	--	115	--	274	221	159	--	--	--	--
Nickel	298	--	204	--	--	--	2920	766	81.7	127	16.4	--	6.06	13.1 U	4.17	--	--	--	--

	SS-88			SS-88A	SS-89		SS-90		SS-90A		SS-91			SS-92	SS-93	SS-94	SS-95	
	SS-88	SS-88	SS-88	SS-88A	SS-89	SS-89	SS-90	SS-90	SS-90A	SS-90A	SS-91	SS-91	SS-91	SS-92	SS-93	SS-94	SS-95	SS-95
	0-1'	1-2'	2-3'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	0-1'	0-1'	0-1'	1-2'
Analytes of Interest	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	568	263	45.7	173	1310	213	1740	146	519	126	379	280	241	445	181	28.6	696	174
Manganese	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

All results expressed in mg/kg -- Sample not analyzed for the noted analyte. U Indicates that the analyte was not detected above the noted detection limit.

Table 2

Soil Analytical Results
Outside Fenceline
Umicore CSM NA Facility, Arab, Alabama

	SS-95A		SS-95B	SS-96		SS-96A	SS-97			SS-98	SS-99	SS-100		SS-100A		SS-101	SS-102		SS-102A
	SS-95A	SS-95A	SS-95B	SS-96	SS-96	SS-96A	SS-97	DUP-14	SS-97	SS-98	SS-99	SS-100	SS-100	SS-100A	SS-100A	SS-101	SS-102	SS-102	SS-102A
	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	1-2'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'
Analytes of Interest	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	1300	74.9	244	401	138	116	184	360	21.2	71	52.3	797	9.28	274	3.49	49.5	270	7.57	75.7
Manganese	--	--	--	--	--	--	106	165	--	87.3	53.9	928	--	--	--	112	--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	SS-103	SS-104		SS-104A			SS-105		SS-105A	SS-106		SS-107	SS-108		SS-108A		SS-109	SS-110	SS-111
	SS-103	SS-104	SS-104	SS-104A	SS-104A	SS-104A	SS-105	SS-105	SS-105A	SS-106	SS-106	SS-107	SS-108	SS-108	SS-108A	SS-108A	SS-109	SS-110	SS-111
	0-1'	0-1'	1-2'	0-1'	1-2'	2-3'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	0-1'	1-2'	0-1'	1-1.5'	0-1'	0-1'	0-1'
Analytes of Interest	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	1/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14	11/20/14
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cobalt	99.3	791	120	1010	340	488	271	129	143	754	311	221	1380	247	1750	293	220	193	145
Manganese	--	--	--	--	--	--	--	--	--	1540	--	1390	1520	--	--		--	--	--
Nickel	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

	SS-112		SS-113	SS-114		SS-114A	SS-114B	SS-115	SS-116			SS-116A	SS-116B	SS-116C	SS-117	SS-121		SS-121A/SS-42A	SS-122/SS-42C
	SS-112	SS-112	SS-113	SS-114	SS-114	SS-114A	SS-114B	SS-115	SS-116	SS-116	SS-116	SS-116A	SS-116B	SS-116C	SS-117	SS-121	SS-121	SS-121A/SS-42A	SS-122/SS-42C
	0-1'	1-1.5'	0-1'	0-1'	1-1.5'	0-1'	0-1'	0-1'	0-1'	1-2'	2-3'	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'
Analytes of Interest	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/22/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	11/23/14	5/19/15	5/19/15	5/19/15	5/19/15
Cadmium	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	8.25	1.55	1.87	4.74
Cobalt	458	560	33.4	496	453	8.56	26.6	84.1	148	--	--	--	--	--	149	79.9	--	20.9	90
Manganese	--	--	--	--	--	--	--	--	4010	4450	110	217	1080	641	210	216	--	126	147
Nickel	--	--	--	--	--	--	--	--	17.6	--	--	--	--	--	44.3	69.3	--	13.6	54.4

	SS-123/SS-42D	SS-123A/SS-43B	SS-123B/SS-42F	SS-124			SS-124A	SS-124B	SS-125	SS-126		SS-127	SS-128	SS-129	SS-130	SS-131	SS-132
	SS-123/SS-42D	SS-123A/SS-43B	SS-123B/SS-42F	SS-124	DUP-19	SS-124	SS-124A	SS-124B	SS-125	SS-126	DUP-18	SS-127	SS-128	SS-129	SS-130	SS-131	SS-132
	0-1'	0-1'	0-1'	0-1'	0-1'	1-2'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'	0-1'
Analytes of Interest	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/19/15	5/18/15	5/18/15
Cadmium	2.88	1.13 U	1.12 U	1.4	13.7	1.14 U	1.06 U	1.10 U	1.15 U	1.11 U	1.08 U	1.21 U	1.21 U	1.19 U	1.26 U	1.26 U	1.34 U
Cobalt	149	10.3	11.6	76.5	764	6.44	5.19	21.5	6.52	6.5	16.3	32.7	12.8	26.9	15.8	6.24	20.6
Manganese	162	92.5	93.4	87.8	1140	--	--	--	42.3	31.1	60	41.7	11.5	57.5	106	247	266
Nickel	161	8.19	7.43	63	184	--	--	--	6.4	7.73	14.4	38	8.65	23.6	12.8	5.82	16.8

All results expressed in mg/kg -- Sample not analyzed for the noted analyte. U Indicates that the analyte was not detected above the noted detection limit.

Table 3

Selected Statistical Summary and Identification of COPCs for Soil Inside the Fenceline Umicore CSM NA Facility, Arab, Alabama

Analytes of Interest	Frequency of Detection	Mean Concentration (mg/kg)	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Industrial RSL (mg/kg)	Identified as COPC? Y / N
Surface Soil (0-1 foot bls)						
Cadmium	13 of 14	23	97	35	980	No
Cobalt	17 of 17	394	1740	844	350	Yes
Manganese	10 of 10	198	338	261	26000	No
Nickel	10 of 10	170	500	282	22000	No
Subsurface Soil						
Cadmium	18 of 22	34	287	86	980	No
Cobalt	22 of 23	115	763	272	350	No
Manganese	12 of 12	188	338	240	26000	No
Nickel	12 of 12	147	500	344	22000	No

All statistics were developed following the ProUCL-recommended identification and removal of outlier values. Additional information on outliers, including comparable statistics with outliers included, is presented in the uncertainties section and on Table D-1 in Attachment D.

Industrial RSL is the USEPA (2015a) default regional screening level for industrial land use.

Table 4

Selected Statistical Summary and Identification of COPCs for Soil Outside the Fenceline Umicore CSM NA Facility, Arab, Alabama

Analytes of Interest	Frequency of Detection	Mean Concentration (mg/kg)	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Industrial RSL (mg/kg)	Identified as COPC? Y / N
Surface Soil (0-1 foot bls)						
Cadmium	25 of 44	6.8	20.4	5.6	980	No
Cobalt	175 of 175	297	1750	422	350	Yes
Manganese	101 of 101	534	2650	791	26000	No
Nickel	93 of 94	99	698	171	22000	No
Subsurface Soil						
Cadmium	40 of 65	6.6	20.4	6.2	980	No
Cobalt	337 of 349	205	1430	293	350	No
Manganese	161 of 162	449	2650	628	26000	No
Nickel	131 of 133	93	766	154	22000	No

All statistics were developed following the ProUCL-recommended identification and removal of outlier values. Additional information on outliers, including comparable statistics with outliers included, is presented in the uncertainties section and on Table D-2 in Attachment D.

Industrial RSL is the USEPA (2015a) default regional screening level for industrial land use.

Table 5

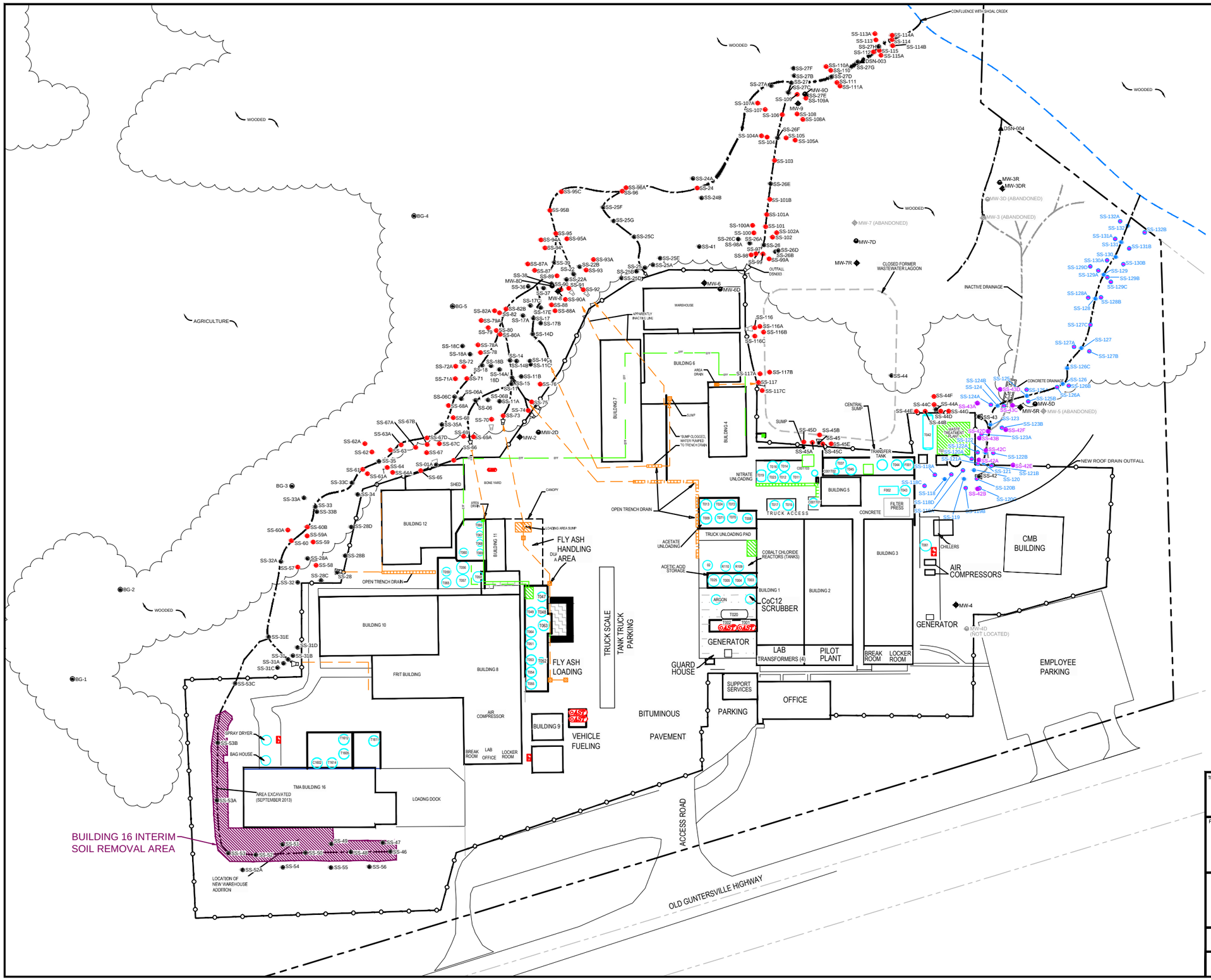
Potentially Applicable RBTLs for Cobalt in Surface Soil
Umicore CMV NA Facility, Arab, Alabama

COPC	Frequency of Detection	Maximum Detected Concentration (mg/kg)	Mean Detected Concentration (mg/kg)	EPC 95% UCL Concentration (mg/kg)	Default Industrial RSL (EPA) (mg/kg)	Adolescent Trespasser RBTL (mg/kg)	Adult Trespasser RBTL (mg/kg)	Adult Maintenance RBTL (mg/kg)	Adult Construction RBTL (mg/kg)
Inside the Fenceline Statistics									
Cobalt (0-1 ft bls)	17 of 17	1740	394	844	350	**NA**	**NA**	1014	538
Outside the Fenceline Statistics									
Cobalt (0-1 ft bls)	175 of 175	1750	297	422	**NA**	487	763	1014	538

NA Not Applicable. As detailed in the letter report, the trespasser scenarios are not applicable to the area inside the security fence, and the default industrial RSL is not applicable to the area outside the security fence.

ATTACHMENT B

Figures



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- UMICORE SURFACE WATER OUTFALL SAMPLE LOCATION
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- ABANDONED MONITORING WELL (SHALLOW)
- MONITORING WELL NOT LOCATED (DEEP)
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (MAY 2015)
- PROVISIONAL SOIL SAMPLE LOCATIONS (MAY 2015)

NOTES:

1. MONITORING WELL AND SOIL BORINGS LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
SOIL SAMPLE LOCATIONS (2014-2015)

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 3–2–16	REVISION NO. 0
JOB NO. UMI–001	FIGURE NO. 1

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PAR_Cleanup Plan\Figures\January 2016 Figures\dwg, FIG 1 2014-2015 SB LOC MAP, 3/4/2016 2:45:04 PM, zbarlow

Figure 2

RBTLs Based on Direct Exposure to Cobalt in Surface Soil

$$\mathrm{RBTL}_{SS} = \frac{THQ \times BW \times AT}{EF \times ED \times \left[\frac{CF \times \left(IRS \times RAF_o + SA \times M \times RAF_d \right)}{RfD_o} + \frac{IR_{ao} \times VF_p}{RfD_i} \right]}$$

Exposure Parameter	Description	Scenario-/Chemical-Specific Values			
		Adolescent Trespasser Scenario	Adult Trespasser Scenario	Adult Maintenance Worker	Adult Construction Worker
$RBTL_{ss}$	Risk-Based Target Level for cobalt in surface soil expressed in mg/kg, based on noncarcinogenic effects.	**487**	**763**	**1014**	**538**
THQ	Baseline Target Risk (or Target Hazard Quotient; THQ) for noncarcinogens (dimensionless).	1.0	1.0	1.0	1.0
BW	Body Weight expressed in kg (ADEM, 2008).	45	70	70	70
AT	Averaging Time for noncarcinogens (period over which exposure is averaged) expressed in days.	3,650	10,950	9,125	120
EF	Exposure Frequency expressed in days/yr.	100	100	50	80
ED	Exposure Duration expressed in years.	10	30	25	0.33
CF	Conversion Factor expressed in kg/mg.	1.0E-06	1.0E-06	1.0E-06	1.0E-06
IRS	Oral Ingestion Rate for soil expressed in mg/day.	100	100	150	177
RAF_o	Oral Relative Absorption Factor (unitless; ADEM, 2008).	1.0	1.0	1.0	1.0
SA	Skin Surface Area available for daily contact expressed in cm^2 (ADEM, 2008).	5,700	5,700	5,700	5,700
M	Soil-to-skin Adherence Factor expressed in mg/cm^2 (ADEM, 2008).	0.20	0.07	0.20	0.20
RAF_d (inorganics)	Dermal Absorption factor for inorganics (dimensionless; ADEM, 2008).	0.001	0.001	0.001	0.001
RfD_o	Reference Dose (oral) for cobalt expressed in mg/kg/day.	3.0E-04	3.0E-04	3.0E-04	3.0E-04
IR_{ao}	Outdoor Air Inhalation Rate (m^3/day; assumed 1 hour ET for trespassers, 4 hours ET for maintenance and 8 hours ET for construction).	1.5	0.833	6	12
VF_p	Volatilization Factor of Particulates expressed in [(mg/m^3-air)/(mg/kg-soil)] (ADEM, 2008).	6.90E-12	6.90E-12	6.90E-12	6.90E-12
RfD_i	Reference Dose (inhalation) for cobalt expressed in mg/kg/day.	8.40E-03	8.40E-03	8.40E-03	8.40E-03

Adapted from ADEM, 2008; Alabama Risk-Based Corrective Action Guidance Manual.
Shading represents potentially applicable RBTLs.

ATTACHMENT C

ProUCL Output File

	Page
Cadmium - Surface Soil Inside Fenceline	2
Cobalt - Surface Soil Inside Fenceline	5
Manganese - Surface Soil Inside Fenceline	8
Nickel - Surface Soil Inside Fenceline	11
Cadmium - Subsurface Soil Inside Fenceline	14
Cobalt - Subsurface Soil Inside Fenceline	17
Manganese - Subsurface Soil Inside Fenceline	21
Nickel - Subsurface Soil Inside Fenceline	24
Cadmium - Surface Soil Outside Fenceline	27
Cobalt - Surface Soil Outside Fenceline	31
Manganese - Surface Soil Outside Fenceline	38
Nickel - Surface Soil Outside Fenceline	44
Cadmium - Subsurface Soil Outside Fenceline	50
Cobalt - Subsurface Soil Outside Fenceline	54
Manganese - Subsurface Soil Outside Fenceline	62
Nickel - Subsurface Soil Outside Fenceline	67

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 12:10:45 PM
From File	UCL data 0to1_d.xls
Full Precision	OFF

Dixon's Outlier Test for Cadmium Surface Soil Inside Fence

Total N = 15
Number NDs = 1
Number Detects = 14
Number Data (n) = 15
10% critical value: 0.472
5% critical value: 0.525
1% critical value: 0.616
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 287 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.825

For 10% significance level, 287 is an outlier.
For 5% significance level, 287 is an outlier.
For 1% significance level, 287 is an outlier.

2. Data Value 0.54 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.040

For 10% significance level, 0.54 is not an outlier.
For 5% significance level, 0.54 is not an outlier.
For 1% significance level, 0.54 is not an outlier.

Test Rerun After Removal of 1 Outlier

Total N = 14
Number NDs = 1
Number Detects = 13
Number Data (n) = 14
10% critical value: 0.492
5% critical value: 0.546
1% critical value: 0.641
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 97 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.589

For 10% significance level, 97 is an outlier.
For 5% significance level, 97 is an outlier.
For 1% significance level, 97 is not an outlier.

2. Data Value 0.54 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.051

For 10% significance level, 0.54 is not an outlier.
For 5% significance level, 0.54 is not an outlier.
For 1% significance level, 0.54 is not an outlier.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 12:20:00 PM
From File	UCL data 0to1_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium Surface Inside Fence

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
Number of Detects	13	Number of Non-Detects	1
Number of Distinct Detects	13	Number of Distinct Non-Detects	1
Minimum Detect	1.22	Minimum Non-Detect	1.08
Maximum Detect	97	Maximum Non-Detect	1.08
Variance Detects	772.2	Percent Non-Detects	7.143%
Mean Detects	23.19	SD Detects	27.79
Median Detects	11.5	CV Detects	1.198
Skewness Detects	1.788	Kurtosis Detects	3.344
Mean of Logged Detects	2.426	SD of Logged Detects	1.331

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.781	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.235	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	21.61	Standard Error of Mean	7.33
SD	26.35	95% KM (BCA) UCL	35.18
95% KM (t) UCL	34.59	95% KM (Percentile Bootstrap) UCL	33.26
95% KM (z) UCL	33.67	95% KM Bootstrap t UCL	43.5
90% KM Chebyshev UCL	43.6	95% KM Chebyshev UCL	53.56
97.5% KM Chebyshev UCL	67.39	99% KM Chebyshev UCL	94.54

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.34	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.767	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.179	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.245	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.824	k star (bias corrected MLE)	0.685
Theta hat (MLE)	28.16	Theta star (bias corrected MLE)	33.86
nu hat (MLE)	21.42	nu star (bias corrected)	17.81
MLE Mean (bias corrected)	23.19	MLE Sd (bias corrected)	28.02

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.673	nu hat (KM)	18.83
Approximate Chi Square Value (18.83, α)	9.997	Adjusted Chi Square Value (18.83, β)	9.153
95% Gamma Approximate KM-UCL (use when n>=50)	40.72	95% Gamma Adjusted KM-UCL (use when n<50)	44.47

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	21.54
Maximum	97	Median	10.1
SD	27.41	CV	1.273
k hat (MLE)	0.547	k star (bias corrected MLE)	0.477
Theta hat (MLE)	39.39	Theta star (bias corrected MLE)	45.13
nu hat (MLE)	15.31	nu star (bias corrected)	13.36
MLE Mean (bias corrected)	21.54	MLE Sd (bias corrected)	31.17
		Adjusted Level of Significance (β)	0.0312
Approximate Chi Square Value (13.36, α)	6.137	Adjusted Chi Square Value (13.36, β)	5.499
95% Gamma Approximate UCL (use when n>=50)	46.89	95% Gamma Adjusted UCL (use when n<50)	52.32

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.866	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.161	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.246	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	21.56	Mean in Log Scale	2.192
SD in Original Scale	27.38	SD in Log Scale	1.55
95% t UCL (assumes normality of ROS data)	34.53	95% Percentile Bootstrap UCL	34.26
95% BCA Bootstrap UCL	36.81	95% Bootstrap t UCL	43.6
95% H-UCL (Log ROS)	151.7		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.258	95% H-UCL (KM -Log)	91.28
KM SD (logged)	1.373	95% Critical H Value (KM-Log)	3.45
KM Standard Error of Mean (logged)	0.382		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	21.57	Mean in Log Scale	2.209
SD in Original Scale	27.38	SD in Log Scale	1.515
95% t UCL (Assumes normality)	34.53	95% H-Stat UCL	137

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	34.59	95% KM (Percentile Bootstrap) UCL	33.26

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	2/25/2016 12:12:49 PM
From File	UCL data 0to1_e.xls
Full Precision	OFF

Dixon's Outlier Test for Cobalt Surface Soil Inside Fence

Number of Observations = 17
10% critical value: 0.438
5% critical value: 0.49
1% critical value: 0.577

1. Observation Value 1740 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.472

For 10% significance level, 1740 is an outlier.
For 5% significance level, 1740 is not an outlier.
For 1% significance level, 1740 is not an outlier.

2. Observation Value 10.8 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.009

For 10% significance level, 10.8 is not an outlier.
For 5% significance level, 10.8 is not an outlier.
For 1% significance level, 10.8 is not an outlier.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 12:20:43 PM
From File	UCL data 0to1_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cobalt Surface Inside Fence

General Statistics

Total Number of Observations	17	Number of Distinct Observations	17
		Number of Missing Observations	0
Minimum	10.8	Mean	394.3
Maximum	1740	Median	133
SD	570.3	Std. Error of Mean	138.3
Coefficient of Variation	1.446	Skewness	1.761

Normal GOF Test

Shapiro Wilk Test Statistic	0.696	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.263	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.215	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	635.7	95% Adjusted-CLT UCL (Chen-1995)	684.9
		95% Modified-t UCL (Johnson-1978)	645.6

Gamma GOF Test

A-D Test Statistic	0.593	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.794	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.165	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.22	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.541	k star (bias corrected MLE)	0.485
Theta hat (MLE)	728.4	Theta star (bias corrected MLE)	812.9
nu hat (MLE)	18.4	nu star (bias corrected)	16.49
MLE Mean (bias corrected)	394.3	MLE Sd (bias corrected)	566.1
		Approximate Chi Square Value (0.05)	8.308
Adjusted Level of Significance	0.0346	Adjusted Chi Square Value	7.705

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	782.5	95% Adjusted Gamma UCL (use when n<50)	843.7

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.932	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.892	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.163	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.215	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.38	Mean of logged Data	4.818
Maximum of Logged Data	7.462	SD of logged Data	1.713

Assuming Lognormal Distribution

95% H-UCL	2809	90% Chebyshev (MVUE) UCL	1112
95% Chebyshev (MVUE) UCL	1412	97.5% Chebyshev (MVUE) UCL	1828
99% Chebyshev (MVUE) UCL	2646		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	621.8	95% Jackknife UCL	635.7
95% Standard Bootstrap UCL	613.5	95% Bootstrap-t UCL	816.6
95% Hall's Bootstrap UCL	760.3	95% Percentile Bootstrap UCL	632.3
95% BCA Bootstrap UCL	662.4		
90% Chebyshev(Mean, Sd) UCL	809.2	95% Chebyshev(Mean, Sd) UCL	997.1
97.5% Chebyshev(Mean, Sd) UCL	1258	99% Chebyshev(Mean, Sd) UCL	1770

Suggested UCL to Use

95% Adjusted Gamma UCL	843.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	2/25/2016 12:13:48 PM
From File	UCL data 0to1_f.xls
Full Precision	OFF

Dixon's Outlier Test for Manganese Surface Soil Inside Fence

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

1. Observation Value 338 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.048

For 10% significance level, 338 is not an outlier.
For 5% significance level, 338 is not an outlier.
For 1% significance level, 338 is not an outlier.

2. Observation Value 60.3 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.032

For 10% significance level, 60.3 is not an outlier.
For 5% significance level, 60.3 is not an outlier.
For 1% significance level, 60.3 is not an outlier.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 12:21:57 PM
From File	UCL data 0to1_f.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Manganese Surface Inside Fence

General Statistics

Total Number of Observations	10	Number of Distinct Observations	10
		Number of Missing Observations	0
Minimum	60.3	Mean	197.8
Maximum	338	Median	179.5
SD	109.3	Std. Error of Mean	34.55
Coefficient of Variation	0.552	Skewness	0.0834

Normal GOF Test

Shapiro Wilk Test Statistic	0.893	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.17	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	261.1	95% Adjusted-CLT UCL (Chen-1995)	255.6
		95% Modified-t UCL (Johnson-1978)	261.3

Gamma GOF Test

A-D Test Statistic	0.436	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.732	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.172	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.268	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.064	k star (bias corrected MLE)	2.212
Theta hat (MLE)	64.56	Theta star (bias corrected MLE)	89.45
nu hat (MLE)	61.28	nu star (bias corrected)	44.23
MLE Mean (bias corrected)	197.8	MLE Sd (bias corrected)	133
		Approximate Chi Square Value (0.05)	29.98
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	27.95

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	291.9	95% Adjusted Gamma UCL (use when n<50)	313

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.166	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.099	Mean of logged Data	5.115
Maximum of Logged Data	5.823	SD of logged Data	0.656

Assuming Lognormal Distribution

95% H-UCL	353.7	90% Chebyshev (MVUE) UCL	330.5
95% Chebyshev (MVUE) UCL	388.9	97.5% Chebyshev (MVUE) UCL	470
99% Chebyshev (MVUE) UCL	629.3		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	254.6	95% Jackknife UCL	261.1
95% Standard Bootstrap UCL	251	95% Bootstrap-t UCL	260.6
95% Hall's Bootstrap UCL	248	95% Percentile Bootstrap UCL	251.5
95% BCA Bootstrap UCL	249.3		
90% Chebyshev(Mean, Sd) UCL	301.5	95% Chebyshev(Mean, Sd) UCL	348.4
97.5% Chebyshev(Mean, Sd) UCL	413.6	99% Chebyshev(Mean, Sd) UCL	541.6

Suggested UCL to Use

95% Student's-t UCL	261.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	2/25/2016 12:14:29 PM
From File	UCL data 0to1_g.xls
Full Precision	OFF

Dixon's Outlier Test for Nickel Surface Soil Inside Fence

Number of Observations = 10
10% critical value: 0.409
5% critical value: 0.477
1% critical value: 0.597

1. Observation Value 500 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.019

For 10% significance level, 500 is not an outlier.
For 5% significance level, 500 is not an outlier.
For 1% significance level, 500 is not an outlier.

2. Observation Value 15.4 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.000

For 10% significance level, 15.4 is not an outlier.
For 5% significance level, 15.4 is not an outlier.
For 1% significance level, 15.4 is not an outlier.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 12:22:54 PM
From File	UCL data 0to1_g.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Nickel Surface Inside Fence

General Statistics

Total Number of Observations	10	Number of Distinct Observations	9
		Number of Missing Observations	0
Minimum	15.4	Mean	170.2
Maximum	500	Median	84.2
SD	193.2	Std. Error of Mean	61.11
Coefficient of Variation	1.135	Skewness	1.084

Normal GOF Test

Shapiro Wilk Test Statistic	0.783	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Normal at 5% Significance Level

Data appear Approximate Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	282.2	95% Adjusted-CLT UCL (Chen-1995)	293.1
		95% Modified-t UCL (Johnson-1978)	285.7

Gamma GOF Test

A-D Test Statistic	0.482	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.756	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.182	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.276	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.785	k star (bias corrected MLE)	0.616
Theta hat (MLE)	216.9	Theta star (bias corrected MLE)	276.3
nu hat (MLE)	15.7	nu star (bias corrected)	12.32
MLE Mean (bias corrected)	170.2	MLE Sd (bias corrected)	216.8
		Approximate Chi Square Value (0.05)	5.44
Adjusted Level of Significance	0.0267	Adjusted Chi Square Value	4.67

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	385.5	95% Adjusted Gamma UCL (use when n<50)	449.1

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.89	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.842	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.162	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.28	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.734	Mean of logged Data	4.379
Maximum of Logged Data	6.215	SD of logged Data	1.4

Assuming Lognormal Distribution

95% H-UCL	1358	90% Chebyshev (MVUE) UCL	436.1
95% Chebyshev (MVUE) UCL	551.5	97.5% Chebyshev (MVUE) UCL	711.6
99% Chebyshev (MVUE) UCL	1026		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	270.7	95% Jackknife UCL	282.2
95% Standard Bootstrap UCL	266.1	95% Bootstrap-t UCL	351.1
95% Hall's Bootstrap UCL	292.3	95% Percentile Bootstrap UCL	267.7
95% BCA Bootstrap UCL	284.3		
90% Chebyshev(Mean, Sd) UCL	353.5	95% Chebyshev(Mean, Sd) UCL	436.6
97.5% Chebyshev(Mean, Sd) UCL	551.8	99% Chebyshev(Mean, Sd) UCL	778.2

Suggested UCL to Use

95% Student's-t UCL	282.2

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 5:06:18 PM
From File	UCL data combined_d.xls
Full Precision	OFF

Dixon's Outlier Test for Cadmium Subsurface Inside Fence

Total N = 22
Number NDs = 4
Number Detects = 18
Number Data (n) = 22
10% critical value: 0.382
5% critical value: 0.43
1% critical value: 0.514
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 287 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.819

For 10% significance level, 287 is an outlier.
For 5% significance level, 287 is an outlier.
For 1% significance level, 287 is an outlier.

2. Data Value 0.54 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.001

For 10% significance level, 0.54 is not an outlier.
For 5% significance level, 0.54 is not an outlier.
For 1% significance level, 0.54 is not an outlier.

Test Rerun After Removal of 1 Outlier - No additional outliers

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:00:38 PM
From File	UCL data combined_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium Subsurface Inside Fence

General Statistics

Total Number of Observations	22	Number of Distinct Observations	22
Number of Detects	18	Number of Non-Detects	4
Number of Distinct Detects	18	Number of Distinct Non-Detects	4
Minimum Detect	1.22	Minimum Non-Detect	1.08
Maximum Detect	287	Maximum Non-Detect	1.15
Variance Detects	4601	Percent Non-Detects	18.18%
Mean Detects	33.77	SD Detects	67.83
Median Detects	8.39	CV Detects	2.009
Skewness Detects	3.439	Kurtosis Detects	12.76
Mean of Logged Detects	2.378	SD of Logged Detects	1.484

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.511	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.316	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	27.83	Standard Error of Mean	13.37
SD	60.95	95% KM (BCA) UCL	51.45
95% KM (t) UCL	50.83	95% KM (Percentile Bootstrap) UCL	51.49
95% KM (z) UCL	49.82	95% KM Bootstrap t UCL	102
90% KM Chebyshev UCL	67.94	95% KM Chebyshev UCL	86.11
97.5% KM Chebyshev UCL	111.3	99% KM Chebyshev UCL	160.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.983	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.796	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.194	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.214	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.548	k star (bias corrected MLE)	0.494
Theta hat (MLE)	61.57	Theta star (bias corrected MLE)	68.35
nu hat (MLE)	19.75	nu star (bias corrected)	17.79
MLE Mean (bias corrected)	33.77	MLE Sd (bias corrected)	48.04

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.208	nu hat (KM)	9.172
Approximate Chi Square Value (9.17, α)	3.431	Adjusted Chi Square Value (9.17, β)	3.173
95% Gamma Approximate KM-UCL (use when n>=50)	74.38	95% Gamma Adjusted KM-UCL (use when n<50)	80.43

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	27.63
Maximum	287	Median	5.39
SD	62.47	CV	2.261
k hat (MLE)	0.31	k star (bias corrected MLE)	0.298
Theta hat (MLE)	89.07	Theta star (bias corrected MLE)	92.66
nu hat (MLE)	13.65	nu star (bias corrected)	13.12
MLE Mean (bias corrected)	27.63	MLE Sd (bias corrected)	50.6
		Adjusted Level of Significance (β)	0.0386
Approximate Chi Square Value (13.12, α)	5.974	Adjusted Chi Square Value (13.12, β)	5.617
95% Gamma Approximate UCL (use when n>=50)	60.69	95% Gamma Adjusted UCL (use when n<50)	64.55

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.961	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.897	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.131	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.209	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	27.69	Mean in Log Scale	1.755
SD in Original Scale	62.44	SD in Log Scale	1.9
95% t UCL (assumes normality of ROS data)	50.6	95% Percentile Bootstrap UCL	53.42
95% BCA Bootstrap UCL	66.47	95% Bootstrap t UCL	101.4
95% H-UCL (Log ROS)	185.4		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.959	95% H-UCL (KM -Log)	81.28
KM SD (logged)	1.578	95% Critical H Value (KM-Log)	3.469
KM Standard Error of Mean (logged)	0.346		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	27.73	Mean in Log Scale	1.841
SD in Original Scale	62.42	SD in Log Scale	1.772
95% t UCL (Assumes normality)	50.63	95% H-Stat UCL	131.6

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	86.11	95% GROS Adjusted Gamma UCL	64.55
95% Adjusted Gamma KM-UCL	80.43		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 5:07:53 PM
From File	UCL data combined_e.xls
Full Precision	OFF

Rosner's Outlier Test for 5 Outliers in Cobalt Subsurface Inside Fence

Total N	26
Number NDs	1
Number Detects	26
Mean with NDs=DL/2	266.2
SD with NDs=DL/2	490.5
Number of data	26
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	266.2	481	1740	26	3.064	2.84	3.16
2	207.3	395.6	1730	25	3.849	2.82	3.14
3	143.8	241.5	927	24	3.243	2.8	3.11
4	109.8	178.5	763	23	3.659	2.78	3.09
5	80.08	110.2	397	22	2.876	2.76	3.06

For 5% significance level, there are 5 Potential Outliers
1740, 1730, 927, 763, 397

For 1% Significance Level, there are 4 Potential Outliers
1740, 1730, 927, 763

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers (1740 and 1730)

Dixon's Outlier Test for Cobalt Subsurface Inside Fence

Total N = 24
Number NDs = 1
Number Detects = 23
Number Data (n) = 24
10% critical value: 0.367
5% critical value: 0.413
1% critical value: 0.497
Note: NDs replaced by DL/2 in Outlier Test

1. Data Value 927 is a Potential Outlier (Upper Tail)?

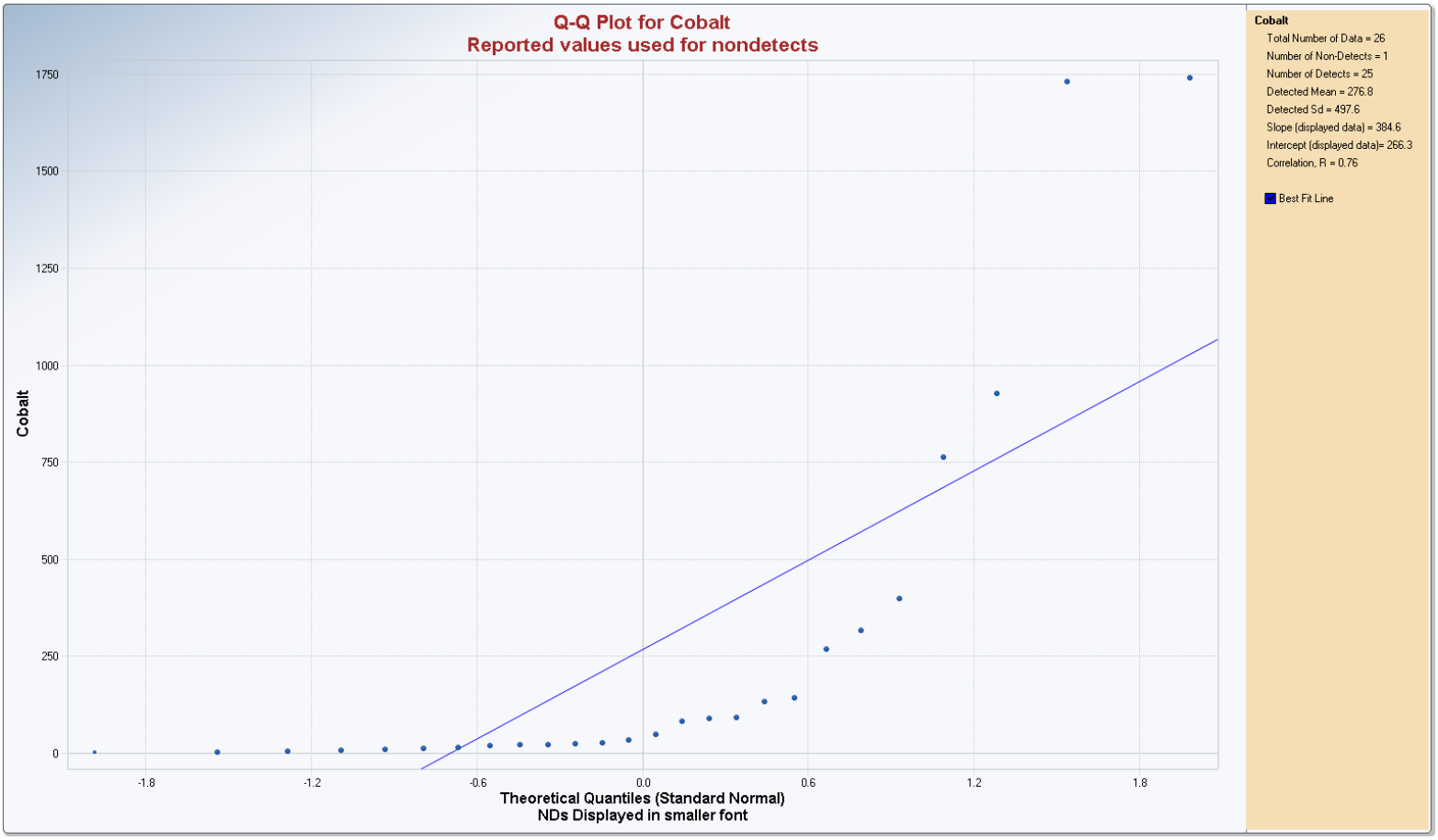
Test Statistic: 0.574

For 10% significance level, 927 is an outlier.
For 5% significance level, 927 is an outlier.
For 1% significance level, 927 is an outlier.

2. Data Value 1.14 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.008

For 10% significance level, 1.14 is not an outlier.
For 5% significance level, 1.14 is not an outlier.
For 1% significance level, 1.14 is not an outlier.


Q-Q Plot for Cobalt
Reported values used for nondetects
Cobalt
1750
1500
1250
1000
750
500
250
0
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cobalt
Total Number of Data = 26
Number of Non-Detects = 1
Number of Detects = 25
Detected Mean = 276.8
Detected Sd = 497.6
Slope (displayed data) = 384.6
Intercept (displayed data)= 266.3
Correlation, R = 0.76
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 5:12:10 PM
From File	UCL data combined_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cobalt Subsurface Inside Fence

General Statistics

Total Number of Observations	23	Number of Distinct Observations	23
Number of Detects	22	Number of Non-Detects	1
Number of Distinct Detects	22	Number of Distinct Non-Detects	1
Minimum Detect	2.74	Minimum Non-Detect	2.28
Maximum Detect	763	Maximum Non-Detect	2.28
Variance Detects	32803	Percent Non-Detects	4.348%
Mean Detects	114.7	SD Detects	181.1
Median Detects	31.05	CV Detects	1.579
Skewness Detects	2.597	Kurtosis Detects	7.501
Mean of Logged Detects	3.717	SD of Logged Detects	1.525

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.645	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	109.8	Standard Error of Mean	37.26
SD	174.6	95% KM (BCA) UCL	176.2
95% KM (t) UCL	173.8	95% KM (Percentile Bootstrap) UCL	176.2
95% KM (z) UCL	171.1	95% KM Bootstrap t UCL	224.4
90% KM Chebyshev UCL	221.6	95% KM Chebyshev UCL	272.2
97.5% KM Chebyshev UCL	342.5	99% KM Chebyshev UCL	480.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.667	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.796	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.17	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.195	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.602	k star (bias corrected MLE)	0.551
Theta hat (MLE)	190.4	Theta star (bias corrected MLE)	208.3
nu hat (MLE)	26.51	nu star (bias corrected)	24.23
MLE Mean (bias corrected)	114.7	MLE Sd (bias corrected)	154.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.396	nu hat (KM)	18.2
Approximate Chi Square Value (18.20, α)	9.537	Adjusted Chi Square Value (18.20, β)	9.084
95% Gamma Approximate KM-UCL (use when n>=50)	209.6	95% Gamma Adjusted KM-UCL (use when n<50)	220.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	109.7
Maximum	763	Median	27.4
SD	178.6	CV	1.627
k hat (MLE)	0.477	k star (bias corrected MLE)	0.444
Theta hat (MLE)	230.2	Theta star (bias corrected MLE)	247.4
nu hat (MLE)	21.93	nu star (bias corrected)	20.4
MLE Mean (bias corrected)	109.7	MLE Sd (bias corrected)	164.7
		Adjusted Level of Significance (β)	0.0389
Approximate Chi Square Value (20.40, α)	11.15	Adjusted Chi Square Value (20.40, β)	10.65
95% Gamma Approximate UCL (use when n>=50)	200.8	95% Gamma Adjusted UCL (use when n<50)	210.1

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.98	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.911	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.189	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	109.8	Mean in Log Scale	3.551
SD in Original Scale	178.5	SD in Log Scale	1.69
95% t UCL (assumes normality of ROS data)	173.7	95% Percentile Bootstrap UCL	174.5
95% BCA Bootstrap UCL	195.4	95% Bootstrap t UCL	231.8
95% H-UCL (Log ROS)	521.3		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	3.592	95% H-UCL (KM -Log)	385.3
KM SD (logged)	1.572	95% Critical H Value (KM-Log)	3.36
KM Standard Error of Mean (logged)	0.336		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	109.8	Mean in Log Scale	3.561
SD in Original Scale	178.5	SD in Log Scale	1.667
95% t UCL (Assumes normality)	173.7	95% H-Stat UCL	492.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	272.2	95% GROS Adjusted Gamma UCL	210.1
95% Adjusted Gamma KM-UCL	220.1		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	2/25/2016 5:13:40 PM
From File	UCL data combined_f.xls
Full Precision	OFF

Dixon's Outlier Test for Manganese Subsurface Soil Inside Fence

Number of Observations = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642

1. Observation Value 338 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.063

For 10% significance level, 338 is not an outlier.
For 5% significance level, 338 is not an outlier.
For 1% significance level, 338 is not an outlier.

2. Observation Value 60.3 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.105

For 10% significance level, 60.3 is not an outlier.
For 5% significance level, 60.3 is not an outlier.
For 1% significance level, 60.3 is not an outlier.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 4:02:54 PM
From File	UCL data combined_f.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Manganese Subsurface Inside Fence

General Statistics

Total Number of Observations	12	Number of Distinct Observations	12
		Number of Missing Observations	0
Minimum	60.3	Mean	187.7
Maximum	338	Median	154
SD	101.7	Std. Error of Mean	29.36
Coefficient of Variation	0.542	Skewness	0.392

Normal GOF Test

Shapiro Wilk Test Statistic	0.897	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Normal at 5% Significance Level
Lilliefors Test Statistic	0.198	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Data appear Normal at 5% Significance Level

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	240.4	95% Adjusted-CLT UCL (Chen-1995)	239.5
		95% Modified-t UCL (Johnson-1978)	240.9

Gamma GOF Test

A-D Test Statistic	0.362	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.738	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.147	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.247	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.441	k star (bias corrected MLE)	2.636
Theta hat (MLE)	54.54	Theta star (bias corrected MLE)	71.19
nu hat (MLE)	82.58	nu star (bias corrected)	63.27
MLE Mean (bias corrected)	187.7	MLE Sd (bias corrected)	115.6
		Approximate Chi Square Value (0.05)	45.97
Adjusted Level of Significance	0.029	Adjusted Chi Square Value	43.73

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	258.3	95% Adjusted Gamma UCL (use when n<50)	271.5

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.926	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.135	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	4.099	Mean of logged Data	5.082
Maximum of Logged Data	5.823	SD of logged Data	0.599

Assuming Lognormal Distribution

95% H-UCL	290.6	90% Chebyshev (MVUE) UCL	291.2
95% Chebyshev (MVUE) UCL	337.2	97.5% Chebyshev (MVUE) UCL	401.1
99% Chebyshev (MVUE) UCL	526.5		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	236	95% Jackknife UCL	240.4
95% Standard Bootstrap UCL	232.7	95% Bootstrap-t UCL	245
95% Hall's Bootstrap UCL	233.7	95% Percentile Bootstrap UCL	234.9
95% BCA Bootstrap UCL	233.3		
90% Chebyshev(Mean, Sd) UCL	275.7	95% Chebyshev(Mean, Sd) UCL	315.6
97.5% Chebyshev(Mean, Sd) UCL	371	99% Chebyshev(Mean, Sd) UCL	479.8

Suggested UCL to Use

95% Student's-t UCL	240.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation	2/25/2016 5:17:55 PM
From File	UCL data combined_g.xls
Full Precision	OFF

Dixon's Outlier Test for Nickel Subsurface Soil Inside Fence

Number of Observations = 12
10% critical value: 0.49
5% critical value: 0.546
1% critical value: 0.642

1. Observation Value 500 is a Potential Outlier (Upper Tail)?

Test Statistic: 0.400

For 10% significance level, 500 is not an outlier.
For 5% significance level, 500 is not an outlier.
For 1% significance level, 500 is not an outlier.

2. Observation Value 14.1 is a Potential Outlier (Lower Tail)?

Test Statistic: 0.003

For 10% significance level, 14.1 is not an outlier.
For 5% significance level, 14.1 is not an outlier.
For 1% significance level, 14.1 is not an outlier.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 4:05:32 PM
From File	UCL data combined_g.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Nickel Subsurface Inside Fence

General Statistics

Total Number of Observations	12	Number of Distinct Observations	11
		Number of Missing Observations	0
Minimum	14.1	Mean	146.8
Maximum	500	Median	59.55
SD	183.3	Std. Error of Mean	52.9
Coefficient of Variation	1.248	Skewness	1.359

Normal GOF Test

Shapiro Wilk Test Statistic	0.736	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.278	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.256	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	241.8	95% Adjusted-CLT UCL (Chen-1995)	256
		95% Modified-t UCL (Johnson-1978)	245.3

Gamma GOF Test

A-D Test Statistic	0.652	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.766	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.168	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.255	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.748	k star (bias corrected MLE)	0.616
Theta hat (MLE)	196.4	Theta star (bias corrected MLE)	238.2
nu hat (MLE)	17.94	nu star (bias corrected)	14.79
MLE Mean (bias corrected)	146.8	MLE Sd (bias corrected)	187
		Approximate Chi Square Value (0.05)	7.116
Adjusted Level of Significance	0.029	Adjusted Chi Square Value	6.32

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	305.2	95% Adjusted Gamma UCL (use when n<50)	343.6

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.891	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.859	Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.169	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.256	Data appear Lognormal at 5% Significance Level

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.646	Mean of logged Data	4.188
Maximum of Logged Data	6.215	SD of logged Data	1.366

Assuming Lognormal Distribution

95% H-UCL	743.1	90% Chebyshev (MVUE) UCL	338
95% Chebyshev (MVUE) UCL	424.2	97.5% Chebyshev (MVUE) UCL	544
99% Chebyshev (MVUE) UCL	779.2		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	233.8	95% Jackknife UCL	241.8
95% Standard Bootstrap UCL	232.9	95% Bootstrap-t UCL	329.7
95% Hall's Bootstrap UCL	250.1	95% Percentile Bootstrap UCL	236.2
95% BCA Bootstrap UCL	247.7		
90% Chebyshev(Mean, Sd) UCL	305.5	95% Chebyshev(Mean, Sd) UCL	377.4
97.5% Chebyshev(Mean, Sd) UCL	477.2	99% Chebyshev(Mean, Sd) UCL	673.2

Suggested UCL to Use

95% Adjusted Gamma UCL	343.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 11:21:14 AM
From File	UCL data 0to1.xls
Full Precision	OFF

Rosner's Outlier Test for 4 Outliers in Cadmium Surface Soil Outside Fence

Total N	46
Number NDs	19
Number Detects	46
Mean with NDs=DL/2	5.275
SD with NDs=DL/2	7.315
Number of data	46
Number of suspected outliers	4

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	5.275	7.235	32	46	3.694	3.09	3.45
2	4.681	6.176	26.9	45	3.598	3.09	3.44
3	4.177	5.223	20.4	44	3.106	3.08	3.43
4	3.799	4.639	17.9	43	3.04	2.07	3.41

For 5% significance level, there are 4 Potential Outliers
32, 26.9, 20.4, 17.9

For 1% Significance Level, there are 2 Potential Outliers
32, 26.9

Test Rerun After Q/Q Plot Confirmation and Removal of 1 Outlier

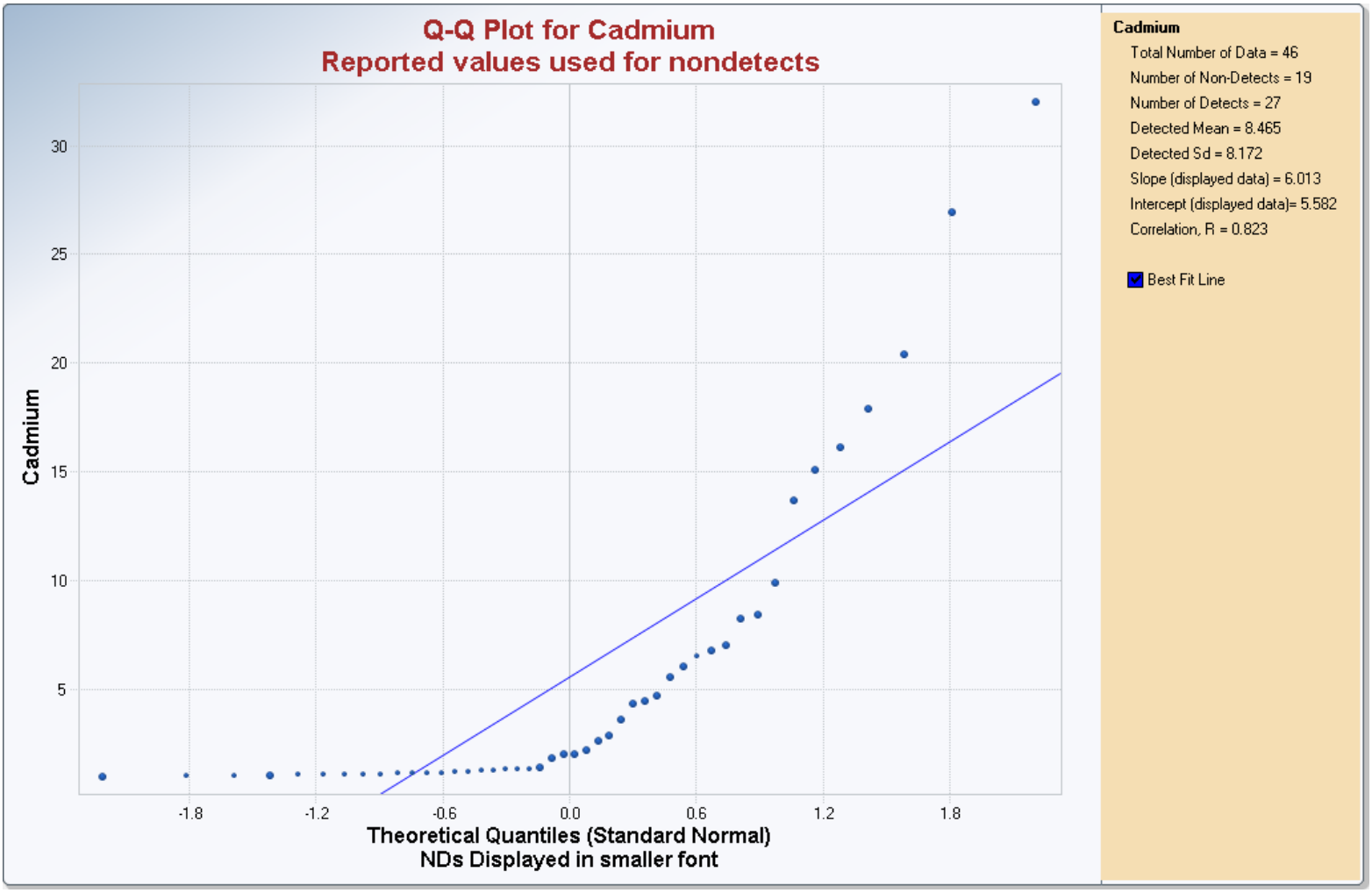
Total N	44
Number NDs	19
Number Detects	44
Mean with NDs=DL/2	4.177
SD with NDs=DL/2	5.223
Number of data	44
Number of suspected outliers	4

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	4.177	5.164	20.4	44	3.142	3.08	3.43
2	3.799	4.639	17.9	43	3.04	3.07	3.41
3	3.464	4.133	16.1	42	3.058	3.06	3.4
4	3.155	3.663	15.1	41	3.261	3.05	3.39

For 5% significance level, there are 4 Potential Outliers
20.4, 17.9, 16.1, 15.1

For 1% Significance Level, there is no Potential Outlier


Q-Q Plot for Cadmium
Reported values used for nondetects
Cadmium
30
25
20
15
10
5
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cadmium
Total Number of Data = 46
Number of Non-Detects = 19
Number of Detects = 27
Detected Mean = 8.465
Detected Sd = 8.172
Slope (displayed data) = 6.013
Intercept (displayed data)= 5.582
Correlation, R = 0.823
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 12:15:15 PM
From File	UCL data 0to1.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium Surface Outside Fence

General Statistics

Total Number of Observations	44	Number of Distinct Observations	40
Number of Detects	25	Number of Non-Detects	19
Number of Distinct Detects	24	Number of Distinct Non-Detects	16
Minimum Detect	0.982	Minimum Non-Detect	1.06
Maximum Detect	20.4	Maximum Non-Detect	6.55
Variance Detects	32.17	Percent Non-Detects	43.18%
Mean Detects	6.786	SD Detects	5.672
Median Detects	4.74	CV Detects	0.836
Skewness Detects	1.114	Kurtosis Detects	0.208
Mean of Logged Detects	1.562	SD of Logged Detects	0.891

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.857	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.164	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Detected Data appear Normal at 5% Significance Level

Detected Data appear Approximate Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	4.311	Standard Error of Mean	0.78
SD	5.067	95% KM (BCA) UCL	5.764
95% KM (t) UCL	5.623	95% KM (Percentile Bootstrap) UCL	5.558
95% KM (z) UCL	5.595	95% KM Bootstrap t UCL	5.996
90% KM Chebyshev UCL	6.653	95% KM Chebyshev UCL	7.713
97.5% KM Chebyshev UCL	9.186	99% KM Chebyshev UCL	12.08

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.349	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.761	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.104	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.178	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.563	k star (bias corrected MLE)	1.402
Theta hat (MLE)	4.343	Theta star (bias corrected MLE)	4.841
nu hat (MLE)	78.13	nu star (bias corrected)	70.09
MLE Mean (bias corrected)	6.786	MLE Sd (bias corrected)	5.732

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.724	nu hat (KM)	63.71
Approximate Chi Square Value (63.71, α)	46.35	Adjusted Chi Square Value (63.71, β)	45.84
95% Gamma Approximate KM-UCL (use when n>=50)	5.927	95% Gamma Adjusted KM-UCL (use when n<50)	5.992

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	3.864
Maximum	20.4	Median	1.635
SD	5.427	CV	1.404
k hat (MLE)	0.291	k star (bias corrected MLE)	0.286
Theta hat (MLE)	13.29	Theta star (bias corrected MLE)	13.51
nu hat (MLE)	25.58	nu star (bias corrected)	25.17
MLE Mean (bias corrected)	3.864	MLE Sd (bias corrected)	7.226
		Adjusted Level of Significance (β)	0.0445
Approximate Chi Square Value (25.17, α)	14.74	Adjusted Chi Square Value (25.17, β)	14.47
95% Gamma Approximate UCL (use when n>=50)	6.598	95% Gamma Adjusted UCL (use when n<50)	6.722

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.965	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.082	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.22	Mean in Log Scale	0.8
SD in Original Scale	5.181	SD in Log Scale	1.118
95% t UCL (assumes normality of ROS data)	5.533	95% Percentile Bootstrap UCL	5.524
95% BCA Bootstrap UCL	5.664	95% Bootstrap t UCL	5.906
95% H-UCL (Log ROS)	6.374		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.9	95% H-UCL (KM -Log)	5.921
KM SD (logged)	1.012	95% Critical H Value (KM-Log)	2.38
KM Standard Error of Mean (logged)	0.157		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.177	Mean in Log Scale	0.706
SD in Original Scale	5.223	SD in Log Scale	1.223
95% t UCL (Assumes normality)	5.5	95% H-Stat UCL	6.985

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Normal Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	5.623	95% KM (Percentile Bootstrap) UCL	5.558

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.

Recommendations are based upon data size, data distribution, and skewness.

These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).

However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation 2/25/2016 11:26:58 AM

From File UCL data 0to1_a.xls

Full Precision OFF

Rosner's Outlier Test for Cobalt Surface Soil Outside Fence

Mean	**404**
Standard Deviation	**749.5**
Number of data	**181**
Number of suspected outliers	**5**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	404	747.5	6650	181	8.356	3.576	3.946
2	369.3	588	4260	180	6.616	3.566	3.946
3	347.6	512.1	3530	179	6.215	3.566	3.94
4	329.7	454	2470	178	4.714	3.566	3.936
5	317.6	425.6	2170	177	4.352	3.566	3.936

For 5% significance level, there are 5 Potential Outliers

Potential outliers are:

6650, 4260, 3530, 2470, 2170

For 1% Significance Level, there are 5 Potential Outliers

Potential outliers are:

6650, 4260, 3530, 2470, 2170

Test Rerun After Q/Q Plot Confirmation and Removal of 4 Outliers

Mean	**317.6**
Standard Deviation	**425.6**
Number of data	**177**
Number of suspected outliers	**5**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	317.6	424.4	2170	177	4.365	3.569	3.939
2	307.1	403.1	2090	176	4.423	3.559	3.939
3	296.9	380.8	1750	175	3.816	3.559	3.933
4	288.5	365.5	1740	174	3.971	3.559	3.929
5	280.2	349.3	1590	173	3.749	3.559	3.929

For 5% significance level, there are 5 Potential Outliers

Potential outliers are:

2170, 2090, 1750, 1740, 1590

For 1% Significance Level, there are 4 Potential Outliers

Potential outliers are:

2170, 2090, 1750, 1740

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

Mean	**296.9**
Standard Deviation	**380.8**
Number of data	**175**
Number of suspected outliers	**5**

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	296.9	379.7	1750	175	3.827	3.565	3.935
2	288.5	365.5	1740	174	3.971	3.555	3.935
3	280.2	349.3	1590	173	3.749	3.555	3.93
4	272.5	335.7	1430	172	3.448	3.555	3.925
5	265.8	324.6	1380	170	3.432	3.555	3.925

For 5% significance level, there are 3 Potential Outliers

Potential outliers are:

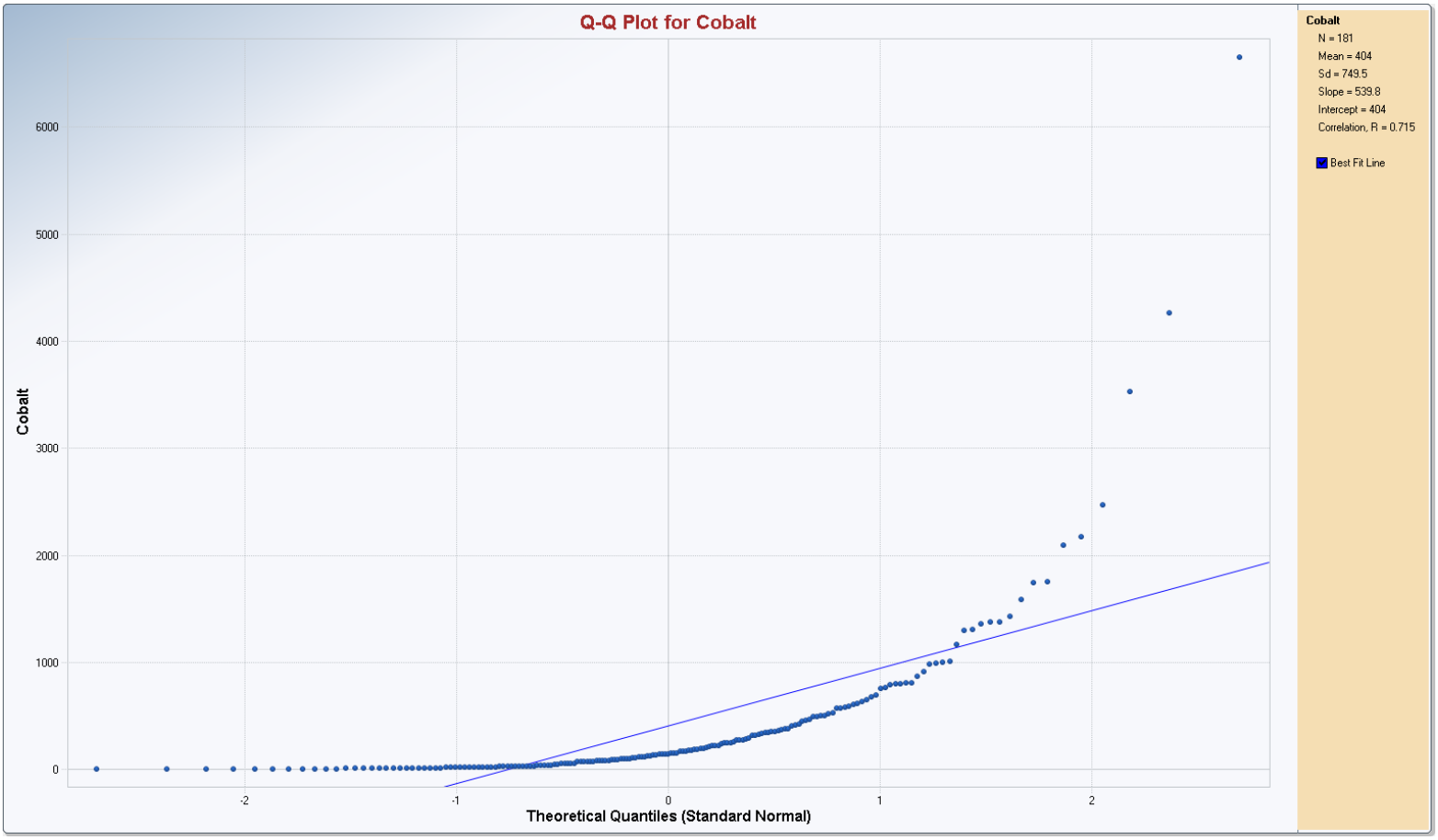
1750, 1740, 1590

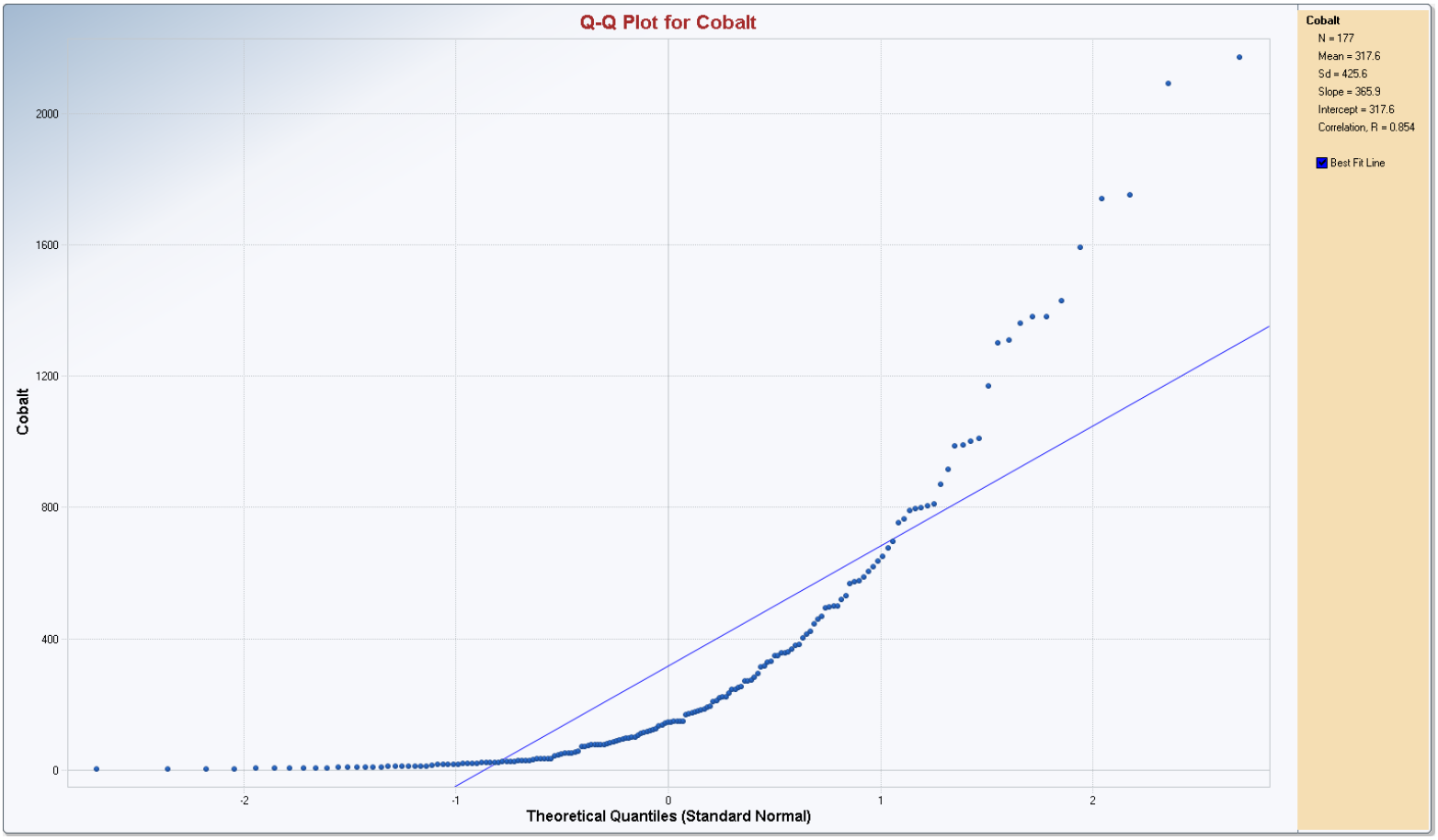
For 1% Significance Level, there are 2 Potential Outliers

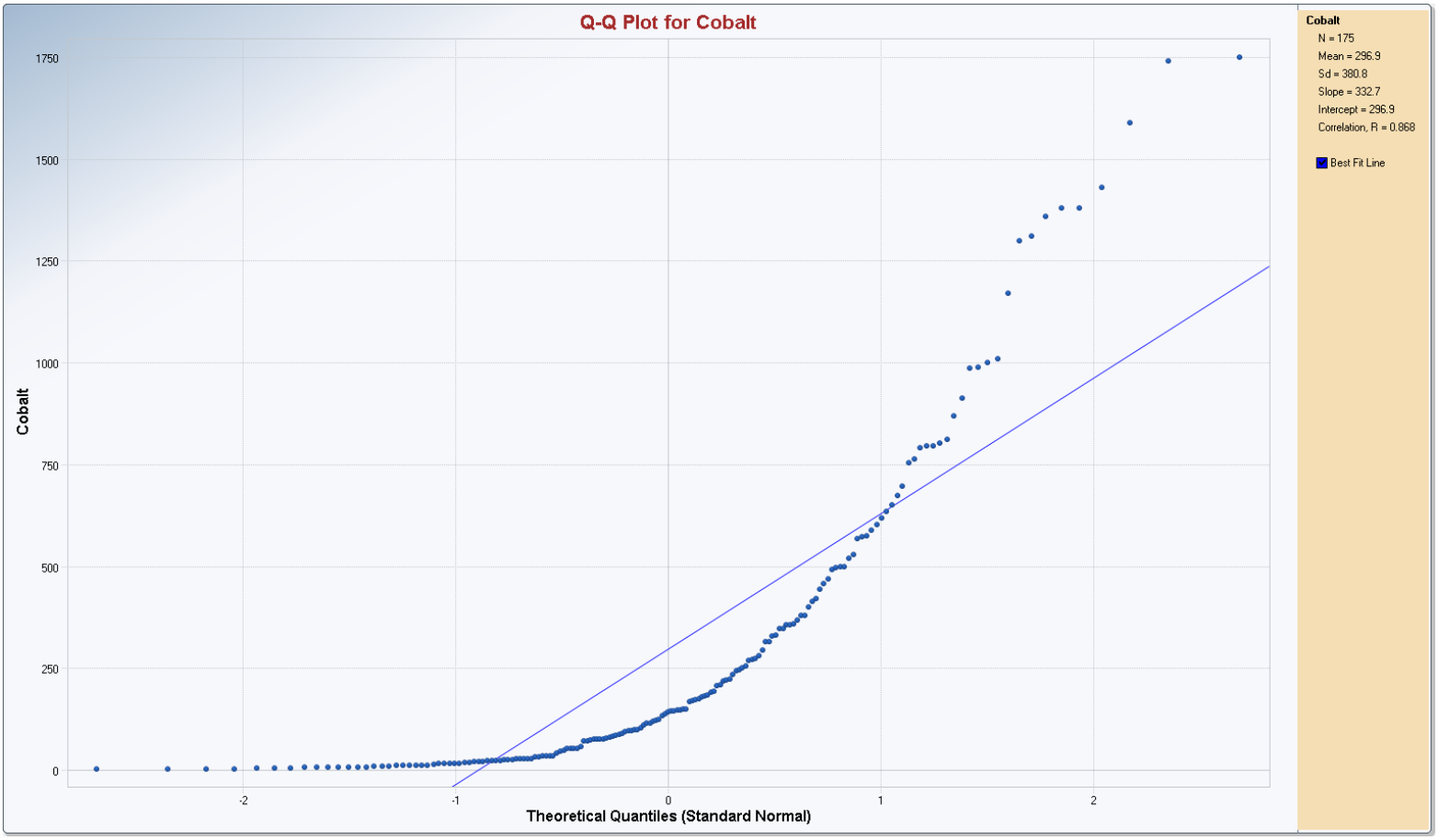
Potential outliers are:

1750, 1740

Potential outliers 1750 and 1740 not confirmed as outliers using Q/Q plot


Q-Q Plot for Cobalt
Cobalt
6000
5000
4000
3000
2000
1000
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
Cobalt
N = 181
Mean = 404
Sd = 749.5
Slope = 539.8
Intercept = 404
Correlation, R = 0.715
Best Fit Line


Q-Q Plot for Cobalt
Cobalt
N = 177
Mean = 317.6
Sd = 425.6
Slope = 365.9
Intercept = 317.6
Correlation, R = 0.854
Best Fit Line
Cobalt
2000
1600
1200
800
400
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)


Q-Q Plot for Cobalt
Cobalt
1750
1500
1250
1000
750
500
250
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
Cobalt
N = 175
Mean = 296.9
Sd = 380.8
Slope = 332.7
Intercept = 296.9
Correlation, R = 0.868
Best Fit Line

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 12:16:26 PM
From File	UCL data 0to1_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cobalt Surface Outside Fence

General Statistics

Total Number of Observations	175	Number of Distinct Observations	166
		Number of Missing Observations	0
Minimum	2.85	Mean	296.9
Maximum	1750	Median	143
SD	380.8	Std. Error of Mean	28.79
Coefficient of Variation	1.283	Skewness	1.86

Normal GOF Test

Shapiro Wilk Test Statistic	0.744	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.22	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.067	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	344.5	95% Adjusted-CLT UCL (Chen-1995)	348.6
		95% Modified-t UCL (Johnson-1978)	345.2

Gamma GOF Test

A-D Test Statistic	1.294	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.808	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0845	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0735	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.625	k star (bias corrected MLE)	0.618
Theta hat (MLE)	475.4	Theta star (bias corrected MLE)	480.7
nu hat (MLE)	218.6	nu star (bias corrected)	216.2
MLE Mean (bias corrected)	296.9	MLE Sd (bias corrected)	377.8
		Approximate Chi Square Value (0.05)	183.1
Adjusted Level of Significance	0.0486	Adjusted Chi Square Value	182.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	350.4	95% Adjusted Gamma UCL (use when n<50)	350.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.944	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	6.2471E-7	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0653	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.067	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.047	Mean of logged Data	4.71
Maximum of Logged Data	7.467	SD of logged Data	1.624

Assuming Lognormal Distribution

95% H-UCL	584.2	90% Chebyshev (MVUE) UCL	628.7
95% Chebyshev (MVUE) UCL	728.7	97.5% Chebyshev (MVUE) UCL	867.5
99% Chebyshev (MVUE) UCL	1140		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	344.3	95% Jackknife UCL	344.5
95% Standard Bootstrap UCL	343.1	95% Bootstrap-t UCL	349.2
95% Hall's Bootstrap UCL	351.3	95% Percentile Bootstrap UCL	346.7
95% BCA Bootstrap UCL	349.4		
90% Chebyshev(Mean, Sd) UCL	383.3	95% Chebyshev(Mean, Sd) UCL	422.4
97.5% Chebyshev(Mean, Sd) UCL	476.7	99% Chebyshev(Mean, Sd) UCL	583.3

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	422.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Uncensored Variables

User Selected Options

Date/Time of Computation 2/25/2016 11:34:58 AM

From File UCL data 0to1_b.xls

Full Precision OFF

Rosner's Outlier Test for Manganese Surface Soil Outside Fence

Mean 685.4

Standard Deviation 1004

Number of data 105

Number of suspected outliers 5

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	685.4	998.9	6990	105	6.312	3.394	3.764
2	624.7	792.2	4010	104	4.273	3.393	3.764
3	591.9	721.3	3910	103	4.6	3.393	3.764
4	559.3	644.4	3150	102	4.02	3.384	3.754
5	533.7	593	2650	101	3.569	3.384	3.754

For 5% significance level, there are 5 Potential Outliers

Potential outliers are:

6990, 4010, 3910, 3150, 2650

For 1% Significance Level, there are 4 Potential Outliers

Potential outliers are:

6990, 4010, 3910, 3150

Test Rerun After Q/Q Plot Confirmation and Removal of 3 Outliers

Mean 559.3

Standard Deviation 644.4

Number of data 102

Number of suspected outliers 5

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	559.3	641.3	3150	102	4.04	3.386	3.756
2	533.7	593	2650	101	3.569	3.385	3.756
3	512.5	556.4	2570	100	3.698	3.385	3.756
4	491.7	518.7	2130	99	3.158	3.376	3.746
5	475	493.8	2060	98	3.21	3.376	3.746

For 5% significance level, there are 3 Potential Outliers

Potential outliers are:

3150, 2650, 2570

For 1% Significance Level, there is 1 Potential Outlier

Potential outliers is: 3150

Test Rerun After Q/Q Plot Confirmation and Removal of 1 Outlier

Mean	**533.7**
Standard Deviation	**593**
Number of data	**101**
Number of suspected outliers	**5**

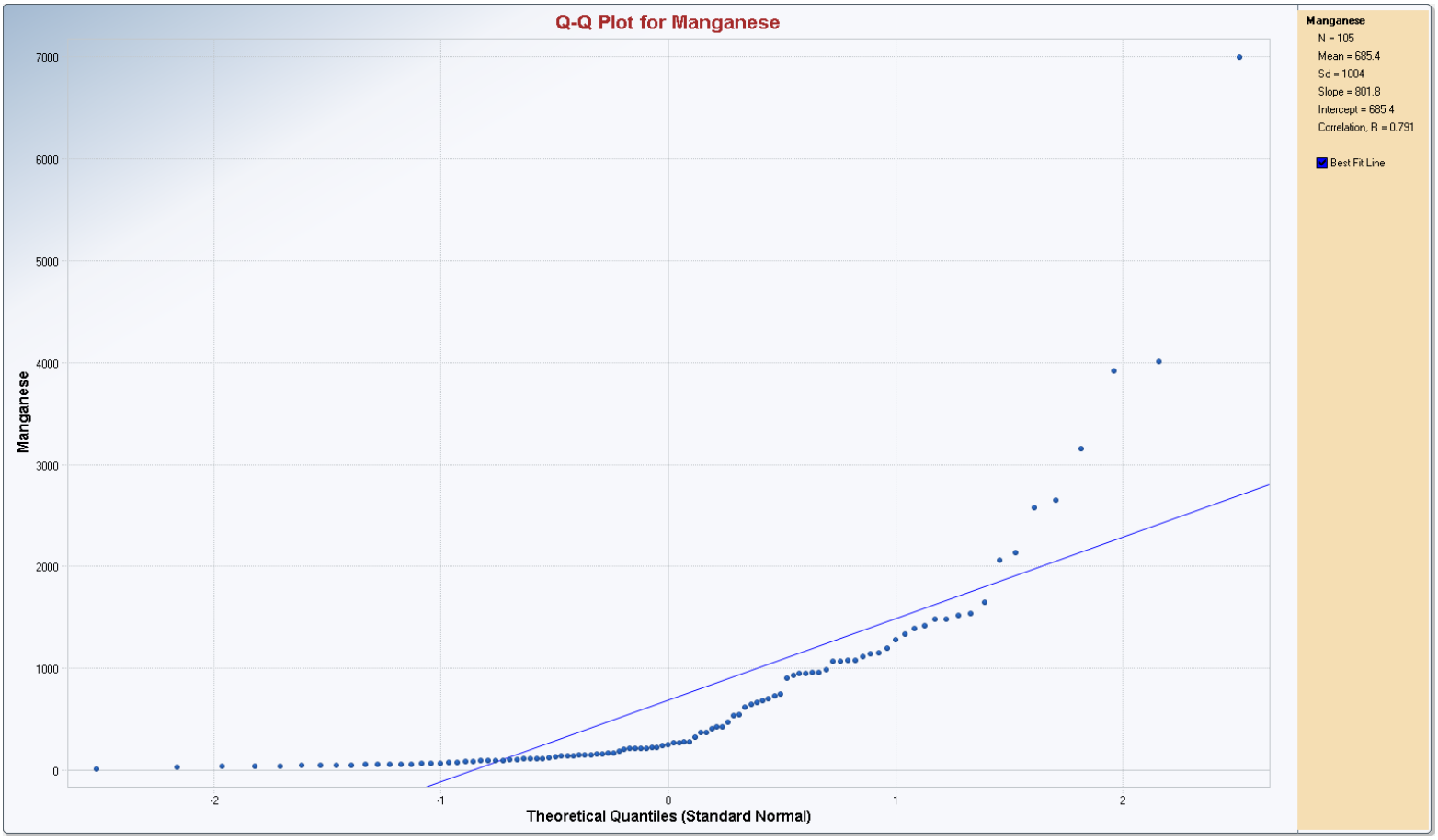
#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	533.7	590.1	2650	101	3.587	3.383	3.753
2	512.5	556.4	2570	100	3.698	3.383	3.753
3	491.7	518.7	2130	99	3.158	3.383	3.753
4	475	493.8	2060	98	3.21	3.373	3.743
5	458.7	469	1650	97	2.54	3.373	3.743

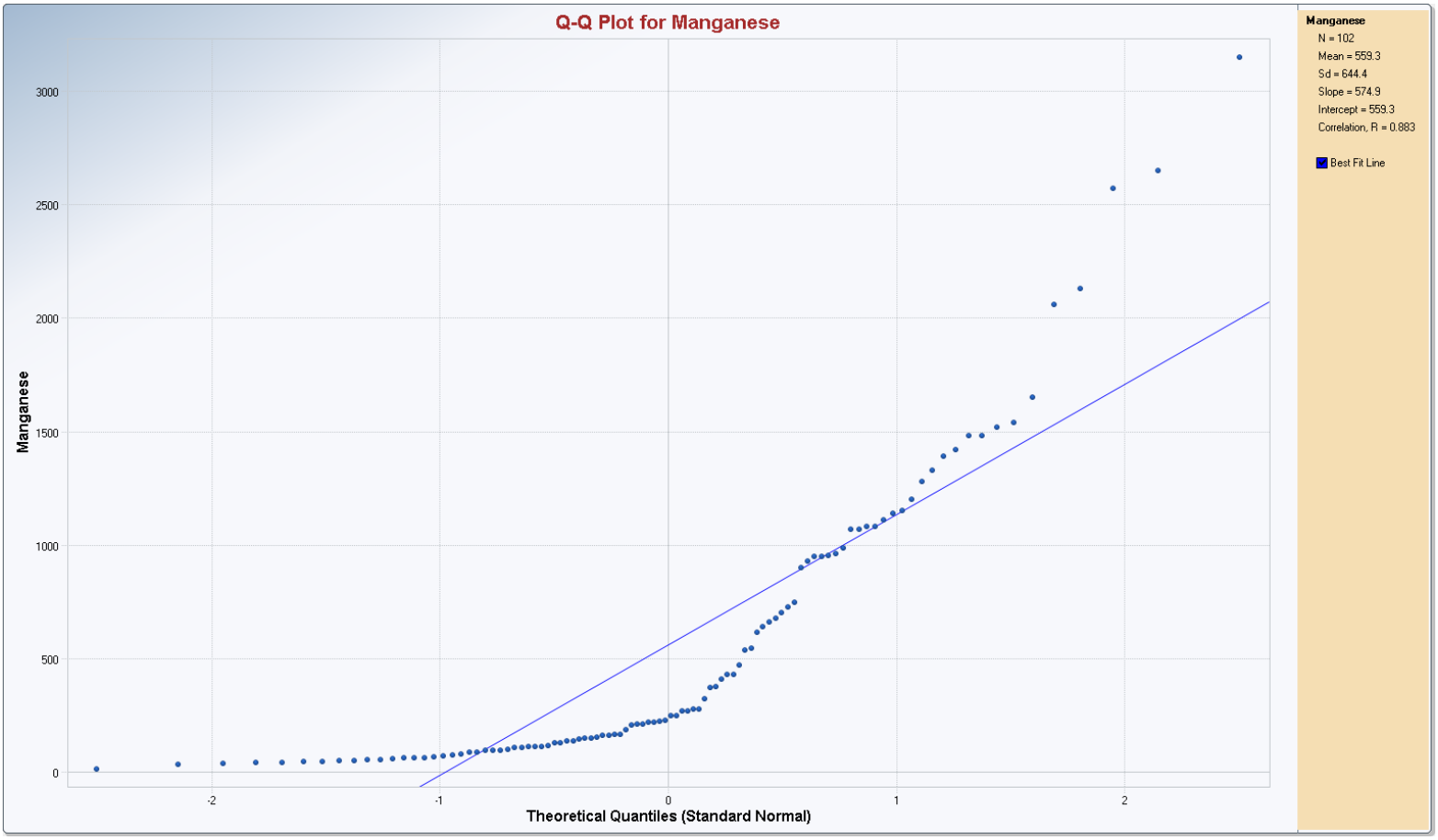
For 5% significance level, there are 2 Potential Outliers

Potential outliers are:

2650, 2570

For 1% Significance Level, there is no Potential Outlier


Q-Q Plot for Manganese
Manganese
N = 105
Mean = 685.4
Sd = 1004
Slope = 801.8
Intercept = 685.4
Correlation, R = 0.791
Best Fit Line
Manganese
7000
6000
5000
4000
3000
2000
1000
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)


Q-Q Plot for Manganese
Manganese
Theoretical Quantiles (Standard Normal)
3000
2500
2000
1500
1000
500
0
-2
-1
0
1
2
Manganese
N = 102
Mean = 559.3
Sd = 644.4
Slope = 574.9
Intercept = 559.3
Correlation, R = 0.883
Best Fit Line

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 12:17:49 PM
From File	UCL data 0to1_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Manganese Surface Outside Fence

General Statistics

Total Number of Observations	101	Number of Distinct Observations	95
		Number of Missing Observations	0
Minimum	11.5	Mean	533.7
Maximum	2650	Median	225
SD	593	Std. Error of Mean	59.01
Coefficient of Variation	1.111	Skewness	1.504

Normal GOF Test

Shapiro Wilk Test Statistic	0.789	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0882	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	631.7	95% Adjusted-CLT UCL (Chen-1995)	640.2
		95% Modified-t UCL (Johnson-1978)	633.1

Gamma GOF Test

A-D Test Statistic	2.29	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.789	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.134	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0923	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.868	k star (bias corrected MLE)	0.848
Theta hat (MLE)	615.2	Theta star (bias corrected MLE)	629.1
nu hat (MLE)	175.2	nu star (bias corrected)	171.4
MLE Mean (bias corrected)	533.7	MLE Sd (bias corrected)	579.4
		Approximate Chi Square Value (0.05)	142.1
Adjusted Level of Significance	0.0476	Adjusted Chi Square Value	141.7

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	643.6	95% Adjusted Gamma UCL (use when n<50)	645.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.948	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00164	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.109	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0882	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.442	Mean of logged Data	5.603
Maximum of Logged Data	7.882	SD of logged Data	1.247

Assuming Lognormal Distribution

95% H-UCL	800.9	90% Chebyshev (MVUE) UCL	862.3
95% Chebyshev (MVUE) UCL	989	97.5% Chebyshev (MVUE) UCL	1165
99% Chebyshev (MVUE) UCL	1510		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	630.7	95% Jackknife UCL	631.7
95% Standard Bootstrap UCL	626.6	95% Bootstrap-t UCL	647.1
95% Hall's Bootstrap UCL	637.2	95% Percentile Bootstrap UCL	634.3
95% BCA Bootstrap UCL	643.4		
90% Chebyshev(Mean, Sd) UCL	710.7	95% Chebyshev(Mean, Sd) UCL	790.9
97.5% Chebyshev(Mean, Sd) UCL	902.2	99% Chebyshev(Mean, Sd) UCL	1121

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	790.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 12:06:18 PM
From File	UCL data 0to1_c.xls
Full Precision	OFF

Rosner's Outlier Test for 4 Outliers in Nickel Surface Soil Outside Fence

Total N	98
Number NDs	1
Number Detects	98
Mean with NDs=DL/2	158.3
SD with NDs=DL/2	371.7
Number of data	98
Number of suspected outliers	4

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	158.3	369.8	2920	98	7.468	3.374	3.744
2	129.8	243.6	1400	97	5.215	3.372	3.742
3	116.6	206.9	1080	96	4.657	3.372	3.742
4	106.5	182.4	924	95	4.482	3.364	3.732

For 5% significance level, there are 4 Potential Outliers
2920, 1400, 1080, 924

For 1% Significance Level, there are 4 Potential Outliers
2920, 1400, 1080, 924

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

Total N	96
Number NDs	1
Number Detects	96
Mean with NDs=DL/2	116.6
SD with NDs=DL/2	206.9
Number of data	96
Number of suspected outliers	4

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	116.6	205.8	1080	96	4.682	3.368	3.738
2	106.5	182.4	924	95	4.482	3.364	3.734
3	97.77	162.4	698	94	3.697	3.364	3.734
4	91.31	150.6	611	93	3.45	3.358	3.724

For 5% significance level, there are 4 Potential Outliers
1080, 924, 698, 611

For 1% Significance Level, there are 2 Potential Outliers
1080, 924

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

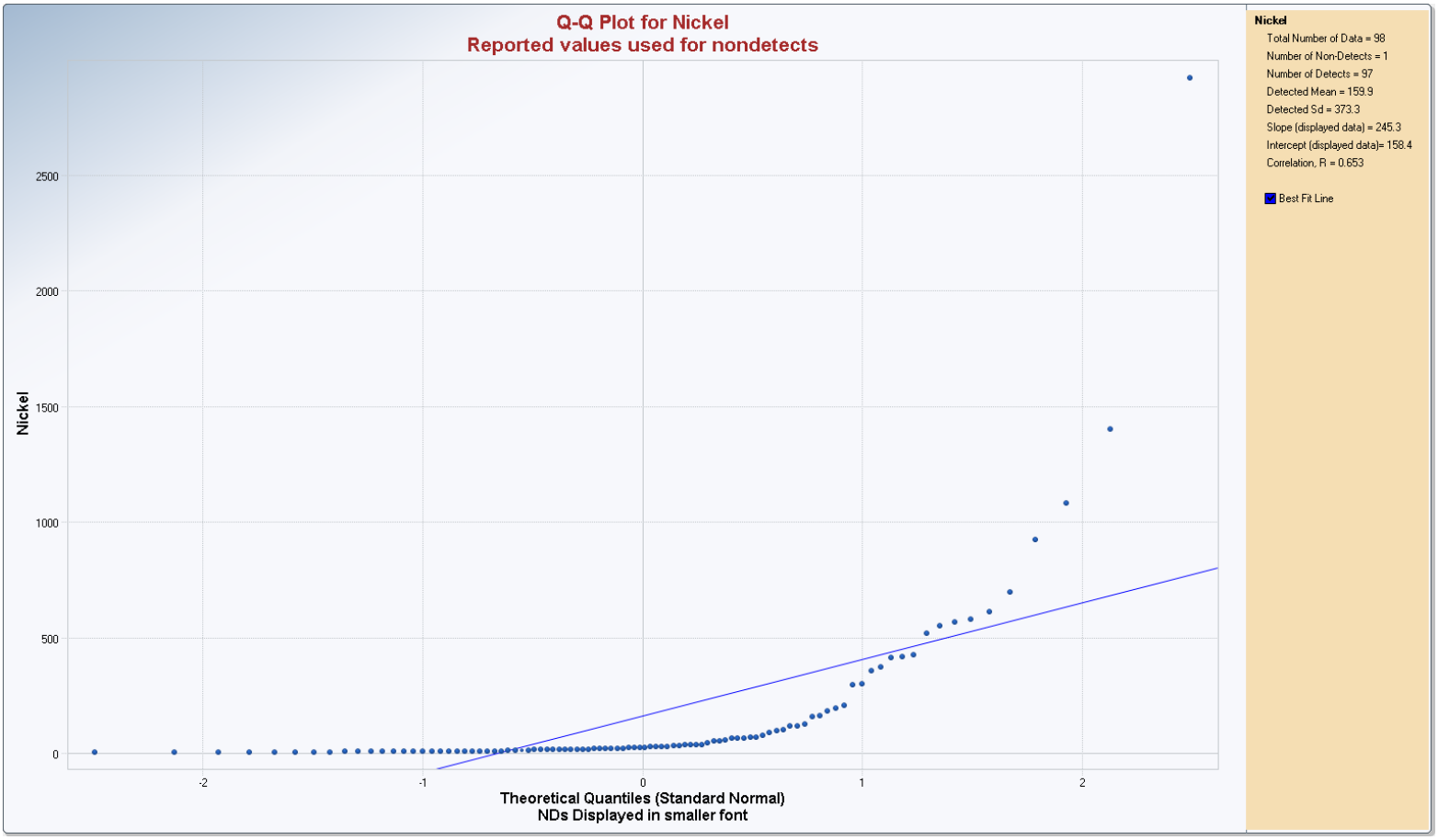
Total N	94
Number NDs	1
Number Detects	94
Mean with NDs=DL/2	97.77
SD with NDs=DL/2	162.4
Number of data	94
Number of suspected outliers	4

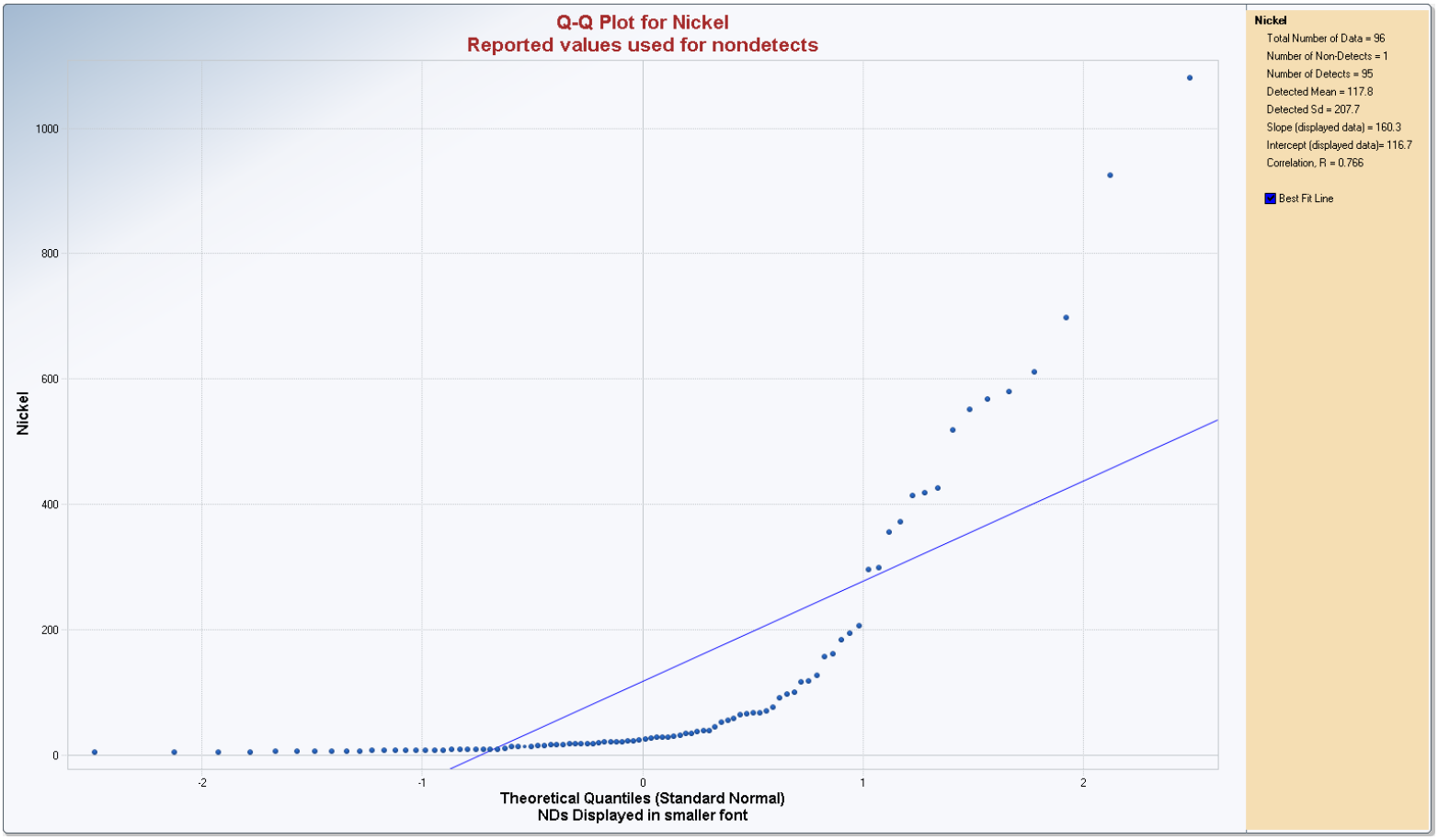
NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	97.77	161.5	698	94	3.716	3.362	3.732
2	91.31	150.6	611	93	3.45	3.356	3.726
3	85.66	141.2	579	92	3.493	3.356	3.726
4	80.24	132	568	91	3.694	3.352	3.716

For 5% significance level, there are 4 Potential Outliers
698, 611, 579, 568

For 1% Significance Level, there is no Potential Outlier


Q-Q Plot for Nickel
Reported values used for nondetects
Nickel
2500
2000
1500
1000
500
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Nickel
Total Number of Data = 98
Number of Non-Detects = 1
Number of Detects = 97
Detected Mean = 159.9
Detected Sd = 373.3
Slope (displayed data) = 245.3
Intercept (displayed data)= 158.4
Correlation, R = 0.653
Best Fit Line


Q-Q Plot for Nickel
Reported values used for nondetects
Nickel
1000
800
600
400
200
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Nickel
Total Number of Data = 96
Number of Non-Detects = 1
Number of Detects = 95
Detected Mean = 117.8
Detected Sd = 207.7
Slope (displayed data) = 160.3
Intercept (displayed data)= 116.7
Correlation, R = 0.766
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 12:18:45 PM
From File	UCL data 0to1_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Nickel Surface Outside Fence

General Statistics

Total Number of Observations	94	Number of Distinct Observations	92
Number of Detects	93	Number of Non-Detects	1
Number of Distinct Detects	91	Number of Distinct Non-Detects	1
Minimum Detect	3.91	Minimum Non-Detect	13.1
Maximum Detect	698	Maximum Non-Detect	13.1
Variance Detects	26561	Percent Non-Detects	1.064%
Mean Detects	98.75	SD Detects	163
Median Detects	23.6	CV Detects	1.65
Skewness Detects	2.177	Kurtosis Detects	3.809
Mean of Logged Detects	3.486	SD of Logged Detects	1.465

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.613	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.303	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0919	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	97.77	Standard Error of Mean	16.75
SD	161.5	95% KM (BCA) UCL	124.2
95% KM (t) UCL	125.6	95% KM (Percentile Bootstrap) UCL	126.2
95% KM (z) UCL	125.3	95% KM Bootstrap t UCL	132.7
90% KM Chebyshev UCL	148	95% KM Chebyshev UCL	170.8
97.5% KM Chebyshev UCL	202.4	99% KM Chebyshev UCL	264.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.148	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.193	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0977	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.564	k star (bias corrected MLE)	0.553
Theta hat (MLE)	175.2	Theta star (bias corrected MLE)	178.7
nu hat (MLE)	104.8	nu star (bias corrected)	102.8
MLE Mean (bias corrected)	98.75	MLE Sd (bias corrected)	132.8

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.366	nu hat (KM)	68.9
Approximate Chi Square Value (68.90, α)	50.79	Adjusted Chi Square Value (68.90, β)	50.55
95% Gamma Approximate KM-UCL (use when n>=50)	132.6	95% Gamma Adjusted KM-UCL (use when n<50)	133.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	97.7
Maximum	698	Median	22.9
SD	162.4	CV	1.662
k hat (MLE)	0.532	k star (bias corrected MLE)	0.522
Theta hat (MLE)	183.5	Theta star (bias corrected MLE)	187
nu hat (MLE)	100.1	nu star (bias corrected)	98.21
MLE Mean (bias corrected)	97.7	MLE Sd (bias corrected)	135.2
		Adjusted Level of Significance (β)	0.0474
Approximate Chi Square Value (98.21, α)	76.35	Adjusted Chi Square Value (98.21, β)	76.05
95% Gamma Approximate UCL (use when n>=50)	125.7	95% Gamma Adjusted UCL (use when n<50)	126.2

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0919	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	97.77	Mean in Log Scale	3.47
SD in Original Scale	162.4	SD in Log Scale	1.465
95% t UCL (assumes normality of ROS data)	125.6	95% Percentile Bootstrap UCL	127.9
95% BCA Bootstrap UCL	130.7	95% Bootstrap t UCL	132.1
95% H-UCL (Log ROS)	142.7		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	97.77	Mean in Log Scale	3.469
SD in Original Scale	162.4	SD in Log Scale	1.466
95% t UCL (Assumes normality)	125.6	95% H-Stat UCL	142.8

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	170.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation 2/25/2016 4:12:38 PM

From File UCL data combined.xls

Full Precision OFF

Rosner's Outlier Test for 5 Outliers in Cadmium Subsurface Soil Outside Fence

Total N	67
Number NDs	25
Number Detects	67
Mean with NDs=DL/2	5.118
SD with NDs=DL/2	6.66
Number of data	67
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	5.118	6.61	32	67	4.067	3.242	3.602
2	4.711	5.81	26.9	66	3.819	3.232	3.599
3	4.37	5.145	20.4	65	3.116	3.232	3.592
4	4.119	4.77	17.9	64	2.889	3.222	3.582
5	3.9	4.473	16.7	63	2.862	3.219	3.579

For 5% significance level, there are 2 Potential Outliers

32, 26.9

For 1% Significance Level, there are 2 Potential Outliers

32, 26.9

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

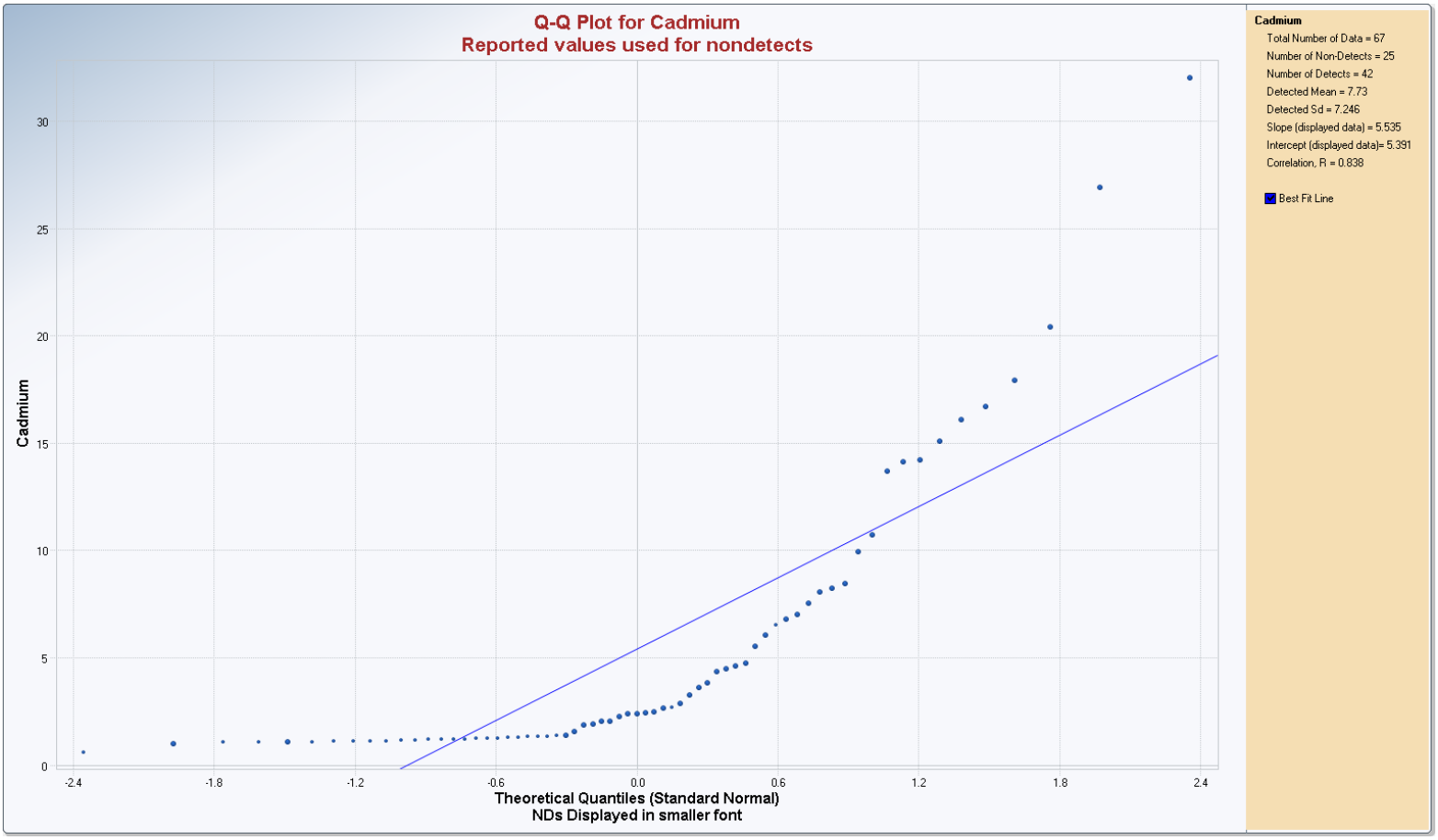
Total N	65
Number NDs	25
Number Detects	65
Mean with NDs=DL/2	4.37
SD with NDs=DL/2	5.145
Number of data	65
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	4.37	5.105	20.4	65	3.14	3.23	3.59
2	4.119	4.77	17.9	64	2.889	3.22	3.585
3	3.9	4.473	16.7	63	2.862	3.22	3.58
4	3.694	4.196	16.1	62	2.957	3.21	3.57
5	3.49	3.91	15.1	61	2.969	3.205	3.565

For 5% Significance Level, there is no Potential Outlier

For 1% Significance Level, there is no Potential Outlier


Q-Q Plot for Cadmium
Reported values used for nondetects
Cadmium
30
25
20
15
10
5
0
-2.4
-1.8
-1.2
-0.6
0.0
0.6
1.2
1.8
2.4
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cadmium
Total Number of Data = 67
Number of Non-Detects = 25
Number of Detects = 42
Detected Mean = 7.73
Detected Sd = 7.246
Slope (displayed data) = 5.535
Intercept (displayed data)= 5.391
Correlation, R = 0.838
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:34:31 PM
From File	UCL data combined.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cadmium Subsurface Outside Fence

General Statistics

Total Number of Observations	65	Number of Distinct Observations	61
Number of Detects	40	Number of Non-Detects	25
Number of Distinct Detects	39	Number of Distinct Non-Detects	22
Minimum Detect	0.982	Minimum Non-Detect	0.601
Maximum Detect	20.4	Maximum Non-Detect	6.55
Variance Detects	29.46	Percent Non-Detects	38.46%
Mean Detects	6.644	SD Detects	5.428
Median Detects	4.55	CV Detects	0.817
Skewness Detects	1.036	Kurtosis Detects	-0.0672
Mean of Logged Detects	1.558	SD of Logged Detects	0.851

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.848	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.187	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	4.433	Standard Error of Mean	0.637
SD	5.057	95% KM (BCA) UCL	5.591
95% KM (t) UCL	5.496	95% KM (Percentile Bootstrap) UCL	5.474
95% KM (z) UCL	5.481	95% KM Bootstrap t UCL	5.613
90% KM Chebyshev UCL	6.345	95% KM Chebyshev UCL	7.211
97.5% KM Chebyshev UCL	8.413	99% KM Chebyshev UCL	10.77

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.793	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.121	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.142	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.635	k star (bias corrected MLE)	1.529
Theta hat (MLE)	4.064	Theta star (bias corrected MLE)	4.346
nu hat (MLE)	130.8	nu star (bias corrected)	122.3
MLE Mean (bias corrected)	6.644	MLE Sd (bias corrected)	5.373

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.768	nu hat (KM)	99.88
Approximate Chi Square Value (99.88, α)	77.83	Adjusted Chi Square Value (99.88, β)	77.39
95% Gamma Approximate KM-UCL (use when n>=50)	5.689	95% Gamma Adjusted KM-UCL (use when n<50)	5.721

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.101
Maximum	20.4	Median	2.05
SD	5.335	CV	1.301
k hat (MLE)	0.316	k star (bias corrected MLE)	0.312
Theta hat (MLE)	12.97	Theta star (bias corrected MLE)	13.15
nu hat (MLE)	41.12	nu star (bias corrected)	40.55
MLE Mean (bias corrected)	4.101	MLE Sd (bias corrected)	7.342
		Adjusted Level of Significance (β)	0.0463
Approximate Chi Square Value (40.55, α)	26.96	Adjusted Chi Square Value (40.55, β)	26.71
95% Gamma Approximate UCL (use when n>=50)	6.169	95% Gamma Adjusted UCL (use when n<50)	6.227

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.951	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.94	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.105	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.14	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	4.396	Mean in Log Scale	0.858
SD in Original Scale	5.117	SD in Log Scale	1.124
95% t UCL (assumes normality of ROS data)	5.455	95% Percentile Bootstrap UCL	5.443
95% BCA Bootstrap UCL	5.548	95% Bootstrap t UCL	5.671
95% H-UCL (Log ROS)	6.096		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.891	95% H-UCL (KM -Log)	6.012
KM SD (logged)	1.09	95% Critical H Value (KM-Log)	2.266
KM Standard Error of Mean (logged)	0.15		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	4.37	Mean in Log Scale	0.793
SD in Original Scale	5.145	SD in Log Scale	1.206
95% t UCL (Assumes normality)	5.435	95% H-Stat UCL	6.388

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Percentile Bootstrap) UCL	5.474	95% GROS Approximate Gamma UCL	6.169
95% Approximate Gamma KM-UCL	5.689		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 4:16:32 PM
From File	UCL data combined_a.xls
Full Precision	OFF

Rosner's Outlier Test for 5 Outliers in Cobalt Subsurface Soil Outside Fence

Total N	358
Number NDs	12
Number Detects	358
Mean with NDs=DL/2	266.7
SD with NDs=DL/2	566.4
Number of data	358
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	266.7	565.6	6650	358	11.29	3.773	4.143
2	248.8	454.9	4260	357	8.819	3.771	4.141
3	237.6	402.5	3530	356	8.179	3.77	4.14
4	228.3	363	2470	355	6.175	3.768	4.138
5	222	343.3	2170	354	5.674	3.766	4.136

For 5% significance level, there are 5 Potential Outliers
6650, 4260, 3530, 2470, 2170

For 1% Significance Level, there are 5 Potential Outliers
6650, 4260, 3530, 2470, 2170

Test Rerun After Q/Q Plot Confirmation and Removal of 4 Outliers

Total N	354
Number NDs	12
Number Detects	354
Mean with NDs=DL/2	222
SD with NDs=DL/2	343.3
Number of data	354
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	222	342.8	2170	354	5.682	3.771	4.141
2	216.4	327.7	2090	353	5.717	3.769	4.139
3	211.1	312.5	1750	352	4.924	3.767	4.137
4	206.7	301.9	1740	351	5.078	3.765	4.135
5	202.4	291	1590	350	4.769	3.763	4.133

For 5% significance level, there are 5 Potential Outliers
2170, 2090, 1750, 1740, 1590

For 1% Significance Level, there are 5 Potential Outliers
2170, 2090, 1750, 1740, 1590

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

Total N	352
Number NDs	12
Number Detects	352
Mean with NDs=DL/2	211.1
SD with NDs=DL/2	312.5
Number of data	352
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	211.1	312.1	1750	352	4.931	3.769	4.139
2	206.7	301.9	1740	351	5.078	3.767	4.137
3	202.4	291	1590	350	4.769	3.765	4.135
4	198.4	281.7	1430	349	4.372	3.764	4.134
5	194.8	274.2	1380	347	4.321	3.762	4.132

For 5% significance level, there are 5 Potential Outliers
1750, 1740, 1590, 1430, 1380

For 1% Significance Level, there are 5 Potential Outliers
1750, 1740, 1590, 1430, 1380

Test Rerun After Q/Q Plot Confirmation and Removal of 3 Outliers

Total N	349
Number NDs	12
Number Detects	349
Mean with NDs=DL/2	198.4
SD with NDs=DL/2	281.7
Number of data	349
Number of suspected outliers	5

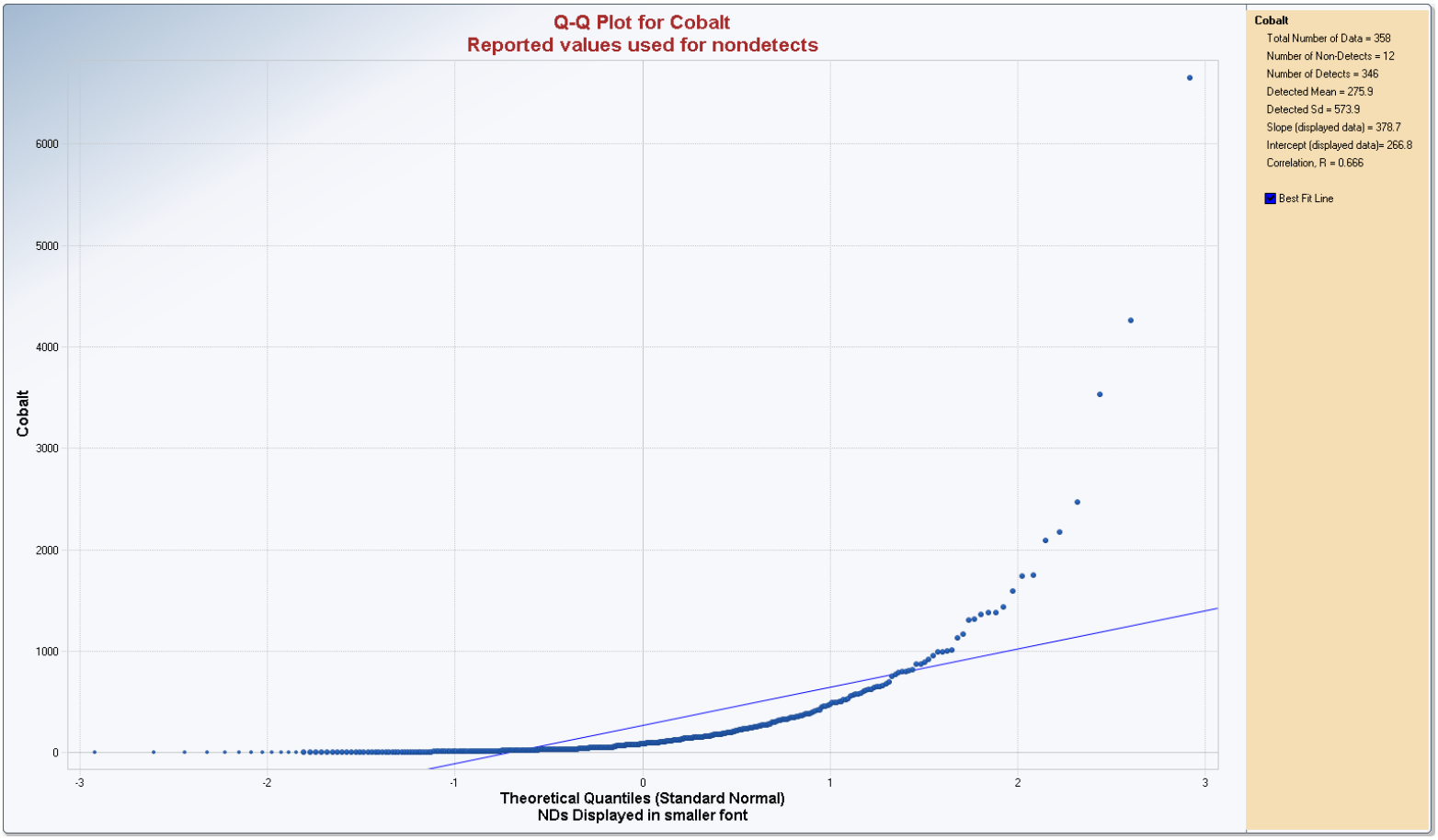
NDs replaced with half value.

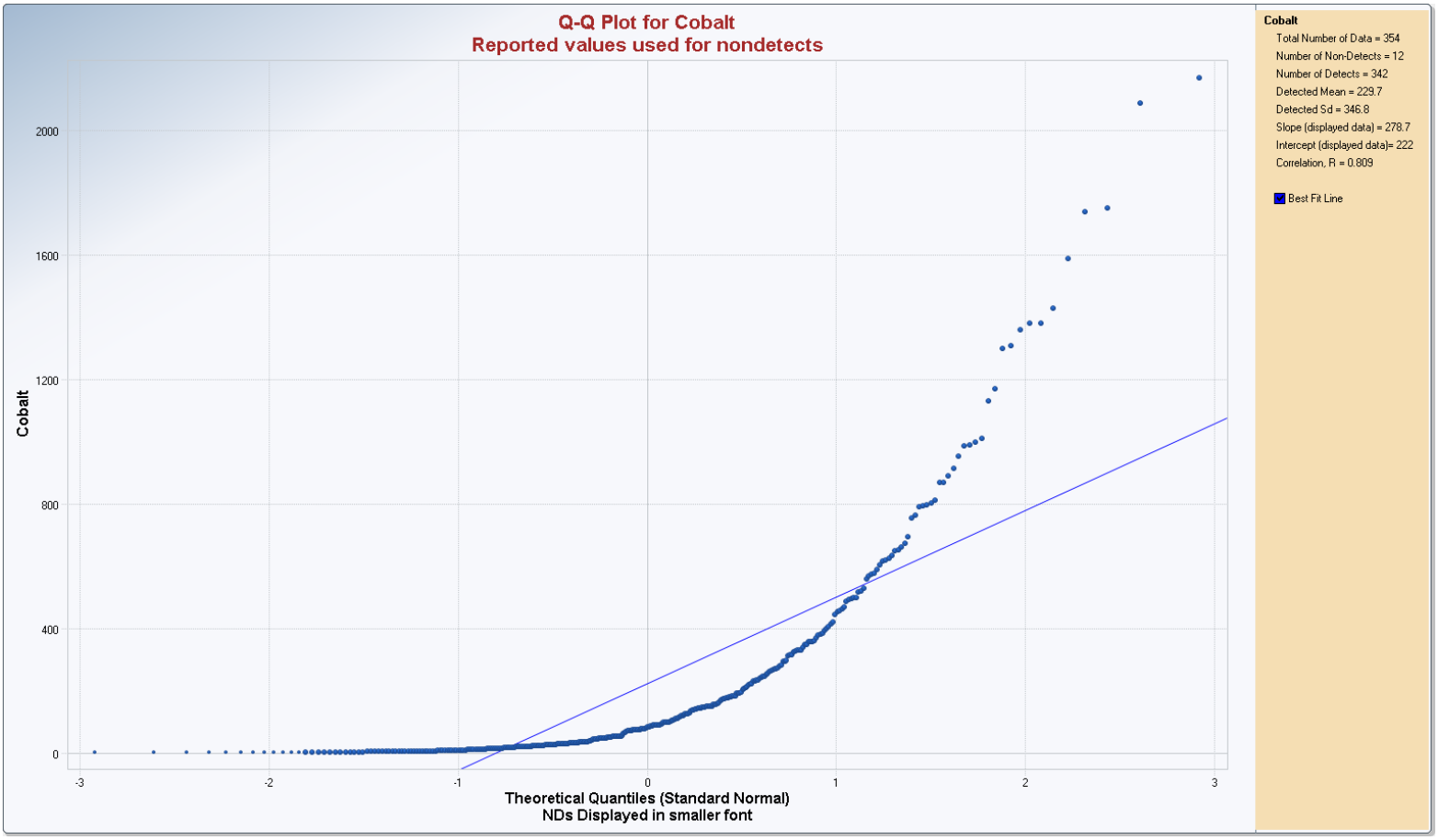
#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	198.4	281.3	1430	349	4.378	3.767	4.137
2	194.8	274.2	1380	347	4.321	3.765	4.135
3	191.4	267.1	1380	348	4.449	3.763	4.133
4	188	259.7	1360	346	4.512	3.761	4.131
5	184.6	252.3	1310	345	4.461	3.759	4.129

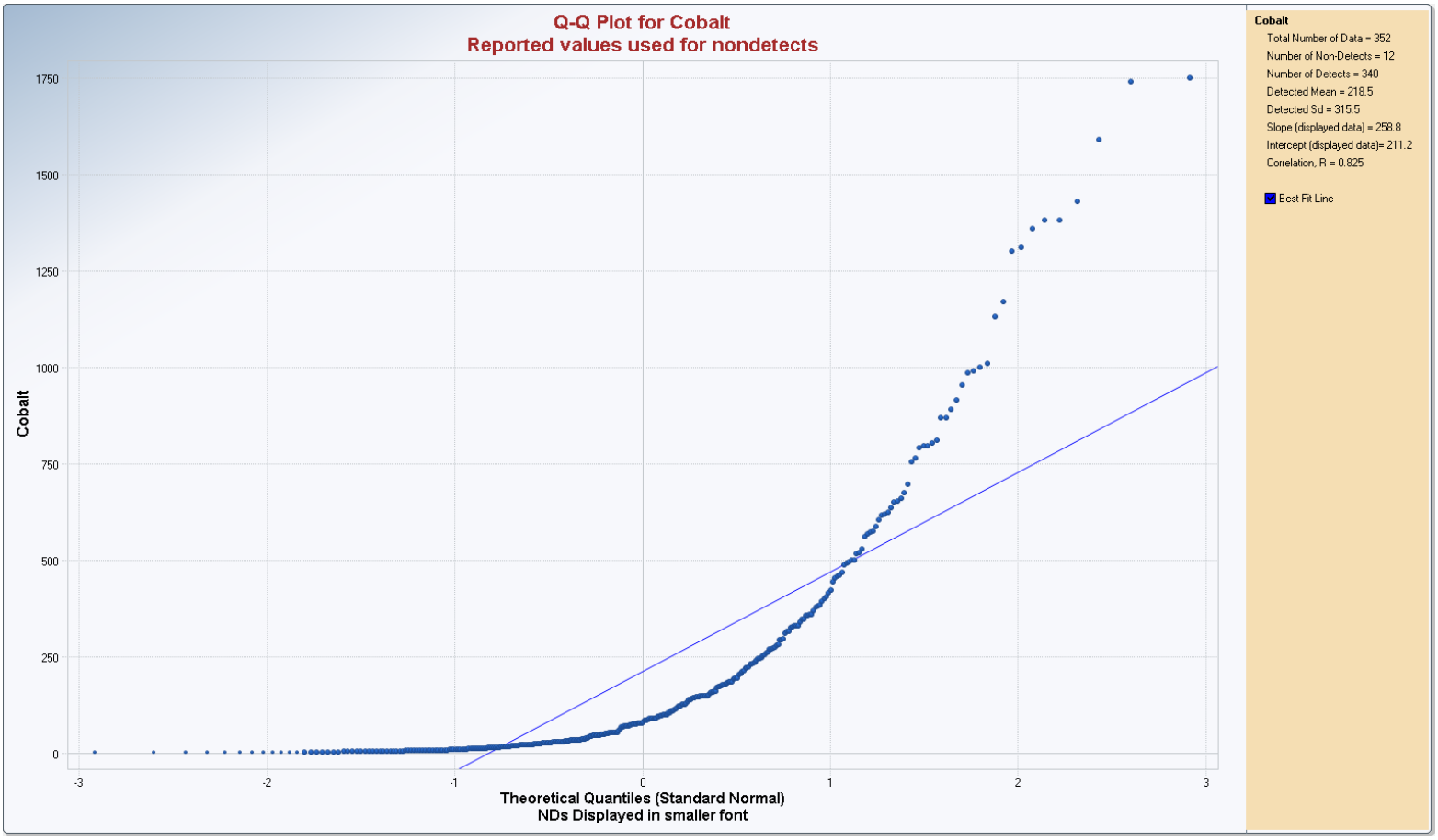
For 5% significance level, there are 5 Potential Outliers
1430, 1380, 1380, 1360, 1310

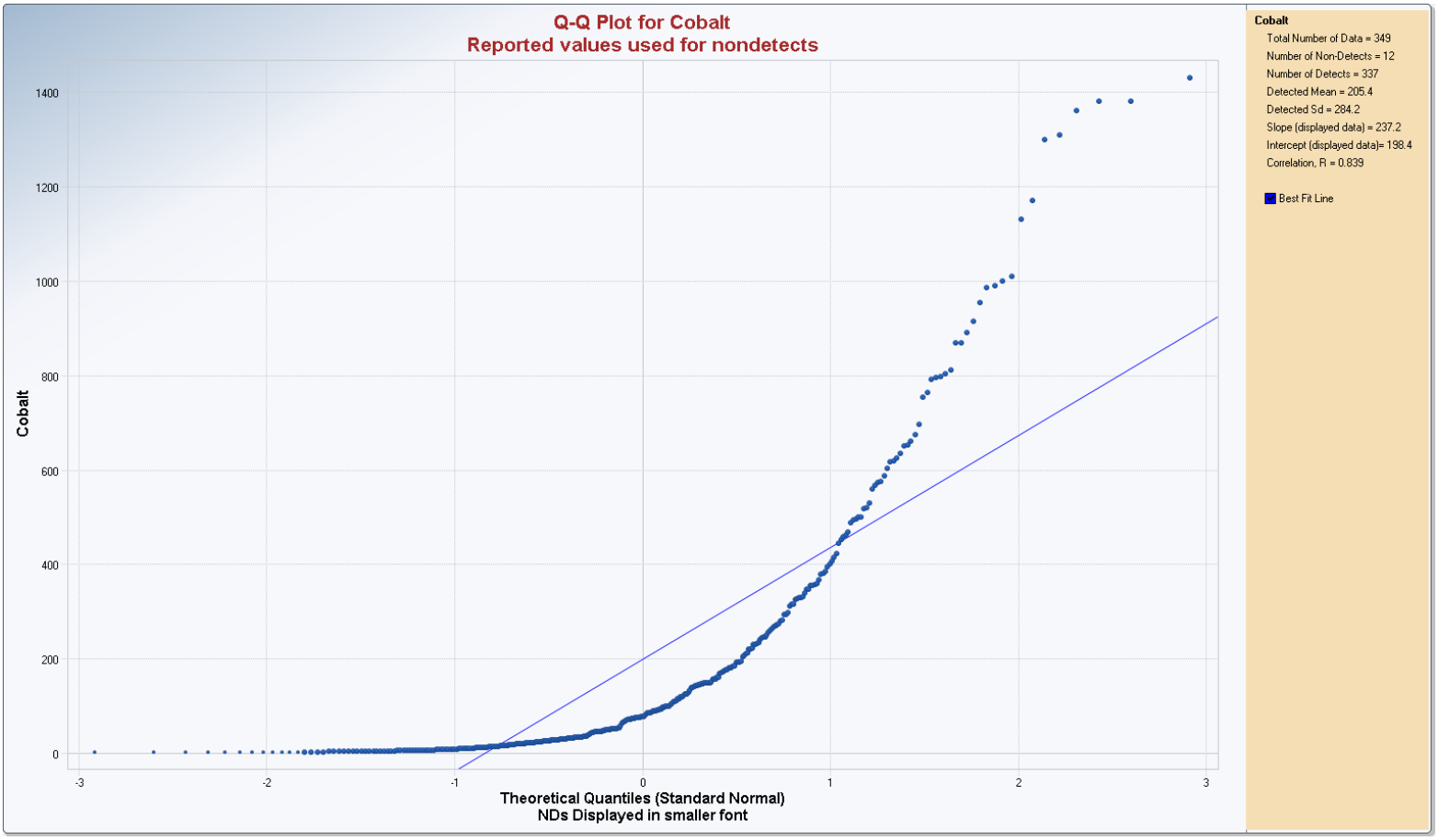
For 1% Significance Level, there are 5 Potential Outliers
1430, 1380, 1380, 1360, 1310

Review of Q/Q plot did not confirm any additional outliers


Q-Q Plot for Cobalt
Reported values used for nondetects
Cobalt
6000
5000
4000
3000
2000
1000
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cobalt
Total Number of Data = 358
Number of Non-Detects = 12
Number of Detects = 346
Detected Mean = 275.9
Detected Sd = 573.9
Slope (displayed data) = 378.7
Intercept (displayed data)= 266.8
Correlation, R = 0.666
Best Fit Line


Q-Q Plot for Cobalt
Reported values used for nondetects
Cobalt
2000
1600
1200
800
400
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cobalt
Total Number of Data = 354
Number of Non-Detects = 12
Number of Detects = 342
Detected Mean = 229.7
Detected Sd = 346.8
Slope (displayed data) = 278.7
Intercept (displayed data)= 222
Correlation, R = 0.809
Best Fit Line


Q-Q Plot for Cobalt
Reported values used for nondetects
Cobalt
1750
1500
1250
1000
750
500
250
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cobalt
Total Number of Data = 352
Number of Non-Detects = 12
Number of Detects = 340
Detected Mean = 218.5
Detected Sd = 315.5
Slope (displayed data) = 258.8
Intercept (displayed data)= 211.2
Correlation, R = 0.825
Best Fit Line


Q-Q Plot for Cobalt
Reported values used for nondetects
Cobalt
1400
1200
1000
800
600
400
200
0
-3
-2
-1
0
1
2
3
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Cobalt
Total Number of Data = 349
Number of Non-Detects = 12
Number of Detects = 337
Detected Mean = 205.4
Detected Sd = 284.2
Slope (displayed data) = 237.2
Intercept (displayed data)= 198.4
Correlation, R = 0.839
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:35:44 PM
From File	UCL data combined_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Cobalt Subsurface Outside Fence

General Statistics

Total Number of Observations	349	Number of Distinct Observations	315
Number of Detects	337	Number of Non-Detects	12
Number of Distinct Detects	306	Number of Distinct Non-Detects	9
Minimum Detect	2.68	Minimum Non-Detect	2.14
Maximum Detect	1430	Maximum Non-Detect	2.49
Variance Detects	80763	Percent Non-Detects	3.438%
Mean Detects	205.4	SD Detects	284.2
Median Detects	86.3	CV Detects	1.384
Skewness Detects	2.151	Kurtosis Detects	4.713
Mean of Logged Detects	4.299	SD of Logged Detects	1.613

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.704	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.238	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0483	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	198.4	Standard Error of Mean	15.08
SD	281.3	95% KM (BCA) UCL	223.1
95% KM (t) UCL	223.3	95% KM (Percentile Bootstrap) UCL	224
95% KM (z) UCL	223.2	95% KM Bootstrap t UCL	224.6
90% KM Chebyshev UCL	243.7	95% KM Chebyshev UCL	264.1
97.5% KM Chebyshev UCL	292.6	99% KM Chebyshev UCL	348.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.45	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.812	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0861	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.052	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.602	k star (bias corrected MLE)	0.598
Theta hat (MLE)	341.3	Theta star (bias corrected MLE)	343.3
nu hat (MLE)	405.6	nu star (bias corrected)	403.3
MLE Mean (bias corrected)	205.4	MLE Sd (bias corrected)	265.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.498	nu hat (KM)	347.3
Approximate Chi Square Value (347.28, α)	305.1	Adjusted Chi Square Value (347.28, β)	304.9
95% Gamma Approximate KM-UCL (use when n>=50)	225.8	95% Gamma Adjusted KM-UCL (use when n<50)	226

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	198.3
Maximum	1430	Median	78
SD	281.7	CV	1.421
k hat (MLE)	0.491	k star (bias corrected MLE)	0.489
Theta hat (MLE)	404	Theta star (bias corrected MLE)	405.9
nu hat (MLE)	342.7	nu star (bias corrected)	341.1
MLE Mean (bias corrected)	198.3	MLE Sd (bias corrected)	283.7
		Adjusted Level of Significance (β)	0.0493
Approximate Chi Square Value (341.06, α)	299.3	Adjusted Chi Square Value (341.06, β)	299.1
95% Gamma Approximate UCL (use when n>=50)	226	95% Gamma Adjusted UCL (use when n<50)	226.2

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0641	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0483	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	198.4	Mean in Log Scale	4.166
SD in Original Scale	281.7	SD in Log Scale	1.733
95% t UCL (assumes normality of ROS data)	223.3	95% Percentile Bootstrap UCL	222.9
95% BCA Bootstrap UCL	226.7	95% Bootstrap t UCL	225.9
95% H-UCL (Log ROS)	376.2		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	198.4	Mean in Log Scale	4.155
SD in Original Scale	281.7	SD in Log Scale	1.759
95% t UCL (Assumes normality)	223.2	95% H-Stat UCL	391.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	292.6

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 4:37:44 PM
From File	UCL data combined_b.xls
Full Precision	OFF

Rosner's Outlier Test for 5 Outliers in Manganese Subsurface Soil Outside Fence

Total N	167
Number NDs	1
Number Detects	167
Mean with NDs=DL/2	567.6
SD with NDs=DL/2	896.9
Number of data	167
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	567.6	894.3	6990	167	7.182	3.551	3.921
2	528.9	746.9	4450	166	5.25	3.541	3.921
3	505.1	683.4	4010	165	5.129	3.541	3.917
4	483.7	627.7	3910	164	5.458	3.541	3.911
5	462.7	568.8	3150	163	4.724	3.541	3.911

For 5% significance level, there are 5 Potential Outliers
6990, 4450, 4010, 3910, 3150

For 1% Significance Level, there are 5 Potential Outliers
6990, 4450, 4010, 3910, 3150

Test Rerun After Q/Q Plot Confirmation and Removal of 4 Outliers

Total N	163
Number NDs	1
Number Detects	163
Mean with NDs=DL/2	462.7
SD with NDs=DL/2	568.8
Number of data	163
Number of suspected outliers	5

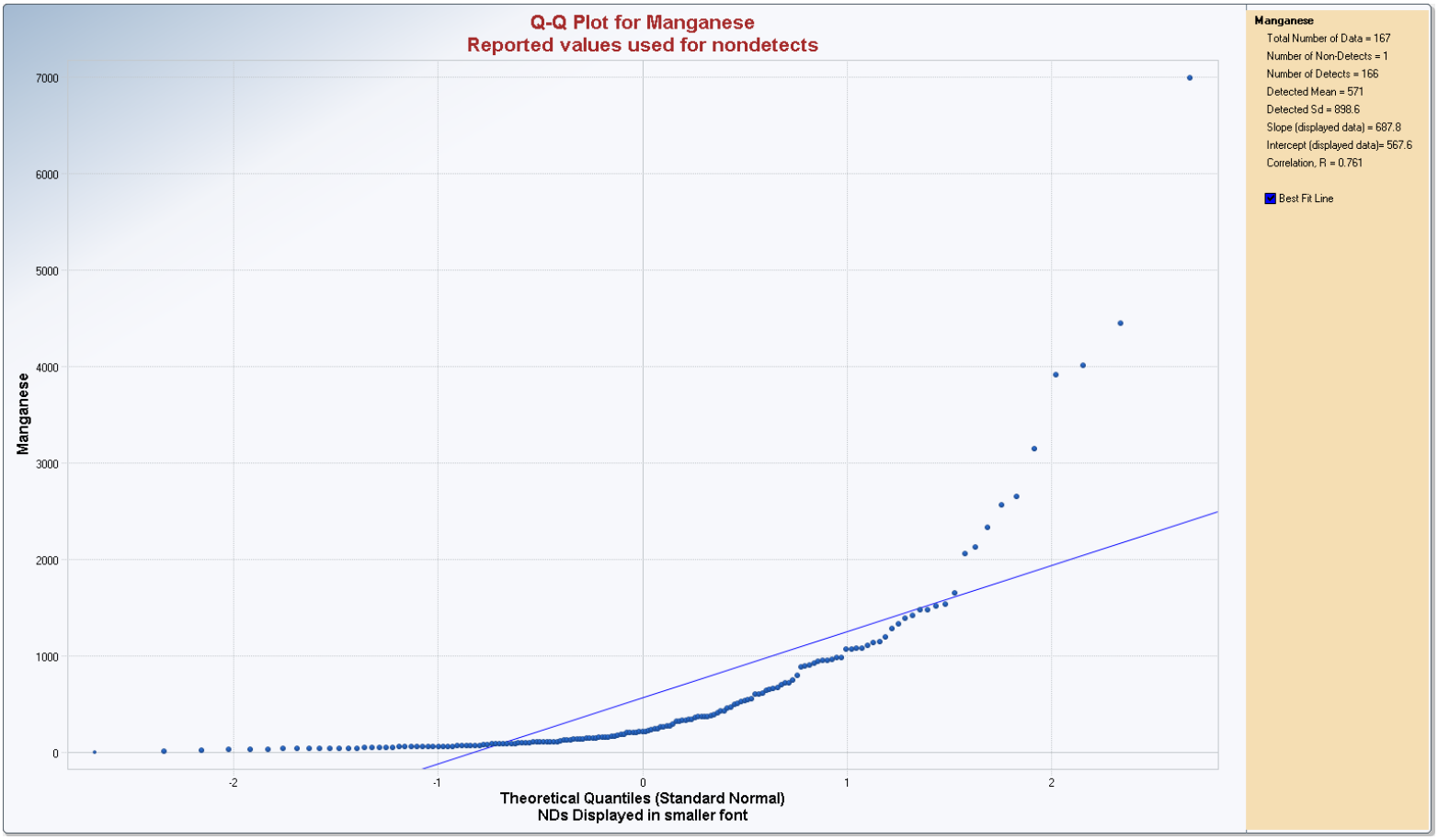
NDs replaced with half value.

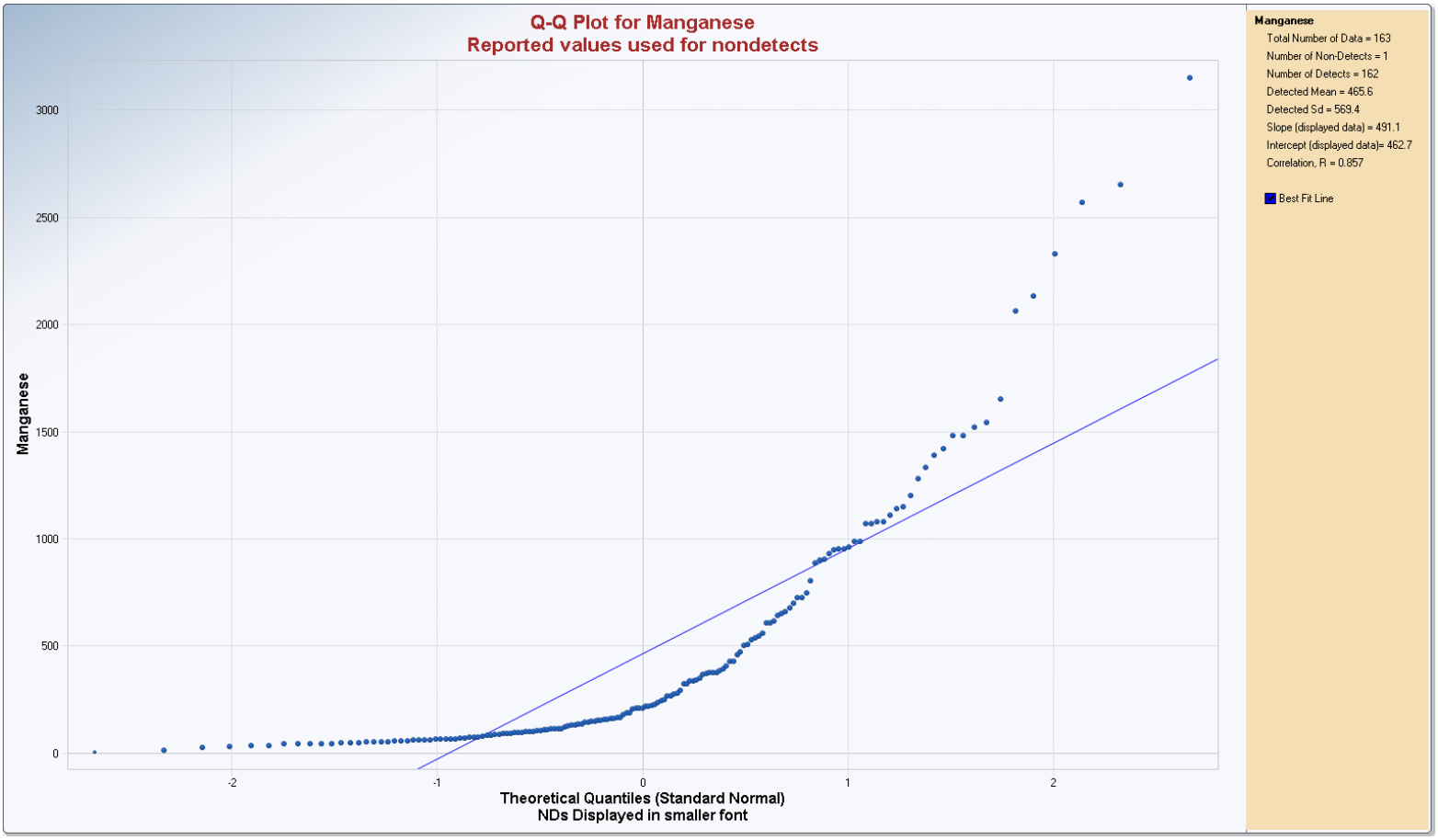
#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	462.7	567.1	3150	163	4.739	3.543	3.913
2	446.1	529.5	2650	162	4.162	3.533	3.913
3	432.5	501.6	2570	161	4.261	3.533	3.911
4	419.1	473.6	2330	160	4.035	3.533	3.903
5	407.1	450	2130	159	3.829	3.533	3.903

For 5% significance level, there are 5 Potential Outliers
3150, 2650, 2570, 2330, 2130

For 1% Significance Level, there are 4 Potential Outliers
3150, 2650, 2570, 2330

Q/Q Plot Confirmed 1 Additional Outlier (3150) - Test not rerun


Q-Q Plot for Manganese
Reported values used for nondetects
Manganese
7000
6000
5000
4000
3000
2000
1000
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Manganese
Total Number of Data = 167
Number of Non-Detects = 1
Number of Detects = 166
Detected Mean = 571
Detected Sd = 898.6
Slope (displayed data) = 687.8
Intercept (displayed data)= 567.6
Correlation, R = 0.761
Best Fit Line


Q-Q Plot for Manganese
Reported values used for nondetects
Manganese
3000
2500
2000
1500
1000
500
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Manganese
Total Number of Data = 163
Number of Non-Detects = 1
Number of Detects = 162
Detected Mean = 465.6
Detected Sd = 569.4
Slope (displayed data) = 491.1
Intercept (displayed data)= 462.7
Correlation, R = 0.857
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:52:10 PM
From File	UCL data combined_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Manganese Subsurface Outside Fence

General Statistics

Total Number of Observations	162	Number of Distinct Observations	155
Number of Detects	161	Number of Non-Detects	1
Number of Distinct Detects	154	Number of Distinct Non-Detects	1
Minimum Detect	11.5	Minimum Non-Detect	3.74
Maximum Detect	2650	Maximum Non-Detect	3.74
Variance Detects	280930	Percent Non-Detects	0.617%
Mean Detects	448.9	SD Detects	530
Median Detects	211	CV Detects	1.181
Skewness Detects	1.922	Kurtosis Detects	3.883
Mean of Logged Detects	5.455	SD of Logged Detects	1.184

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.749	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.205	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0698	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	446.2	Standard Error of Mean	41.61
SD	527.9	95% KM (BCA) UCL	528.6
95% KM (t) UCL	515	95% KM (Percentile Bootstrap) UCL	520.1
95% KM (z) UCL	514.6	95% KM Bootstrap t UCL	526.1
90% KM Chebyshev UCL	571	95% KM Chebyshev UCL	627.5
97.5% KM Chebyshev UCL	706	99% KM Chebyshev UCL	860.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	3.4	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.789	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.129	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0762	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.897	k star (bias corrected MLE)	0.884
Theta hat (MLE)	500.5	Theta star (bias corrected MLE)	507.6
nu hat (MLE)	288.8	nu star (bias corrected)	284.8
MLE Mean (bias corrected)	448.9	MLE Sd (bias corrected)	477.3

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.714	nu hat (KM)	231.4
Approximate Chi Square Value (231.43, α)	197.2	Adjusted Chi Square Value (231.43, β)	196.9
95% Gamma Approximate KM-UCL (use when n>=50)	523.6	95% Gamma Adjusted KM-UCL (use when n<50)	524.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	446.1
Maximum	2650	Median	210.5
SD	529.6	CV	1.187
k hat (MLE)	0.834	k star (bias corrected MLE)	0.822
Theta hat (MLE)	535	Theta star (bias corrected MLE)	542.4
nu hat (MLE)	270.2	nu star (bias corrected)	266.5
MLE Mean (bias corrected)	446.1	MLE Sd (bias corrected)	491.9
		Adjusted Level of Significance (β)	0.0485
Approximate Chi Square Value (266.49, α)	229.7	Adjusted Chi Square Value (266.49, β)	229.4
95% Gamma Approximate UCL (use when n>=50)	517.6	95% Gamma Adjusted UCL (use when n<50)	518.3

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0755	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0698	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	446.2	Mean in Log Scale	5.434
SD in Original Scale	529.5	SD in Log Scale	1.209
95% t UCL (assumes normality of ROS data)	515	95% Percentile Bootstrap UCL	519.3
95% BCA Bootstrap UCL	524	95% Bootstrap t UCL	521.2
95% H-UCL (Log ROS)	595.1		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	446.1	Mean in Log Scale	5.425
SD in Original Scale	529.5	SD in Log Scale	1.239
95% t UCL (Assumes normality)	515	95% H-Stat UCL	617.2

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	627.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Outlier Tests for Selected Variables replacing nondetects with 1/2 the Detection Limit

User Selected Options

Date/Time of Computation	2/25/2016 4:53:40 PM
From File	UCL data combined_c.xls
Full Precision	OFF

Rosner's Outlier Test for 5 Outliers in Nickel Subsurface Soil Outside Fence

Total N	137
Number NDs	2
Number Detects	137
Mean with NDs=DL/2	135.3
SD with NDs=DL/2	328.4
Number of data	137
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	135.3	327.2	2920	137	8.51	3.484	3.854
2	114.8	225.4	1400	136	5.702	3.476	3.854
3	105.3	196.9	1080	135	4.951	3.476	3.854
4	98	178.5	924	134	4.628	3.474	3.844
5	91.79	164	766	133	4.112	3.474	3.844

For 5% significance level, there are 5 Potential Outliers
2920, 1400, 1080, 924, 766

For 1% Significance Level, there are 5 Potential Outliers
2920, 1400, 1080, 924, 766

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

Total N	135
Number NDs	2
Number Detects	135
Mean with NDs=DL/2	105.3
SD with NDs=DL/2	196.9
Number of data	135
Number of suspected outliers	5

NDs replaced with half value.

#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	105.3	196.1	1080	135	4.97	3.478	3.848
2	98	178.5	924	134	4.628	3.471	3.848
3	91.79	164	766	133	4.112	3.471	3.848
4	86.69	153.6	719	132	4.117	3.468	3.838
5	81.86	143.8	698	131	4.285	3.468	3.838

For 5% significance level, there are 5 Potential Outliers
1080, 924, 766, 719, 698

For 1% Significance Level, there are 5 Potential Outliers
1080, 924, 766, 719, 698

Test Rerun After Q/Q Plot Confirmation and Removal of 2 Outliers

Total N	133
Number NDs	2
Number Detects	133
Mean with NDs=DL/2	91.79
SD with NDs=DL/2	164
Number of data	133
Number of suspected outliers	5

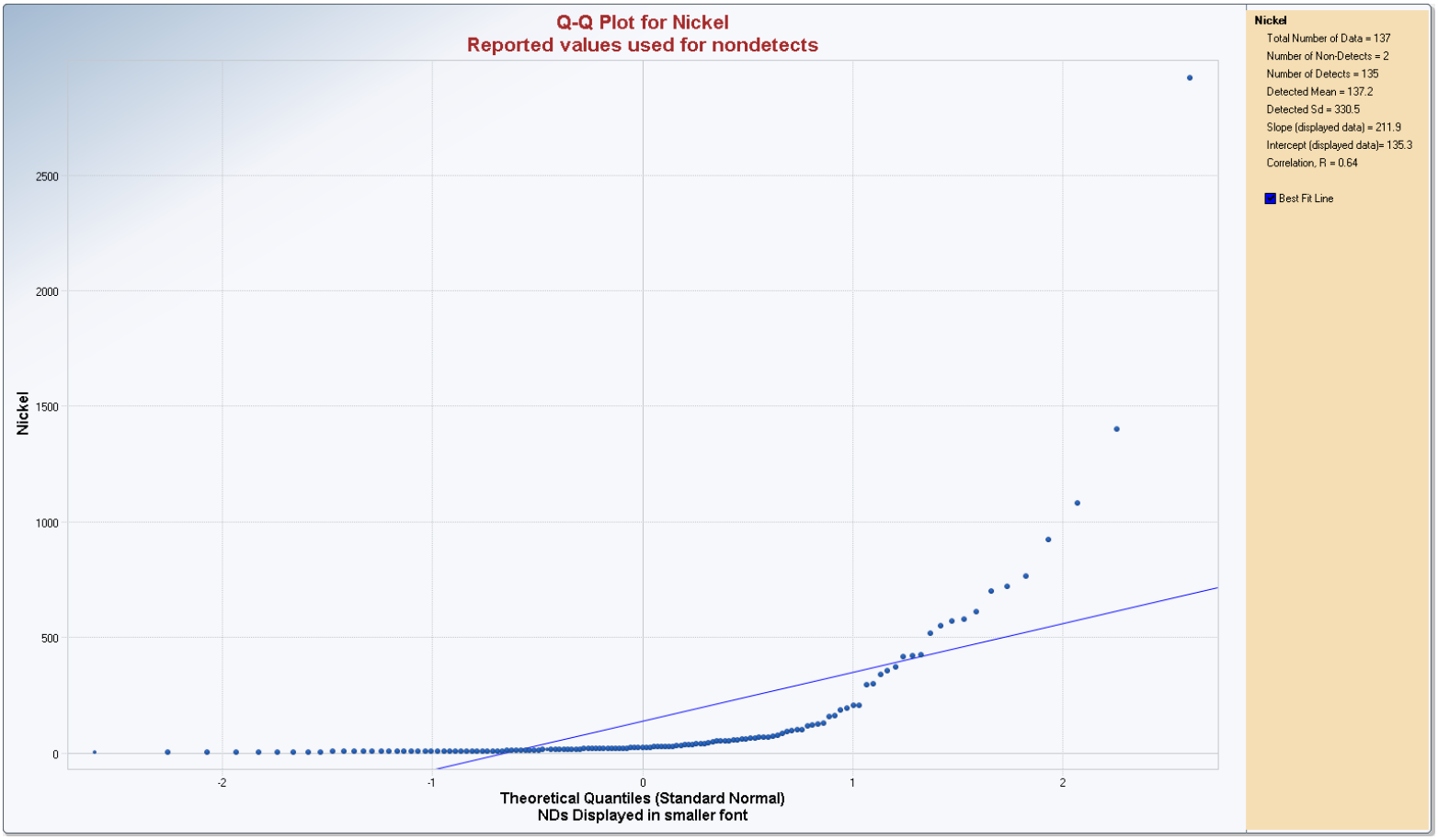
NDs replaced with half value.

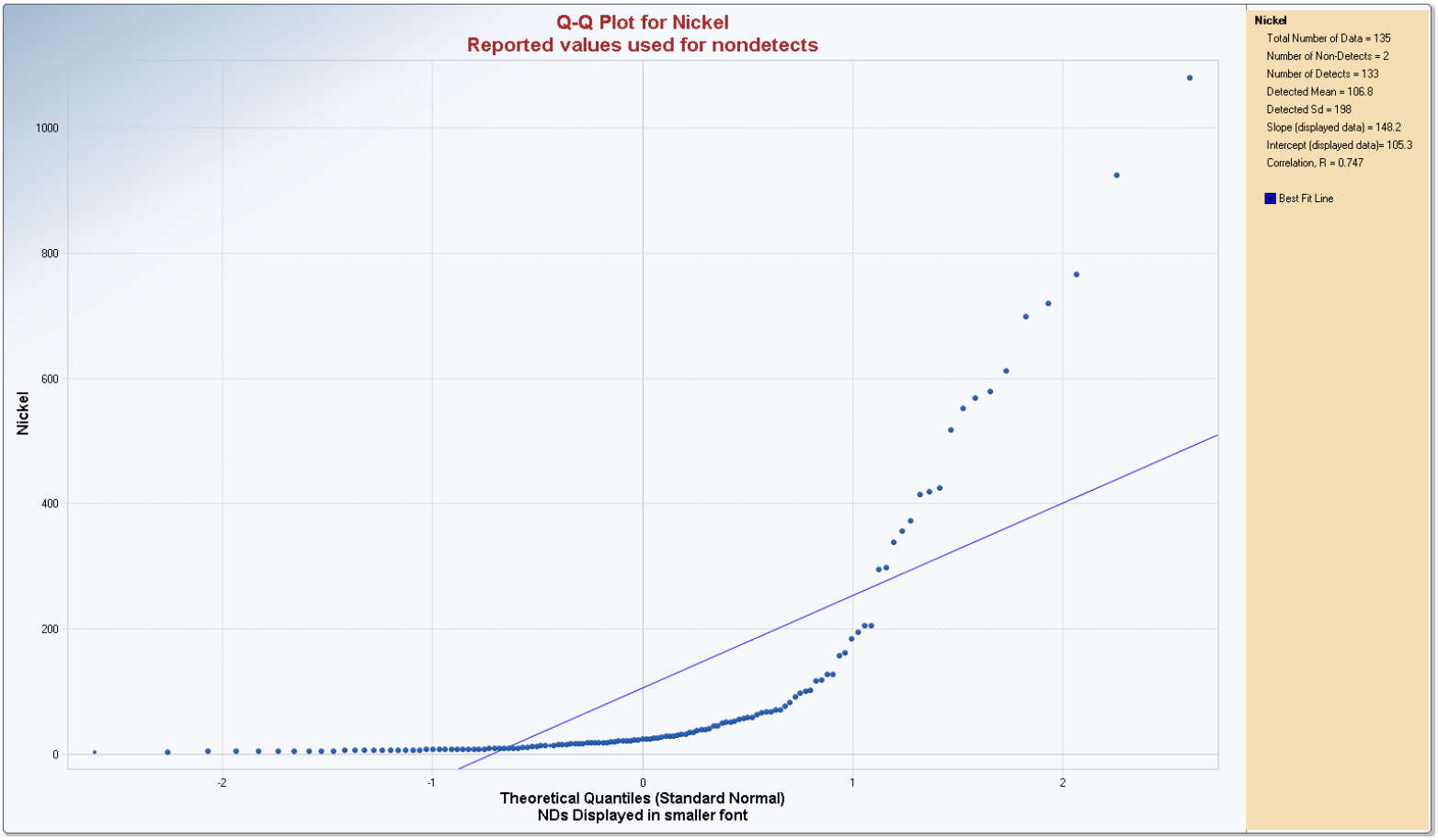
#	Mean	sd	Potential outlier	Obs. Number	Test value	Critical value (5%)	Critical value (1%)
1	91.79	163.3	766	133	4.127	3.472	3.842
2	86.69	153.6	719	132	4.117	3.466	3.842
3	81.86	143.8	698	131	4.285	3.466	3.842
4	77.12	133.7	611	130	3.994	3.462	3.832
5	72.98	125.6	579	129	4.03	3.462	3.832

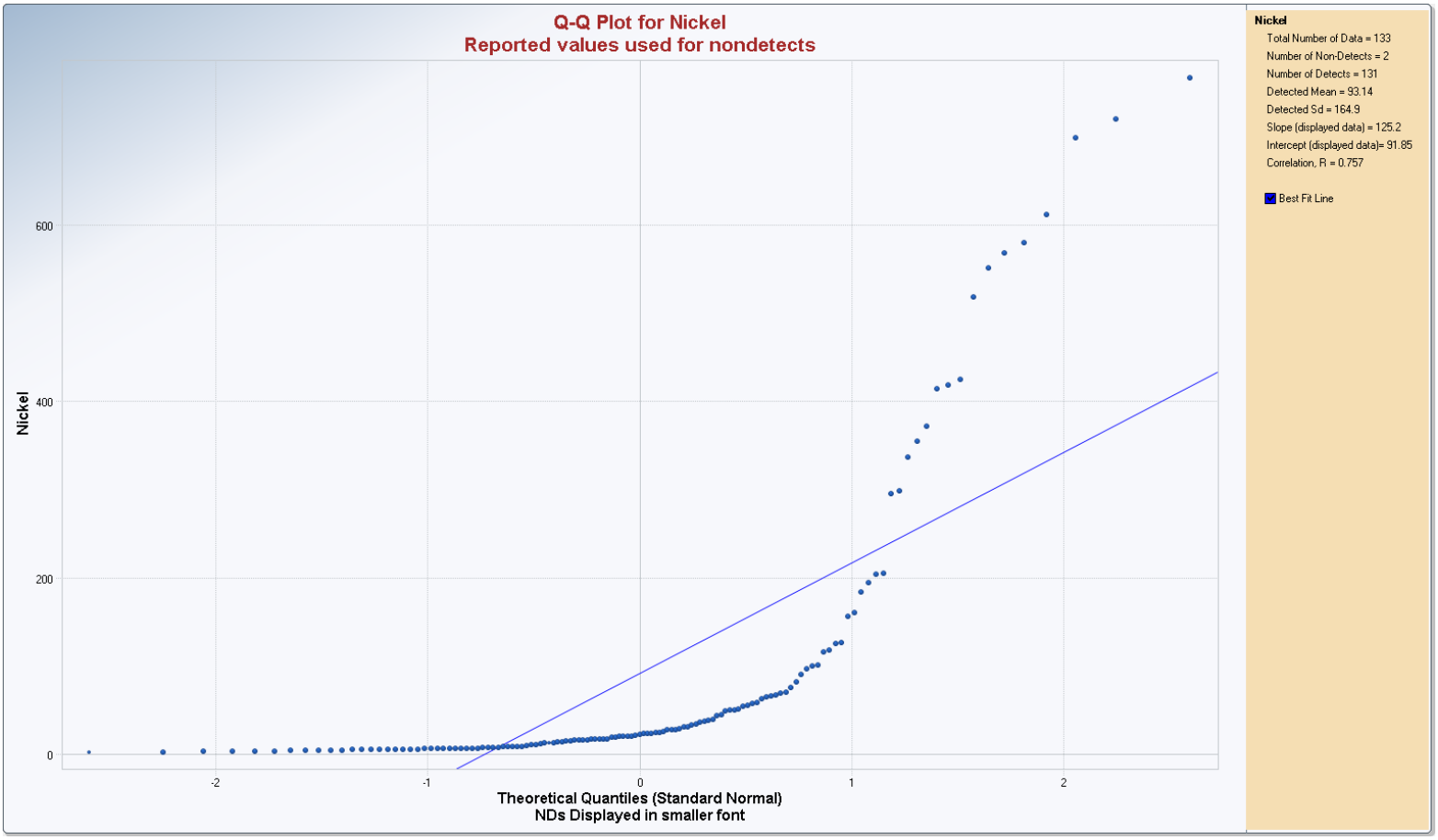
For 5% significance level, there are 5 Potential Outliers
766, 719, 698, 611, 579

For 1% Significance Level, there are 5 Potential Outliers
766, 719, 698, 611, 579

Q/Q Plot review did not confirm any additional outliers


Q-Q Plot for Nickel
Reported values used for nondetects
Nickel
2500
2000
1500
1000
500
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Nickel
Total Number of Data = 137
Number of Non-Detects = 2
Number of Detects = 135
Detected Mean = 137.2
Detected Sd = 330.5
Slope (displayed data) = 211.9
Intercept (displayed data)= 135.3
Correlation, R = 0.64
Best Fit Line


Q-Q Plot for Nickel
Reported values used for nondetects
Nickel
1000
800
600
400
200
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Nickel
Total Number of Data = 135
Number of Non-Detects = 2
Number of Detects = 133
Detected Mean = 106.8
Detected Sd = 198
Slope (displayed data) = 148.2
Intercept (displayed data)= 105.3
Correlation, R = 0.747
Best Fit Line


Q-Q Plot for Nickel
Reported values used for nondetects
Nickel
600
400
200
0
-2
-1
0
1
2
Theoretical Quantiles (Standard Normal)
NDs Displayed in smaller font
Nickel
Total Number of Data = 133
Number of Non-Detects = 2
Number of Detects = 131
Detected Mean = 93.14
Detected Sd = 164.9
Slope (displayed data) = 125.2
Intercept (displayed data)= 91.85
Correlation, R = 0.757
Best Fit Line

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:59:55 PM
From File	UCL data combined_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Nickel Subsurface Outside Fence

General Statistics

Total Number of Observations	133	Number of Distinct Observations	129
Number of Detects	131	Number of Non-Detects	2
Number of Distinct Detects	127	Number of Distinct Non-Detects	2
Minimum Detect	2.76	Minimum Non-Detect	2.49
Maximum Detect	766	Maximum Non-Detect	13.1
Variance Detects	27177	Percent Non-Detects	1.504%
Mean Detects	93.14	SD Detects	164.9
Median Detects	23.5	CV Detects	1.77
Skewness Detects	2.514	Kurtosis Detects	5.686
Mean of Logged Detects	3.393	SD of Logged Detects	1.468

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.577	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.311	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0774	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	91.8	Standard Error of Mean	14.22
SD	163.3	95% KM (BCA) UCL	114.2
95% KM (t) UCL	115.4	95% KM (Percentile Bootstrap) UCL	116.3
95% KM (z) UCL	115.2	95% KM Bootstrap t UCL	120.6
90% KM Chebyshev UCL	134.5	95% KM Chebyshev UCL	153.8
97.5% KM Chebyshev UCL	180.6	99% KM Chebyshev UCL	233.3

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	7.155	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.815	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.172	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0859	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.549	k star (bias corrected MLE)	0.541
Theta hat (MLE)	169.8	Theta star (bias corrected MLE)	172.1
nu hat (MLE)	143.7	nu star (bias corrected)	141.8
MLE Mean (bias corrected)	93.14	MLE Sd (bias corrected)	126.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.316	nu hat (KM)	84.03
Approximate Chi Square Value (84.03, α)	63.9	Adjusted Chi Square Value (84.03, β)	63.71
95% Gamma Approximate KM-UCL (use when n>=50)	120.7	95% Gamma Adjusted KM-UCL (use when n<50)	121.1

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	91.74
Maximum	766	Median	22.2
SD	164	CV	1.788
k hat (MLE)	0.508	k star (bias corrected MLE)	0.502
Theta hat (MLE)	180.5	Theta star (bias corrected MLE)	182.8
nu hat (MLE)	135.2	nu star (bias corrected)	133.5
MLE Mean (bias corrected)	91.74	MLE Sd (bias corrected)	129.5
		Adjusted Level of Significance (β)	0.0482
Approximate Chi Square Value (133.47, α)	107.8	Adjusted Chi Square Value (133.47, β)	107.5
95% Gamma Approximate UCL (use when n>=50)	113.6	95% Gamma Adjusted UCL (use when n<50)	113.9

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0825	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0774	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	91.79	Mean in Log Scale	3.351
SD in Original Scale	164	SD in Log Scale	1.504
95% t UCL (assumes normality of ROS data)	115.3	95% Percentile Bootstrap UCL	117.3
95% BCA Bootstrap UCL	121.6	95% Bootstrap t UCL	117.6
95% H-UCL (Log ROS)	125.8		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	91.79	Mean in Log Scale	3.357
SD in Original Scale	164	SD in Log Scale	1.488
95% t UCL (Assumes normality)	115.3	95% H-Stat UCL	123

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	153.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ATTACHMENT D

Uncertainties Section Tables and ProUCL Output

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Table D-1

Uncertainty Evaluation for
Soil Inside the Fenceline
Umicore CSM NA Facility, Arab, Alabama

Analytes of Interest	Number of Outliers Removed	Frequency of Detection	Mean Concentration (mg/kg)	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Industrial RSL (mg/kg)	Identified as COPC? Y / N
Surface Soil (0-1 foot bls)							
Cadmium (risk eval)	1	13 of 14	23	97	35	980	No
Cadmium (uncertainty eval)	0	14 of 15	42	287	122	980	No
Cobalt	0	17 of 17	394	1740	844	350	Yes
Manganese	0	10 of 10	198	338	261	26000	No
Nickel	0	10 of 10	170	500	282	22000	No
Subsurface Soil							
Cadmium	0	18 of 22	34	287	86	980	No
Cobalt (risk eval)	3	22 of 23	115	763	272	350	No
Cobalt (uncertainty eval)	0	25 of 26	277	1740	686	350	Yes
Manganese	0	12 of 12	188	338	240	26000	No
Nickel	0	12 of 12	147	500	344	22000	No

Yellow highlighted rows provide the statistics if outliers are not removed from the data sets.

Table D-2

Uncertainty Evaluation for
Soil Outside the Fenceline
Umicore CSM NA Facility, Arab, Alabama

Analytes of Interest	Number of Outliers Removed	Frequency of Detection	Mean Concentration (mg/kg)	Maximum Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Industrial RSL (mg/kg)	Identified as COPC? Y / N
Surface Soil (0-1 foot bls)							
Cadmium (risk eval)	2	25 of 44	6.8	20.4	5.6	980	No
Cadmium (uncertainty eval)	0	27 of 46	8.5	32.0	8.6	980	No
Cobalt (risk eval)	6	175 of 175	297	1750	422	350	Yes
Cobalt (uncertainty eval)	0	181 of 181	404	6650	647	350	Yes
Manganese (risk eval)	4	101 of 101	534	2650	791	26000	No
Manganese (uncertainty eval)	0	105 of 105	685	6990	1112	26000	No
Nickel (risk eval)	4	93 of 94	99	698	171	22000	No
Nickel (uncertainty eval)	0	97 of 98	160	2920	393	22000	No
Subsurface Soil							
Cadmium (risk eval)	2	40 of 65	6.6	20.4	6.2	980	No
Cadmium (uncertainty eval)	0	42 of 67	7.7	32	7.3	980	No
Cobalt (risk eval)	9	337 of 349	205	1430	293	350	No
Cobalt (uncertainty eval)	0	346 of 358	276	6650	454	350	Yes
Manganese (risk eval)	5	161 of 162	449	2650	628	26000	No
Manganese (uncertainty eval)	0	166 of 167	571	6990	870	26000	No
Nickel (risk eval)	4	131 of 133	93	766	154	22000	No
Nickel (uncertainty eval)	0	135 of 137	137	2920	311	22000	No

Yellow highlighted rows provide the statistics if outliers are not removed from the data sets.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:51:19 PM
From File	UCL data 0to1_d.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cadmium Surface Soil Inside Fence - Outliers Included

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
Number of Detects	14	Number of Non-Detects	1
Number of Distinct Detects	14	Number of Distinct Non-Detects	1
Minimum Detect	1.22	Minimum Non-Detect	1.08
Maximum Detect	287	Maximum Non-Detect	1.08
Variance Detects	5684	Percent Non-Detects	6.667%
Mean Detects	42.03	SD Detects	75.39
Median Detects	13.1	CV Detects	1.794
Skewness Detects	3.032	Kurtosis Detects	9.888
Mean of Logged Detects	2.657	SD of Logged Detects	1.543

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.571	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.302	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	39.3	Standard Error of Mean	19
SD	70.93	95% KM (BCA) UCL	76.02
95% KM (t) UCL	72.78	95% KM (Percentile Bootstrap) UCL	73.7
95% KM (z) UCL	70.56	95% KM Bootstrap t UCL	152.6
90% KM Chebyshev UCL	96.32	95% KM Chebyshev UCL	122.1
97.5% KM Chebyshev UCL	158	99% KM Chebyshev UCL	228.4

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.545	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.786	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.156	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.24	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.575	k star (bias corrected MLE)	0.499
Theta hat (MLE)	73.11	Theta star (bias corrected MLE)	84.18
nu hat (MLE)	16.1	nu star (bias corrected)	13.98
MLE Mean (bias corrected)	42.03	MLE Sd (bias corrected)	59.48

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.307	nu hat (KM)	9.213
Approximate Chi Square Value (9.21, α)	3.456	Adjusted Chi Square Value (9.21, β)	3.035
95% Gamma Approximate KM-UCL (use when n>=50)	104.8	95% Gamma Adjusted KM-UCL (use when n<50)	119.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	39.23
Maximum	287	Median	11.5
SD	73.46	CV	1.872
k hat (MLE)	0.434	k star (bias corrected MLE)	0.392
Theta hat (MLE)	90.41	Theta star (bias corrected MLE)	100.2
nu hat (MLE)	13.02	nu star (bias corrected)	11.75
MLE Mean (bias corrected)	39.23	MLE Sd (bias corrected)	62.69
		Adjusted Level of Significance (β)	0.0324
Approximate Chi Square Value (11.75, α)	5.062	Adjusted Chi Square Value (11.75, β)	4.532
95% Gamma Approximate UCL (use when n>=50)	91.06	95% Gamma Adjusted UCL (use when n<50)	101.7

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.975	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.874	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.146	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.237	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	39.25	Mean in Log Scale	2.402
SD in Original Scale	73.44	SD in Log Scale	1.784
95% t UCL (assumes normality of ROS data)	72.65	95% Percentile Bootstrap UCL	71.73
95% BCA Bootstrap UCL	92.82	95% Bootstrap t UCL	151.2
95% H-UCL (Log ROS)	392.2		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	2.485	95% H-UCL (KM -Log)	200.7
KM SD (logged)	1.574	95% Critical H Value (KM-Log)	3.749
KM Standard Error of Mean (logged)	0.422		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	39.27	Mean in Log Scale	2.439
SD in Original Scale	73.44	SD in Log Scale	1.711
95% t UCL (Assumes normality)	72.66	95% H-Stat UCL	308.9

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	122.1	95% GROS Adjusted Gamma UCL	101.7
95% Adjusted Gamma KM-UCL	119.3		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 4:02:21 PM
From File	UCL data combined_e.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cobalt Subsurface Soil Inside Fence - Outliers Included

General Statistics

Total Number of Observations	26	Number of Distinct Observations	26
Number of Detects	25	Number of Non-Detects	1
Number of Distinct Detects	25	Number of Distinct Non-Detects	1
Minimum Detect	2.74	Minimum Non-Detect	2.28
Maximum Detect	1740	Maximum Non-Detect	2.28
Variance Detects	247601	Percent Non-Detects	3.846%
Mean Detects	276.8	SD Detects	497.6
Median Detects	47.3	CV Detects	1.798
Skewness Detects	2.331	Kurtosis Detects	4.74
Mean of Logged Detects	4.141	SD of Logged Detects	1.849

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.593	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.327	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	266.3	Standard Error of Mean	96.27
SD	481	95% KM (BCA) UCL	447.7
95% KM (t) UCL	430.7	95% KM (Percentile Bootstrap) UCL	437.2
95% KM (z) UCL	424.6	95% KM Bootstrap t UCL	589.7
90% KM Chebyshev UCL	555.1	95% KM Chebyshev UCL	685.9
97.5% KM Chebyshev UCL	867.5	99% KM Chebyshev UCL	1224

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.106	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.821	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.176	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.186	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.438	k star (bias corrected MLE)	0.412
Theta hat (MLE)	632.5	Theta star (bias corrected MLE)	672.2
nu hat (MLE)	21.88	nu star (bias corrected)	20.59
MLE Mean (bias corrected)	276.8	MLE Sd (bias corrected)	431.4

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.306	nu hat (KM)	15.94
Approximate Chi Square Value (15.94, α)	7.917	Adjusted Chi Square Value (15.94, β)	7.544
95% Gamma Approximate KM-UCL (use when n>=50)	536	95% Gamma Adjusted KM-UCL (use when n<50)	562.4

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	266.2
Maximum	1740	Median	41
SD	490.6	CV	1.843
k hat (MLE)	0.374	k star (bias corrected MLE)	0.356
Theta hat (MLE)	711.9	Theta star (bias corrected MLE)	746.9
nu hat (MLE)	19.44	nu star (bias corrected)	18.53
MLE Mean (bias corrected)	266.2	MLE Sd (bias corrected)	445.9
		Adjusted Level of Significance (β)	0.0398
Approximate Chi Square Value (18.53, α)	9.777	Adjusted Chi Square Value (18.53, β)	9.357
95% Gamma Approximate UCL (use when n>=50)	504.5	95% Gamma Adjusted UCL (use when n<50)	527.2

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.918	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.113	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.177	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	266.2	Mean in Log Scale	3.963
SD in Original Scale	490.5	SD in Log Scale	2.028
95% t UCL (assumes normality of ROS data)	430.5	95% Percentile Bootstrap UCL	438.9
95% BCA Bootstrap UCL	480.2	95% Bootstrap t UCL	584.6
95% H-UCL (Log ROS)	2125		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	4.014	95% H-UCL (KM -Log)	1393
KM SD (logged)	1.888	95% Critical H Value (KM-Log)	3.825
KM Standard Error of Mean (logged)	0.378		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	266.2	Mean in Log Scale	3.987
SD in Original Scale	490.5	SD in Log Scale	1.975
95% t UCL (Assumes normality)	430.5	95% H-Stat UCL	1816

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	685.9	95% GROS Adjusted Gamma UCL	527.2
95% Adjusted Gamma KM-UCL	562.4		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:42:27 PM
From File	UCL data 0to1.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cadmium Surface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	46	Number of Distinct Observations	42
Number of Detects	27	Number of Non-Detects	19
Number of Distinct Detects	26	Number of Distinct Non-Detects	16
Minimum Detect	0.982	Minimum Non-Detect	1.06
Maximum Detect	32	Maximum Non-Detect	6.55
Variance Detects	66.78	Percent Non-Detects	41.3%
Mean Detects	8.465	SD Detects	8.172
Median Detects	5.55	CV Detects	0.965
Skewness Detects	1.506	Kurtosis Detects	1.787
Mean of Logged Detects	1.697	SD of Logged Detects	0.984

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.819	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.204	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.404	Standard Error of Mean	1.075
SD	7.15	95% KM (BCA) UCL	7.279
95% KM (t) UCL	7.21	95% KM (Percentile Bootstrap) UCL	7.275
95% KM (z) UCL	7.172	95% KM Bootstrap t UCL	7.852
90% KM Chebyshev UCL	8.629	95% KM Chebyshev UCL	10.09
97.5% KM Chebyshev UCL	12.12	99% KM Chebyshev UCL	16.1

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.406	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.768	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0971	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.172	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.279	k star (bias corrected MLE)	1.162
Theta hat (MLE)	6.619	Theta star (bias corrected MLE)	7.288
nu hat (MLE)	69.06	nu star (bias corrected)	62.72
MLE Mean (bias corrected)	8.465	MLE Sd (bias corrected)	7.854

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.571	nu hat (KM)	52.56
Approximate Chi Square Value (52.56, α)	36.91	Adjusted Chi Square Value (52.56, β)	36.48
95% Gamma Approximate KM-UCL (use when n>=50)	7.697	95% Gamma Adjusted KM-UCL (use when n<50)	7.786

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.973
Maximum	32	Median	1.96
SD	7.503	CV	1.509
k hat (MLE)	0.278	k star (bias corrected MLE)	0.274
Theta hat (MLE)	17.88	Theta star (bias corrected MLE)	18.12
nu hat (MLE)	25.59	nu star (bias corrected)	25.25
MLE Mean (bias corrected)	4.973	MLE Sd (bias corrected)	9.492
		Adjusted Level of Significance (β)	0.0448
Approximate Chi Square Value (25.25, α)	14.8	Adjusted Chi Square Value (25.25, β)	14.54
95% Gamma Approximate UCL (use when n>=50)	8.482	95% Gamma Adjusted UCL (use when n<50)	8.633

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.971	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.923	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0846	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.171	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.295	Mean in Log Scale	0.884
SD in Original Scale	7.294	SD in Log Scale	1.245
95% t UCL (assumes normality of ROS data)	7.101	95% Percentile Bootstrap UCL	7.095
95% BCA Bootstrap UCL	7.546	95% Bootstrap t UCL	7.915
95% H-UCL (Log ROS)	8.507		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	1.007	95% H-UCL (KM -Log)	7.617
KM SD (logged)	1.111	95% Critical H Value (KM-Log)	2.448
KM Standard Error of Mean (logged)	0.168		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	5.275	Mean in Log Scale	0.822
SD in Original Scale	7.315	SD in Log Scale	1.317
95% t UCL (Assumes normality)	7.087	95% H-Stat UCL	9.169

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (t) UCL	7.21	95% GROS Adjusted Gamma UCL	8.633
95% Adjusted Gamma KM-UCL	7.786		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 3:45:10 PM
From File	UCL data 0to1_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cobalt Surface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	181	Number of Distinct Observations	172
		Number of Missing Observations	0
Minimum	2.85	Mean	404
Maximum	6650	Median	147
SD	749.5	Std. Error of Mean	55.71
Coefficient of Variation	1.855	Skewness	4.803

Normal GOF Test

Shapiro Wilk Test Statistic	0.548	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.296	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0659	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	496.1	95% Adjusted-CLT UCL (Chen-1995)	516.9
		95% Modified-t UCL (Johnson-1978)	499.4

Gamma GOF Test

A-D Test Statistic	1.993	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.817	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0765	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0723	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.533	k star (bias corrected MLE)	0.528
Theta hat (MLE)	758	Theta star (bias corrected MLE)	765.4
nu hat (MLE)	193	nu star (bias corrected)	191.1
MLE Mean (bias corrected)	404	MLE Sd (bias corrected)	556.1
		Approximate Chi Square Value (0.05)	160.1
Adjusted Level of Significance	0.0487	Adjusted Chi Square Value	159.9

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	482.2	95% Adjusted Gamma UCL (use when n<50)	482.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.00357	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0579	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0659	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.047	Mean of logged Data	4.821
Maximum of Logged Data	8.802	SD of logged Data	1.709

Assuming Lognormal Distribution

95% H-UCL	771.2	90% Chebyshev (MVUE) UCL	825.9
95% Chebyshev (MVUE) UCL	962.5	97.5% Chebyshev (MVUE) UCL	1152
99% Chebyshev (MVUE) UCL	1525		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	495.7	95% Jackknife UCL	496.1
95% Standard Bootstrap UCL	497.9	95% Bootstrap-t UCL	529.8
95% Hall's Bootstrap UCL	540.6	95% Percentile Bootstrap UCL	499.8
95% BCA Bootstrap UCL	529.1		
90% Chebyshev(Mean, Sd) UCL	571.2	95% Chebyshev(Mean, Sd) UCL	646.9
97.5% Chebyshev(Mean, Sd) UCL	751.9	99% Chebyshev(Mean, Sd) UCL	958.3

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	646.9

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.

UCL Statistics for Uncensored Full Data Sets

User Selected Options	
Date/Time of Computation	2/25/2016 3:45:52 PM
From File	UCL data 0to1_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Manganese Surface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	105	Number of Distinct Observations	99
		Number of Missing Observations	0
Minimum	11.5	Mean	685.4
Maximum	6990	Median	247
SD	1004	Std. Error of Mean	97.95
Coefficient of Variation	1.464	Skewness	3.396

Normal GOF Test

Shapiro Wilk Test Statistic	0.653	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.251	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0865	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	847.9	95% Adjusted-CLT UCL (Chen-1995)	881.1
		95% Modified-t UCL (Johnson-1978)	853.3

Gamma GOF Test

A-D Test Statistic	2.336	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.797	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.146	**Kolmogrov-Smirnoff Gamma GOF Test**
5% K-S Critical Value	0.0917	Data Not Gamma Distributed at 5% Significance Level

Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	0.731	k star (bias corrected MLE)	0.716
Theta hat (MLE)	937.5	Theta star (bias corrected MLE)	956.5
nu hat (MLE)	153.5	nu star (bias corrected)	150.5
MLE Mean (bias corrected)	685.4	MLE Sd (bias corrected)	809.7
		Approximate Chi Square Value (0.05)	123.1
Adjusted Level of Significance	0.0477	Adjusted Chi Square Value	122.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	837.6	95% Adjusted Gamma UCL (use when n<50)	840

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.964	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk P Value	0.0449	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0985	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.0865	Data Not Lognormal at 5% Significance Level

Data Not Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	2.442	Mean of logged Data	5.708
Maximum of Logged Data	8.852	SD of logged Data	1.335

Assuming Lognormal Distribution

95% H-UCL	1025	90% Chebyshev (MVUE) UCL	1098
95% Chebyshev (MVUE) UCL	1268	97.5% Chebyshev (MVUE) UCL	1503
99% Chebyshev (MVUE) UCL	1966		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	846.5	95% Jackknife UCL	847.9
95% Standard Bootstrap UCL	847.2	95% Bootstrap-t UCL	901.3
95% Hall's Bootstrap UCL	917.7	95% Percentile Bootstrap UCL	850.4
95% BCA Bootstrap UCL	886.3		
90% Chebyshev(Mean, Sd) UCL	979.2	95% Chebyshev(Mean, Sd) UCL	1112
97.5% Chebyshev(Mean, Sd) UCL	1297	99% Chebyshev(Mean, Sd) UCL	1660

Suggested UCL to Use

95% Chebyshev (Mean, Sd) UCL	1112

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL. These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002) and Singh and Singh (2003). However, simulations results will not cover all Real World data sets. For additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:46:42 PM
From File	UCL data 0to1_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Nickel Surface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	98	Number of Distinct Observations	96
Number of Detects	97	Number of Non-Detects	1
Number of Distinct Detects	95	Number of Distinct Non-Detects	1
Minimum Detect	3.91	Minimum Non-Detect	13.1
Maximum Detect	2920	Maximum Non-Detect	13.1
Variance Detects	139353	Percent Non-Detects	1.02%
Mean Detects	159.9	SD Detects	373.3
Median Detects	26.1	CV Detects	2.335
Skewness Detects	5.017	Kurtosis Detects	32.15
Mean of Logged Detects	3.642	SD of Logged Detects	1.623

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.469	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.338	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.09	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	158.3	Standard Error of Mean	37.55
SD	369.8	95% KM (BCA) UCL	220.7
95% KM (t) UCL	220.7	95% KM (Percentile Bootstrap) UCL	224.7
95% KM (z) UCL	220.1	95% KM Bootstrap t UCL	261.2
90% KM Chebyshev UCL	271	95% KM Chebyshev UCL	322
97.5% KM Chebyshev UCL	392.8	99% KM Chebyshev UCL	531.9

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	6.133	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.831	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.208	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0967	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.451	k star (bias corrected MLE)	0.444
Theta hat (MLE)	354.8	Theta star (bias corrected MLE)	360.4
nu hat (MLE)	87.43	nu star (bias corrected)	86.06
MLE Mean (bias corrected)	159.9	MLE Sd (bias corrected)	240

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.183	nu hat (KM)	35.92
Approximate Chi Square Value (35.92, α)	23.21	Adjusted Chi Square Value (35.92, β)	23.05
95% Gamma Approximate KM-UCL (use when n>=50)	245.1	95% Gamma Adjusted KM-UCL (use when n<50)	246.7

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	158.2
Maximum	2920	Median	25.5
SD	371.7	CV	2.349
k hat (MLE)	0.432	k star (bias corrected MLE)	0.425
Theta hat (MLE)	366.7	Theta star (bias corrected MLE)	372.2
nu hat (MLE)	84.58	nu star (bias corrected)	83.32
MLE Mean (bias corrected)	158.2	MLE Sd (bias corrected)	242.7
		Adjusted Level of Significance (β)	0.0476
Approximate Chi Square Value (83.32, α)	63.28	Adjusted Chi Square Value (83.32, β)	63.02
95% Gamma Approximate UCL (use when n>=50)	208.3	95% Gamma Adjusted UCL (use when n<50)	209.2

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.116	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.09	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	158.3	Mean in Log Scale	3.624
SD in Original Scale	371.7	SD in Log Scale	1.624
95% t UCL (assumes normality of ROS data)	220.7	95% Percentile Bootstrap UCL	228.1
95% BCA Bootstrap UCL	244.3	95% Bootstrap t UCL	264.9
95% H-UCL (Log ROS)	227.5		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	158.3	Mean in Log Scale	3.624
SD in Original Scale	371.7	SD in Log Scale	1.624
95% t UCL (Assumes normality)	220.7	95% H-Stat UCL	227.7

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	392.8

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:55:14 PM
From File	UCL data combined.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cadmium Subsurface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	67	Number of Distinct Observations	63
Number of Detects	42	Number of Non-Detects	25
Number of Distinct Detects	41	Number of Distinct Non-Detects	22
Minimum Detect	0.982	Minimum Non-Detect	0.601
Maximum Detect	32	Maximum Non-Detect	6.55
Variance Detects	52.51	Percent Non-Detects	37.31%
Mean Detects	7.73	SD Detects	7.246
Median Detects	4.685	CV Detects	0.937
Skewness Detects	1.594	Kurtosis Detects	2.46
Mean of Logged Detects	1.644	SD of Logged Detects	0.918

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.779	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.137	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	5.179	Standard Error of Mean	0.814
SD	6.567	95% KM (BCA) UCL	6.655
95% KM (t) UCL	6.537	95% KM (Percentile Bootstrap) UCL	6.6
95% KM (z) UCL	6.518	95% KM Bootstrap t UCL	6.892
90% KM Chebyshev UCL	7.62	95% KM Chebyshev UCL	8.726
97.5% KM Chebyshev UCL	10.26	99% KM Chebyshev UCL	13.27

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.787	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.769	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.118	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.139	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	1.391	k star (bias corrected MLE)	1.307
Theta hat (MLE)	5.557	Theta star (bias corrected MLE)	5.912
nu hat (MLE)	116.8	nu star (bias corrected)	109.8
MLE Mean (bias corrected)	7.73	MLE Sd (bias corrected)	6.76

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.622	nu hat (KM)	83.35
Approximate Chi Square Value (83.35, α)	63.31	Adjusted Chi Square Value (83.35, β)	62.92
95% Gamma Approximate KM-UCL (use when n>=50)	6.819	95% Gamma Adjusted KM-UCL (use when n<50)	6.86

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	4.849
Maximum	32	Median	2.24
SD	6.839	CV	1.41
k hat (MLE)	0.304	k star (bias corrected MLE)	0.3
Theta hat (MLE)	15.97	Theta star (bias corrected MLE)	16.16
nu hat (MLE)	40.69	nu star (bias corrected)	40.2
MLE Mean (bias corrected)	4.849	MLE Sd (bias corrected)	8.853
		Adjusted Level of Significance (β)	0.0464
Approximate Chi Square Value (40.20, α)	26.67	Adjusted Chi Square Value (40.20, β)	26.43
95% Gamma Approximate UCL (use when n>=50)	7.308	95% Gamma Adjusted UCL (use when n<50)	7.375

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Test Statistic	0.909	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.942	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.101	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.137	Detected Data appear Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	5.125	Mean in Log Scale	0.909
SD in Original Scale	6.648	SD in Log Scale	1.216
95% t UCL (assumes normality of ROS data)	6.48	95% Percentile Bootstrap UCL	6.489
95% BCA Bootstrap UCL	6.717	95% Bootstrap t UCL	6.792
95% H-UCL (Log ROS)	7.191		

UCLs using Lognormal Distribution and KM Estimates when Detected data are Lognormally Distributed

KM Mean (logged)	0.965	95% H-UCL (KM -Log)	7.012
KM SD (logged)	1.155	95% Critical H Value (KM-Log)	2.226
KM Standard Error of Mean (logged)	0.154		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	5.118	Mean in Log Scale	0.87
SD in Original Scale	6.66	SD in Log Scale	1.268
95% t UCL (Assumes normality)	6.476	95% H-Stat UCL	7.446

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM (Percentile Bootstrap) UCL	6.6	95% GROS Approximate Gamma UCL	7.308
95% Approximate Gamma KM-UCL	6.819		

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:57:18 PM
From File	UCL data combined_a.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Cobalt Subsurface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	358	Number of Distinct Observations	324
Number of Detects	346	Number of Non-Detects	12
Number of Distinct Detects	315	Number of Distinct Non-Detects	9
Minimum Detect	2.68	Minimum Non-Detect	2.14
Maximum Detect	6650	Maximum Non-Detect	2.49
Variance Detects	329387	Percent Non-Detects	3.352%
Mean Detects	275.9	SD Detects	573.9
Median Detects	90.4	CV Detects	2.08
Skewness Detects	6.157	Kurtosis Detects	53.7
Mean of Logged Detects	4.391	SD of Logged Detects	1.691

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.488	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.317	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0476	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	266.7	Standard Error of Mean	29.93
SD	565.6	95% KM (BCA) UCL	316.5
95% KM (t) UCL	316.1	95% KM (Percentile Bootstrap) UCL	319.8
95% KM (z) UCL	316	95% KM Bootstrap t UCL	330.9
90% KM Chebyshev UCL	356.6	95% KM Chebyshev UCL	397.2
97.5% KM Chebyshev UCL	453.7	99% KM Chebyshev UCL	564.6

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	5.429	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.821	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0878	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0517	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.515	k star (bias corrected MLE)	0.512
Theta hat (MLE)	536.2	Theta star (bias corrected MLE)	538.8
nu hat (MLE)	356.1	nu star (bias corrected)	354.4
MLE Mean (bias corrected)	275.9	MLE Sd (bias corrected)	385.6

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.222	nu hat (KM)	159.3
Approximate Chi Square Value (159.28, α)	131.1	Adjusted Chi Square Value (159.28, β)	131
95% Gamma Approximate KM-UCL (use when n>=50)	324.1	95% Gamma Adjusted KM-UCL (use when n<50)	324.3

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	266.7
Maximum	6650	Median	85
SD	566.4	CV	2.124
k hat (MLE)	0.434	k star (bias corrected MLE)	0.432
Theta hat (MLE)	614.4	Theta star (bias corrected MLE)	616.9
nu hat (MLE)	310.8	nu star (bias corrected)	309.5
MLE Mean (bias corrected)	266.7	MLE Sd (bias corrected)	405.6
		Adjusted Level of Significance (β)	0.0493
Approximate Chi Square Value (309.52, α)	269.8	Adjusted Chi Square Value (309.52, β)	269.6
95% Gamma Approximate UCL (use when n>=50)	306	95% Gamma Adjusted UCL (use when n<50)	306.1

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0521	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0476	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	266.7	Mean in Log Scale	4.255
SD in Original Scale	566.4	SD in Log Scale	1.818
95% t UCL (assumes normality of ROS data)	316.1	95% Percentile Bootstrap UCL	321.9
95% BCA Bootstrap UCL	331.9	95% Bootstrap t UCL	328.2
95% H-UCL (Log ROS)	486.1		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	266.7	Mean in Log Scale	4.248
SD in Original Scale	566.4	SD in Log Scale	1.833
95% t UCL (Assumes normality)	316.1	95% H-Stat UCL	498.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	453.7

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:58:37 PM
From File	UCL data combined_b.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Manganese Subsurface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	167	Number of Distinct Observations	160
Number of Detects	166	Number of Non-Detects	1
Number of Distinct Detects	159	Number of Distinct Non-Detects	1
Minimum Detect	11.5	Minimum Non-Detect	3.74
Maximum Detect	6990	Maximum Non-Detect	3.74
Variance Detects	807431	Percent Non-Detects	0.599%
Mean Detects	571	SD Detects	898.6
Median Detects	219	CV Detects	1.574
Skewness Detects	3.774	Kurtosis Detects	19.11
Mean of Logged Detects	5.543	SD of Logged Detects	1.269

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.607	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.267	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0688	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	567.6	Standard Error of Mean	69.41
SD	894.2	95% KM (BCA) UCL	704.7
95% KM (t) UCL	682.4	95% KM (Percentile Bootstrap) UCL	687.2
95% KM (z) UCL	681.8	95% KM Bootstrap t UCL	714.3
90% KM Chebyshev UCL	775.8	95% KM Chebyshev UCL	870.1
97.5% KM Chebyshev UCL	1001	99% KM Chebyshev UCL	1258

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	4.265	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.796	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.129	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0753	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.745	k star (bias corrected MLE)	0.735
Theta hat (MLE)	766.7	Theta star (bias corrected MLE)	776.6
nu hat (MLE)	247.2	nu star (bias corrected)	244.1
MLE Mean (bias corrected)	571	MLE Sd (bias corrected)	665.9

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.403	nu hat (KM)	134.6
Approximate Chi Square Value (134.55, α)	108.8	Adjusted Chi Square Value (134.55, β)	108.6
95% Gamma Approximate KM-UCL (use when n>=50)	702.2	95% Gamma Adjusted KM-UCL (use when n<50)	703.5

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	567.6
Maximum	6990	Median	217
SD	896.9	CV	1.58
k hat (MLE)	0.703	k star (bias corrected MLE)	0.694
Theta hat (MLE)	807.5	Theta star (bias corrected MLE)	817.6
nu hat (MLE)	234.7	nu star (bias corrected)	231.9
MLE Mean (bias corrected)	567.6	MLE Sd (bias corrected)	681.2
		Adjusted Level of Significance (β)	0.0486
Approximate Chi Square Value (231.86, α)	197.6	Adjusted Chi Square Value (231.86, β)	197.3
95% Gamma Approximate UCL (use when n>=50)	665.9	95% Gamma Adjusted UCL (use when n<50)	666.8

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0804	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0688	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	567.6	Mean in Log Scale	5.521
SD in Original Scale	896.9	SD in Log Scale	1.296
95% t UCL (assumes normality of ROS data)	682.4	95% Percentile Bootstrap UCL	685.2
95% BCA Bootstrap UCL	714.1	95% Bootstrap t UCL	717.3
95% H-UCL (Log ROS)	739.6		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	567.6	Mean in Log Scale	5.513
SD in Original Scale	896.9	SD in Log Scale	1.321
95% t UCL (Assumes normality)	682.4	95% H-Stat UCL	764.1

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

95% KM (Chebyshev) UCL	870.1

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	2/25/2016 3:59:20 PM
From File	UCL data combined_c.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

Uncertainty Section - Nickel Subsurface Soil Outside Fence - Outliers Included

General Statistics

Total Number of Observations	137	Number of Distinct Observations	133
Number of Detects	135	Number of Non-Detects	2
Number of Distinct Detects	131	Number of Distinct Non-Detects	2
Minimum Detect	2.76	Minimum Non-Detect	2.49
Maximum Detect	2920	Maximum Non-Detect	13.1
Variance Detects	109209	Percent Non-Detects	1.46%
Mean Detects	137.2	SD Detects	330.5
Median Detects	24	CV Detects	2.408
Skewness Detects	5.426	Kurtosis Detects	38.99
Mean of Logged Detects	3.507	SD of Logged Detects	1.59

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.454	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.342	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0763	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

Mean	135.3	Standard Error of Mean	28.06
SD	327.2	95% KM (BCA) UCL	188.8
95% KM (t) UCL	181.8	95% KM (Percentile Bootstrap) UCL	184
95% KM (z) UCL	181.4	95% KM Bootstrap t UCL	207.3
90% KM Chebyshev UCL	219.5	95% KM Chebyshev UCL	257.6
97.5% KM Chebyshev UCL	310.5	99% KM Chebyshev UCL	414.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	8.657	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.83	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.191	**Kolmogrov-Smirnoff GOF**
5% K-S Critical Value	0.0856	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	0.456	k star (bias corrected MLE)	0.45
Theta hat (MLE)	301.2	Theta star (bias corrected MLE)	304.6
nu hat (MLE)	123	nu star (bias corrected)	121.6
MLE Mean (bias corrected)	137.2	MLE Sd (bias corrected)	204.5

Gamma Kaplan-Meier (KM) Statistics

k hat (KM)	0.171	nu hat (KM)	46.84
Approximate Chi Square Value (46.84, α)	32.13	Adjusted Chi Square Value (46.84, β)	32
95% Gamma Approximate KM-UCL (use when n>=50)	197.2	95% Gamma Adjusted KM-UCL (use when n<50)	198

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs

GROS may not be used when kstar of detected data is small such as < 0.1

For such situations, GROS method tends to yield inflated values of UCLs and BTVs

For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	135.2
Maximum	2920	Median	23.6
SD	328.4	CV	2.429
k hat (MLE)	0.429	k star (bias corrected MLE)	0.424
Theta hat (MLE)	315.5	Theta star (bias corrected MLE)	318.8
nu hat (MLE)	117.4	nu star (bias corrected)	116.2
MLE Mean (bias corrected)	135.2	MLE Sd (bias corrected)	207.6
		Adjusted Level of Significance (β)	0.0482
Approximate Chi Square Value (116.21, α)	92.32	Adjusted Chi Square Value (116.21, β)	92.1
95% Gamma Approximate UCL (use when n>=50)	170.2	95% Gamma Adjusted UCL (use when n<50)	170.6

Lognormal GOF Test on Detected Observations Only

Lilliefors Test Statistic	0.0932	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0763	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	135.3	Mean in Log Scale	3.463
SD in Original Scale	328.4	SD in Log Scale	1.629
95% t UCL (assumes normality of ROS data)	181.7	95% Percentile Bootstrap UCL	184.5
95% BCA Bootstrap UCL	201.1	95% Bootstrap t UCL	204.1
95% H-UCL (Log ROS)	178.7		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	135.3	Mean in Log Scale	3.471
SD in Original Scale	328.4	SD in Log Scale	1.609
95% t UCL (Assumes normality)	181.7	95% H-Stat UCL	173.3

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution at 5% Significance Level

Suggested UCL to Use

97.5% KM (Chebyshev) UCL	310.5

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

ATTACHMENT E

References Cited

Cited References

ADEM (Alabama Department of Environmental Management). 2008. Alabama Risk-Based Corrective Action Manual. April 2008 – Revision 2.

H&H (Hart & Hickman, PC). 2014. Property Assessment Report and Work Plan Addendum. July 15, 2014.

H&H (Hart & Hickman, PC). 2016. Property Assessment Report and Cleanup Plan. In production.

USEPA (U.S. Environmental Protection Agency). 2013a. Statistical Software ProUCL 5.0.00 for Environmental Applications for Data Sets with and without Nondetect Observations. September 19, 2013.

USEPA (U.S. Environmental Protection Agency). 2013b. ProUCL 5.0.00 User Guide. EPA/600/R-07/041. September 2013.

USEPA (U.S. Environmental Protection Agency). 2015a. Regional Screening Level (RSL) Summary Table. November 2015.

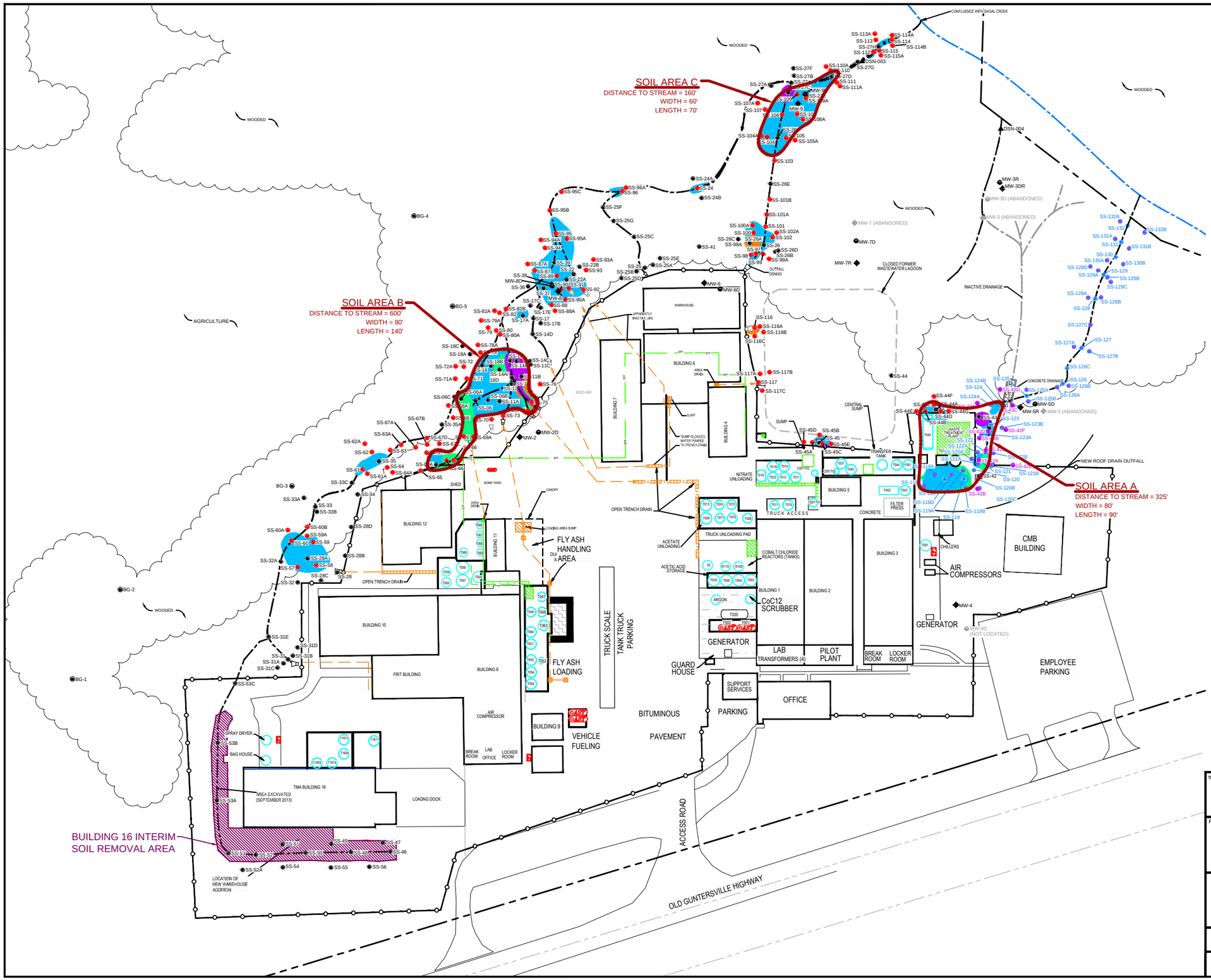
USEPA (U.S. Environmental Protection Agency). 2015b. Regional Screening Levels (RSLs) – User's Guide. November 2015.

Appendix G

Protection of Surface Water from Soil and Groundwater Risk Evaluation

hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS



LEGEND

- SITE PROPERTY BOUNDARY
- INTERMITTENT DRAINAGE
- SHOAL CREEK
- SECURITY FENCE
- TRANSFORMER
- PETROLEUM ABOVE GROUND STORAGE TANK
- NON-PETROLEUM ABOVE GROUND STORAGE TANK
- OPEN TRENCH DRAIN TO WASTEWATER
- OPEN TRENCH DRAIN TO STORMWATER
- UNDERGROUND STORMWATER PIPE TO WASTEWATER
- UNDERGROUND STORMWATER PIPE TO STORMWATER
- OVERHEAD WASTEWATER LINE TO WASTEWATER
- ACTIVE DISCHARGE
- INACTIVE DISCHARGE
- UMICORE SURFACE WATER OUTFALL SAMPLE LOCATION
- DEEP MONITORING WELL
- SHALLOW MONITORING WELL
- ABANDONED MONITORING WELL (SHALLOW)
- MONITORING WELL NOT LOCATED (DEEP)
- SOIL BORING (MAY-JUNE 2013)
- BACKGROUND SOIL BORING (MAY 2013)
- SOIL BORING (NOVEMBER 2014)
- SOIL BORING (SEPTEMBER 2013)
- SOIL BORING (MAY 2015)
- PROVISIONAL SOIL SAMPLE LOCATIONS (MAY 2015)
- ESTIMATED EXTENT OF COBALT ABOVE INDUSTRIAL RSL AND/OR SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF MANGANESE ABOVE SITE-SPECIFIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF NICKEL ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL
- ESTIMATED EXTENT OF CADMIUM ABOVE GENERIC PROTECTION OF GROUNDWATER SCREENING LEVEL

NOTES:

1. MONITORING WELL AND SOIL BORINGS LOCATIONS PROFESSIONALLY SURVEYED IN JUNE 2013, DECEMBER 2014, AND JUNE 2015.

N

APPROXIMATE
0 100 200
SCALE IN FEET

TITLE
PROTECTION OF SURFACE WATER RBTL CALCULATION SOIL AREAS

PROJECT
UMICORE CSM NA FACILITY
1951 GUNTERVILLE ROAD
ARAB, ALABAMA

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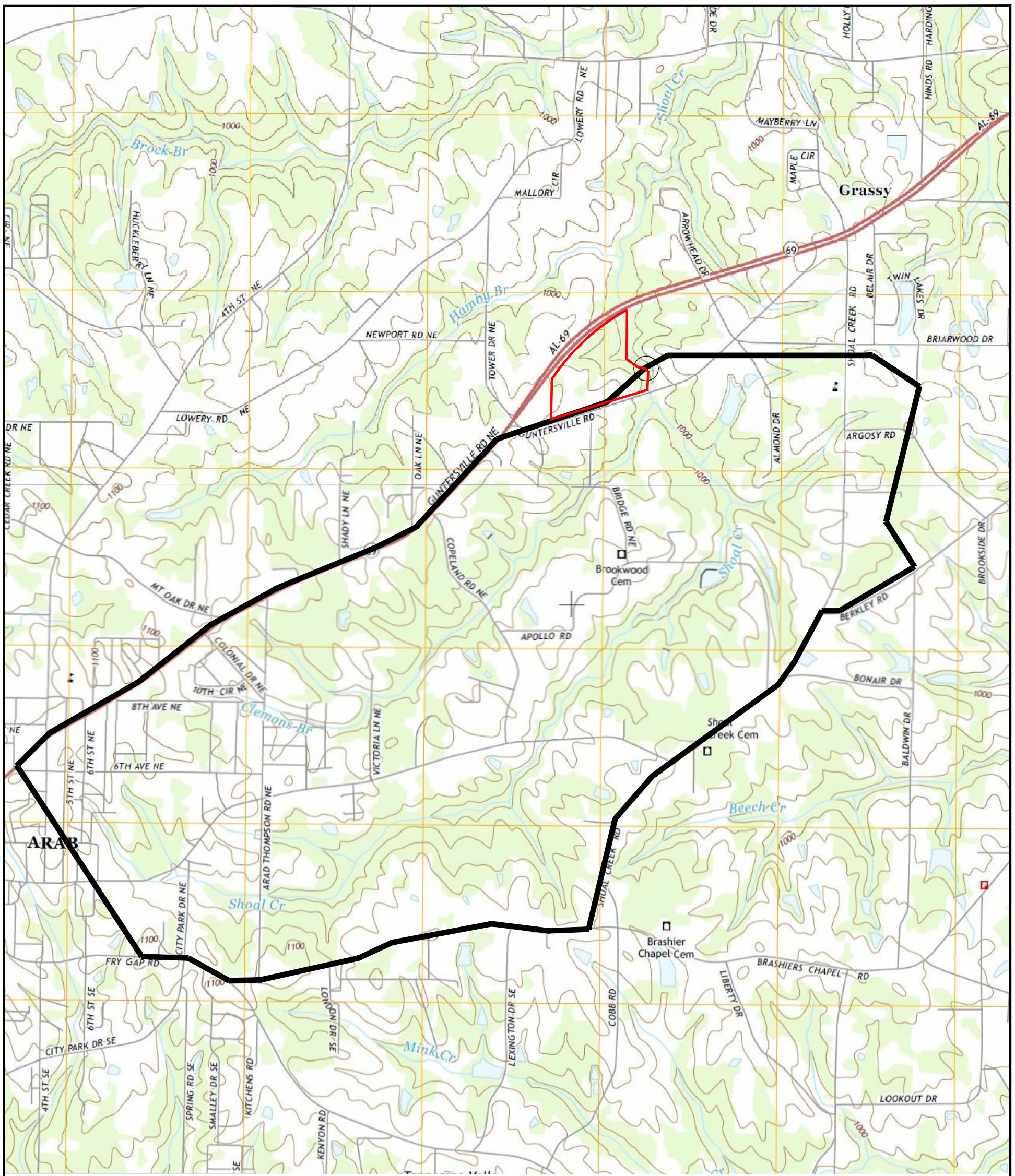
License # C-1269 / #C-245 Geology

DATE: 3–10–16	REVISION NO. 0
JOB NO. UMI–001	ATTACHMENT NO. 1

S:\AAA-Master Projects\Umicore (UMI)\UMI-001 Umicore CSM NA\PARCP\Stream Risk Mgmt Eval\Soil Areas for RBTL Calcs.dwg, ATT 1, 3/18/2016 10:42:43 AM, zbarlow



LEGEND

SITE PROPERTY BOUNDARY

7Q10 AREA

N

APPROXIMATE

0 1,800 3,600

SCALE IN FEET

TITLE

7Q10 CONTRIBUTING DRAINAGE AREA

PROJECT

UMICORE CSM NA FACILITY
ARAB, ALABAMA

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DATE: 03-9-16	REVISION NO. 0
JOB NO. UMI-001	ATTACHMENT NO. 2

Table 1 (Page 1 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area A
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Calculation of Allowable Source Soil and Groundwater Concentrations

Calculations are based on numerous conservative assumptions, including:
1. steady-state groundwater plume;
2. steady-state flow in stream; and
3. no loss of COCs in the stream due to natural attenuation processes

Step 1: Identify streams potentially impacted by COCs at the site.
Shoal Creek

Step 2: Identify upstream (background) COC concentrations (C_{su})

C_{su} (Cd) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Co) =	10 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Mn) =	89.7	µg/l	=	0.09	mg/l	
C_{su} (Ni) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0

Step 3: Estimate allowable concentration of COCs in stream (C_{sw}).
Determined per the Water Quality Criteria established in ADEM Admin Code 335-6-10-.07 (the "Consumption Fish/Water" pathway). In the absense of a COC addressed in 335-6-10, the most current version of the USEPA National Recommended Water Quality Criteria should be used.

Target concentration for Cd is dependent on hardness
C_{sw} (Cd) = 0.094 µg/l conc. (µg/l) = (e(0.7409[ln(hardness in mg/l as $CaCO_3$)]-4.719))(CF) Admin Code 335-6-10-.07 Eq. 2 (freshwater chronic)
CF = 0.967 Conversion Factor (CF) = 1.101672-[ln(hardness)(0.041838)]
Hardness = 25.267 mg/L as $CaCO_3$ *site-specific value: avg. of three SW samples*

C_{sw} (Co) = 19 µg/l No established USEPA National Recommended Water Quality Criteria for cobalt and manganese. Values are from: US EPA Supplemental Guidance to ERAGS: Region 4,
C_{sw} (Mn) = 93 µg/l Ecological Risk Assessment - Region 4 Surface Water Screening Values for Hazardous Waste Sites, Updated 2015 (Table 1a - Freshwater Screening Values).
C_{sw} (Ni) eco = 16.2 µg/l conc. (µg/l) = (e(0.8460[ln(hardness in mg/l as CaCO3)]+0.0584))(CF); where CF = 0.997 Admin Code 335-6-10-.07 Eq. 10 (freshwater chronic)
C_{sw} (Ni) HH= 411 µg/l conc. (mg/l) = (HBW x RfD x RSC)/[(FCR x BCF) + WCR]; where Admin Code 335-6-10-.07 Eq. 16 (Consumption of water and fish)

HBW =	70	kg	human body weight
RfD =	0.02	mg/kg-day	reference dose
RSC =	1.0		relative source contribution
FCR =	0.03	kg/day	fish consumption rate
BCF =	47	1/kg	bioconcentration factor
WCR =	2	1/day	water consumption rate

Values above obtained from Admin Code 335-6-10-.07

Step 4: Estimate the allowable concentration in the groundwater at the point of dicharge (C_{gw})

RM-2 C_{gw}
For an RM-2 evaluation, mixing within the stream is used and the C_{gw} is estimated by the mass balance:
$C_{gw}=(C_{sw}*(Q_{gw}+Q_{sw})/Q_{gw})-C_{su}*(Q_{sw}/Q_{gw})$; where (Eq. D-4.1 ARBCA)

C_{gw} = Allowable concentration in groundwater at the point of discharge into the stream (mg/l)

C_{gw} (Cd) =	0.007	mg/l
C_{gw} (Co) =	1.39	mg/l
C_{gw} (Mn) =	0.33	mg/l
C_{sw} (Ni) eco =	1.18	mg/l
C_{sw} (Ni) HH=	30	mg/l

Q_{gw} = 783 cfd Impacted groundwater discharge into the stream cubic ft per day (cfd); where
Q_{gw} = Impacted groundwater discharge into the stream (ft^3/day); where
$Q_{gw} = U_{gw}*A_{gw}$; where (Eq. D-4.2 ARBCA, except cm/yr to ft/yr conversion factor not included)
U_{gw} = 0.075 ft/day Groundwater Darcy velocity
U_{gw}= K*i/n; where (Eq. D-4.3 ARBCA, except effective porosity included in calculation)

K =	0.5	ft/day	Hydraulic conductivity of the saturated zone (site-specific value)
i =	0.03	ft/ft	Hydraulic gradient (site-specific value)
n =	0.2		Effective porosity (site-specific value)

A_{gw} = 10,435 sf Cross-sectional area of impacted groundwater flow
A_{gw} = Lp*Dp (Eq. D-4.4 ARBCA)
Lp = 198.7 ft Width of the groundwater plume discharging to the stream; where
Lp = (*Y*/30.48)+(2*sqrt(α_y*X_s) where (Eq. D-4.5 ARBCA)

Y =	2,438	cm	width of soil source perpendicular to the groundwater flow direction
Xs = X_{poe}/30.48 =	325	ft	distance from downgradient edge of groundwater source to the stream
α_y =	10.8	ft	lateral dispersivity α_y = Xs/30

Dp = 52.5 ft Thickness of the groundwater plume discharging to the stream
Dp = (δ_{gw}/30.48)+(2*sqrt(α_z*X_s) where (Eq. D-4.6 ARBCA)

δ_{gw} =	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
Xs = X_{poe}/30.48 =	325	ft	distance from downgradient edge of groundwater source to the stream
α_z =	1.6	ft	lateral dispersivity α_z = Xs/200

Q_{sw} = Stream flow rate upstream of the point of groundwater discharge (cfd)
Q_{sw} = 56,268 cfd
Q_{sw} = *7Q10**86,400 (Eq. D-4.10 ARBCA)
7Q10 = 0.65 cfs 7Q10 flow estimated using the method developed by Bingham (1982)
7Q10 = $0.0000015*(G-30)^{1.35} * A^{1.05} * (P-30)^{1.64}$; where

G =	140		Stream flow recession index (Bingham, 1982)
P =	55	in	Mean annual precipitation (Bingham, 1982)
A =	3.64	sq miles	Contributing drainage area (estimated drainage area to Shoal Creek at upstream point of groundwater discharge)

C_{sw} = Allowable downstream concentration at the downstream edge of the stream's mixing zone (from Step 3 above)

C_{sw} (Cd) =	0.000094	mg/l	
C_{sw} (Co) =	0.019	mg/l	
C_{sw} (Mn) =	0.093	mg/l	
C_{sw} (Ni) eco =	0.016	mg/l	
C_{sw} (Ni) HH=	0.411	mg/l	chronic

C_{su} = COC concentration upstream of the groundwater plume discharge (from Step 2 above)

C_{su} (Cd) =	0.0	mg/l
C_{su} (Co) =	0.0	mg/l
C_{su} (Mn) =	0.09	mg/l
C_{su} (Ni) =	0.0	mg/l

Table 1 (Page 2 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area A
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Step 5a: Estimate the allowable concentration in the groundwater at the source (C_{gws})

RM-2 C_{gws}

C_{gws} (Cd) =	**0.1**	mg/l
C_{gws} (Co) =	**24**	mg/l
C_{gws} (Mn) =	**6**	mg/l
C_{gsw} (Ni) eco =	**20**	mg/l
C_{gsw} (Ni) HH=	**510**	mg/l

$C_{gws} = C_{gw}*DAF_{stream}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.11 ARBCA)
C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)
$DAF_{stream} = C_o/C(x_{poe})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the stream
$C_o/C(x_{poe}) = erf[Y/(4*sqrt(\alpha_y*x_{poe}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poe}))]$; where From ARBCA Manual B-14: Domenico Model
$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poe} =	9,906	9,906	9,906	9,906	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the stream
α_y =	330	330	330	330	cm	lateral dispersivity = $x_{poe}/30$
α_z =	50	50	50	50	cm	vertical dispersivity = $x_{poe}/200$
Y =	2,438	2,438	2,438	2,438	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF =	17	17	17	17		

Step 5b: Estimate the allowable concentration in the groundwater at the sentry well (C_{sw}). MW-3R is the sentry well

RM-2 C_{sw}

C_{sw} (Cd) =	**0.010**	mg/l
C_{sw} (Co) =	**1.9**	mg/l
C_{sw} (Mn) =	**0.46**	mg/l
C_{sw} (Ni) eco =	**1.6**	mg/l
C_{sw} (Ni) HH=	**41.5**	mg/l

$C_{sw} = C_{gw}*DAF_{stream} / DAF_{SW}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.12 ARBCA)
C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)
DAF_{stream} = Dilution attenuation factor (without decay) in the saturated zone between the source and the stream (from Step 5a)
$DAF_{SW} = C_o/C(x_{poeSW})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the sentry well
$C_o/C(x_{poeSW}) = erf[Y/(4*sqrt(\alpha_y*x_{poeSW}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poeSW}))]$; where From ARBCA Manual B-14: Domenico Model
$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poeSW} =	7,010	7,010	7,010	7,010	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the sentry well
α_y =	330	330	330	330	cm	lateral dispersivity = $x_{poe}/30$
α_z =	50	50	50	50	cm	vertical dispersivity = $x_{poe}/200$
Y =	2,438	2,438	2,438	2,438	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF_{SW} =	12	12	12	12		

Step 6: Estimate the allowable soil source concentration (C_{soil})

RM-2 C_{soil}

C_{soil} (Cd) =	**18**	mg/kg
C_{soil} (Co) =	**20,163**	mg/kg
C_{soil} (Mn) =	**13,424**	mg/kg
C_{soil} (Ni) eco =	**18,103**	mg/kg
C_{soil} (Ni) HH =	**457,633**	mg/kg

RM-2 C_{soil} (using ARBCA LF_{sw})

C_{soil} (Cd) =	**488**	mg/kg
C_{soil} (Co) =	**15,435**	mg/kg
C_{soil} (Mn) =	**--**	mg/kg
C_{soil} (Ni) eco =	**132,732**	mg/kg
C_{soil} (Ni) HH =	**3,355,335**	mg/kg

$C_{soil} = (C_{gw}*DAF_{stream})/LF_{sw}$ where C_{soil} = Allowable source soil concentration (mg/kg), and LF_{sw} = Leaching factor from soil to groundwater [(mg/L-H2O)/(mg/kg-soil)]
$LF_{sw} = P_s/(\theta_{ws}+K_s*P_s+H*\theta_{as})*(1+(U_{gw}*\delta_{gw})/I*W)$; where From ARBCA Manual B-15

	Cd	Co	Mn*	Ni		
P_s =	1.8	1.8	1.8	1.8	g-soil/cm3-soil	Dry soil bulk density (Note 1)
θ_{ws} =	0.1	0.1	0.1	0.1	cm3-H2O/cm3-soil	Volumetric water content in vadose zone soils (Note 1)
θ_{as} =	0.2	0.2	0.2	0.2	cm3-air/cm3-soil	Volumetric air content in the vadose zone soils (Note 1)
K_s =	795	125	N/A	1,258	cm3-H2O/g-soil	foc × Koc, or Chemical-specific soil-water sorption coefficient for the unsaturated zone (Note 2)
δ_{gw} =	200	200	200	200	cm	Groundwater mixing zone thickness (Note 1)
H =	0	0	0	0	(L-H2O)/(L-air)	Chemical-specific Henry's Law constant (N/A for metals)
U_{gw} =	834	834	834	834	cm/year	Groundwater Darcy Velocity (from Step 4)
I =	14.4	14.4	14.4	14.4	cm	Infiltration rate of water through soil (Note 3)
W =	2,743	2,743	2,743	2,743	cm	Length of source area parallel to groundwater flow
LF_{sw} =	0.00024	0.00153	--	0.00015		
SPLP-based LF_{sw} =	**0.00648**	**0.00117**	**0.00042**	**0.00112**		

Red values are used in the C_{soil} calculations (Note 4)

Notes
1. RM-1 default value obtained from ARBCA Manual Table 3-2.
2. Sorption coefficients for Cd, Co, and Ni are are the median value partition coefficients from http://nepis.epa.gov/Exe/ZyPDF.cgi/P1000GHE.PDF?Dockey=P1000GHE.PDF
3. Infiltration rate of water through soil (see note below): average of the Meyboom (4.6 inches/yr) and WHAT Recharge estimation methods (6.7 inches/yr) for Geologic Area 4 which is cited in the Geological Survey of Alabama publication entitled Groundwater Hydrogeology, Recharge, and Water Availability in the Tennessee River Watershed of Alabama, Open File Report 0910 by Cook, Marlon R., Moss, Neil E., and Jennings, Stephen P. (as cited on Page 30 of the pdf document).
4. SPLP-based LF_{sw} calculated using average of SPLP concentrations divided by average of total concentrations in soil samples on which SPLP was performed [(mg/L-H2O/mg/kg-soil)]. The higher (more conservative) of the SPLP-based LF_{sw} and LF_{sw} (calculated using the ARBCA method) values are used in the final C_{soil} calculation. The C_{soil} values calculated using the ARBCA LF_{sw} values are shown for reference only.

Calculation Input and Output

Source Dimension Inputs	Enter dimensions in ft to calculate C_{gws} (Step 5) and C_{soil} (Step 6)		
source to stream (x_{poe})	**325** ft	=	9,906 cm
source width (Y)	**80** ft	=	2,438 cm
source length (W)	**90** ft	=	2,743 cm
source to sentry (x_{poeSW})	**230** ft	=	7,010 cm

Allowable source groundwater RBTL concentration (C_{gws})

C_{gws} (Cd) =	**0.12**	mg/l
C_{gws} (Co) =	**23.6**	mg/l
C_{gws} (Mn) =	**5.6**	mg/l
C_{gsw} (Ni) eco =	**20.2**	mg/l
C_{gsw} (Ni) HH=	**510**	mg/l

Allowable Sentry Well (MW-3R) groundwater RBTL concentration (C_{sw})

C_{sw} (Cd) =	**0.0096**	mg/l
C_{sw} (Co) =	**1.92**	mg/l
C_{sw} (Mn) =	**0.46**	mg/l
C_{sw} (Ni) eco =	**1.64**	mg/l
C_{sw} (Ni) HH=	**41.5**	mg/l

Allowable soil source RBTL concentration (C_{soil})

C_{soil} (Cd) =	**18**	mg/kg
C_{soil} (Co) =	**20,163**	mg/kg
C_{soil} (Mn) =	**13,424**	mg/kg
C_{soil} (Ni) eco =	**18,103**	mg/kg
C_{soil} (Ni) HH =	**457,633**	mg/kg

Table 2 (Page 1 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area B
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Calculation of Allowable Source Soil and Groundwater Concentrations

Calculations are based on numerous conservative assumptions, including:
1. steady-state groundwater plume;
2. steady-state flow in stream; and
3. no loss of COCs in the stream due to natural attenuation processes

Step 1: Identify streams potentially impacted by COCs at the site.
Shoal Creek

Step 2: Identify upstream (background) COC concentrations (C_{su})

C_{su} (Cd) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Co) =	10 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Mn) =	89.7	µg/l	=	0.09	mg/l	
C_{su} (Ni) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0

Step 3: Estimate allowable concentration of COCs in stream (C_{sw}).
Determined per the Water Quality Criteria established in ADEM Admin Code 335-6-10-.07 (the "Consumption Fish/Water" pathway). In the absense of a COC addressed in 335-6-10, the most current version of the USEPA National Recommended Water Quality Criteria should be used.

Target concentration for Cd is dependent on hardness
C_{sw} (Cd) = 0.094 µg/l conc. (µg/l) = (e(0.7409[ln(hardness in mg/l as $CaCO_3$)]-4.719))(CF) Admin Code 335-6-10-.07 Eq. 2 (freshwater chronic)
CF = 0.967 Conversion Factor (CF) = 1.101672-[ln(hardness)(0.041838)]
Hardness = 25.267 mg/L as $CaCO_3$ *site-specific value: avg. of three SW samples*

C_{sw} (Co) = 19 µg/l No established USEPA National Recommended Water Quality Criteria for cobalt and manganese. Values are from: US EPA Supplemental Guidance to ERAGS: Region 4,
C_{sw} (Mn) = 93 µg/l Ecological Risk Assessment - Region 4 Surface Water Screening Values for Hazardous Waste Sites, Updated 2015 (Table 1a - Freshwater Screening Values).
C_{sw} (Ni) eco = 16.2 µg/l conc. (µg/l) = (e(0.8460[ln(hardness in mg/l as CaCO3)]+0.0584))(CF); where CF = 0.997 Admin Code 335-6-10-.07 Eq. 10 (freshwater chronic)
C_{sw} (Ni) HH= 411 µg/l conc. (mg/l) = (HBW x RfD x RSC)/[(FCR x BCF) + WCR]; where Admin Code 335-6-10-.07 Eq. 16 (Consumption of water and fish)

HBW =	70	kg	human body weight
RfD =	0.02	mg/kg-day	reference dose
RSC =	1.0		relative source contribution
FCR =	0.03	kg/day	fish consumption rate
BCF =	47	1/kg	bioconcentration factor
WCR =	2	1/day	water consumption rate

Values above obtained from Admin Code 335-6-10-.07

Step 4: Estimate the allowable concentration in the groundwater at the point of dicharge (C_{gw})

RM-2 C_{gw}
For an RM-2 evaluation, mixing within the stream is used and the C_{gw} is estimated by the mass balance:
$C_{gw}=(C_{sw}*(Q_{gw}+Q_{sw})/Q_{gw})-C_{su}*(Q_{sw}/Q_{gw})$; where (Eq. D-4.1 ARBCA)

C_{gw} = Allowable concentration in groundwater at the point of discharge into the stream (mg/l)

C_{gw} (Cd) =	0.0	mg/l
C_{gw} (Co) =	1	mg/l
C_{gw} (Mn) =	0	mg/l
C_{sw} (Ni) eco =	0	mg/l
C_{sw} (Ni) HH=	12	mg/l

Q_{gw} = 2,051 cfd Impacted groundwater discharge into the stream cubic ft per day (cfd); where
Q_{gw} = Impacted groundwater discharge into the stream (ft^3/day); where
$Q_{gw} = U_{gw}*A_{gw}$; where (Eq. D-4.2 ARBCA, except cm/yr to ft/yr conversion factor not included)
U_{gw} = 0.075 ft/day Groundwater Darcy velocity
U_{gw}= K*i/n; where (Eq. D-4.3 ARBCA, except effective porosity included in calculation)

K =	0.5	ft/day	Hydraulic conductivity of the saturated zone (site-specific value)
i =	0.03	ft/ft	Hydraulic gradient (site-specific value)
n =	0.2		Effective porosity (site-specific value)

A_{gw} = 27,341 sf Cross-sectional area of impacted groundwater flow
A_{gw} = Lp*Dp (Eq. D-4.4 ARBCA)
Lp = 299.1 ft Width of the groundwater plume discharging to the stream; where
Lp = (*Y*/30.48)+(2*sqrt(α_y*X_s) where (Eq. D-4.5 ARBCA)

Y =	2,438	cm	width of soil source perpendicular to the groundwater flow direction
Xs = X_{poe}/30.48 =	600	ft	distance from downgradient edge of groundwater source to the stream
α_y =	20.0	ft	lateral dispersivity α_y = Xs/30

Dp = 91.4 ft Thickness of the groundwater plume discharging to the stream
Dp = (δ_{gw}/30.48)+(2*sqrt(α_z*X_s) where (Eq. D-4.6 ARBCA)

δ_{gw} =	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
Xs = X_{poe}/30.48 =	600	ft	distance from downgradient edge of groundwater source to the stream
α_z =	3.0	ft	lateral dispersivity α_z = Xs/200

Q_{sw} = Stream flow rate upstream of the point of groundwater discharge (cfd)
Q_{sw} = 56,268 cfd
Q_{sw} = *7Q10**86,400 (Eq. D-4.10 ARBCA)
7Q10 = 0.65 cfs 7Q10 flow estimated using the method developed by Bingham (1982)
7Q10 = $0.0000015*(G-30)^{1.35} * A^{1.05} * (P-30)^{1.64}$; where

G =	140		Stream flow recession index (Bingham, 1982)
P =	55	in	Mean annual precipitation (Bingham, 1982)
A =	3.64	sq miles	Contributing drainage area (estimated drainage area to Shoal Creek at upstream point of groundwater discharge)

C_{sw} = Allowable downstream concentration at the downstream edge of the stream's mixing zone (from Step 3 above)

C_{sw} (Cd) =	0.000094	mg/l	
C_{sw} (Co) =	0.019	mg/l	
C_{sw} (Mn) =	0.093	mg/l	
C_{sw} (Ni) eco =	0.016	mg/l	
C_{sw} (Ni) HH=	0.411	mg/l	chronic

C_{su} = COC concentration upstream of the groundwater plume discharge (from Step 2 above)

C_{su} (Cd) =	0.0	mg/l
C_{su} (Co) =	0.0	mg/l
C_{su} (Mn) =	0.09	mg/l
C_{su} (Ni) =	0.0	mg/l

Table 2 (Page 2 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area B
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Step 5a: Estimate the allowable concentration in the groundwater at the source (C_{gws})

RM-2 C_{gws}

C_{gws} (Cd) =	**0.2**	mg/l
C_{gws} (Co) =	**30**	mg/l
C_{gws} (Mn) =	**10**	mg/l
C_{gsw} (Ni) eco =	**26**	mg/l
C_{gsw} (Ni) HH=	**658**	mg/l

$C_{gws} = C_{gw}*DAF_{stream}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.11 ARBCA)
C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)
$DAF_{stream} = C_o/C(x_{poe})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the stream
$C_o/C(x_{poe}) = erf[Y/(4*sqrt(\alpha_y*x_{poe}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poe}))]$; where From ARBCA Manual B-14: Domenico Model
$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poe} =	18,288	18,288	18,288	18,288	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the stream
α_y =	610	610	610	610	cm	lateral dispersivity = $x_{poe}/30$
α_z =	91	91	91	91	cm	vertical dispersivity = $x_{poe}/200$
Y =	2,438	2,438	2,438	2,438	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF =	56	56	56	56		

Step 5b: Estimate the allowable concentration in the groundwater at the sentry well (C_{sw}). MW-6 is the sentry well

MW-3R as the Sentry Well

RM-2 C_{sw}

C_{sw} (Cd) =	**0.007**	mg/l
C_{sw} (Co) =	**1.5**	mg/l
C_{sw} (Mn) =	**0.51**	mg/l
C_{sw} (Ni) eco =	**1.3**	mg/l
C_{sw} (Ni) HH=	**32.6**	mg/l

$C_{sw} = C_{gw}*DAF_{stream} / DAF_{SW}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.12 ARBCA)
C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)
DAF_{stream} = Dilution attenuation factor (without decay) in the saturated zone between the source and the stream (from Step 5a)
$DAF_{SW} = C_o/C(x_{poeSW})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the sentry well
$C_o/C(x_{poeSW}) = erf[Y/(4*sqrt(\alpha_y*x_{poeSW}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poeSW}))]$; where From ARBCA Manual B-14: Domenico Model
$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poeSW} =	6,401	6,401	6,401	6,401	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the sentry well
α_y =	610	610	610	610	cm	lateral dispersivity = $x_{poe}/30$
α_z =	91	91	91	91	cm	vertical dispersivity = $x_{poe}/200$
Y =	2,438	2,438	2,438	2,438	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF_{SW} =	20	20	20	20		

MW-5 as the Sentry Well

RM-2 C_{sw}

C_{sw} (Cd) =	**0.007**	mg/l
C_{sw} (Co) =	**1.5**	mg/l
C_{sw} (Mn) =	**0.51**	mg/l
C_{sw} (Ni) eco =	**1.3**	mg/l
C_{sw} (Ni) HH=	**32.6**	mg/l

$C_{sw} = C_{gw}*DAF_{stream} / DAF_{SW}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.12 ARBCA)
C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)
DAF_{stream} = Dilution attenuation factor (without decay) in the saturated zone between the source and the stream (from Step 5a)
$DAF_{SW} = C_o/C(x_{poeSW})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the sentry well
$C_o/C(x_{poeSW}) = erf[Y/(4*sqrt(\alpha_y*x_{poeSW}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poeSW}))]$; where From ARBCA Manual B-14: Domenico Model
$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poeSW} =	6,401	6,401	6,401	6,401	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the sentry well
α_y =	610	610	610	610	cm	lateral dispersivity = $x_{poe}/30$
α_z =	91	91	91	91	cm	vertical dispersivity = $x_{poe}/200$
Y =	2,438	2,438	2,438	2,438	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF_{SW} =	20	20	20	20		

Step 6: Estimate the allowable soil source concentration (C_{soil})

RM-2 C_{soil}

C_{soil} (Cd) =	**23**	mg/kg
C_{soil} (Co) =	**25,992**	mg/kg
C_{soil} (Mn) =	**24,652**	mg/kg
C_{soil} (Ni) eco =	**23,337**	mg/kg
C_{soil} (Ni) HH =	**589,937**	mg/kg

RM-2 C_{soil} (using ARBCA LF_{sw})

C_{soil} (Cd) =	**447**	mg/kg
C_{soil} (Co) =	**14,152**	mg/kg
C_{soil} (Mn) =	**--**	mg/kg
C_{soil} (Ni) eco =	**121,693**	mg/kg
C_{soil} (Ni) HH =	**3,076,276**	mg/kg

$C_{soil} = (C_{gw}*DAF_{stream})/LF_{sw}$ where C_{soil} = Allowable source soil concentration (mg/kg), and LF_{sw} = Leaching factor from soil to groundwater [(mg/L-H2O)/(mg/kg-soil)]
$LF_{sw} = P_s/(\theta_{ws}+K_s*P_s+H*\theta_{as})*(1+(U_{gw}*\delta_{gw})/I*W)$; where From ARBCA Manual B-15

	Cd	Co	Mn*	Ni		
P_s =	1.8	1.8	1.8	1.8	g-soil/cm3-soil	Dry soil bulk density (Note 1)
θ_{ws} =	0.1	0.1	0.1	0.1	cm3-H2O/cm3-soil	Volumetric water content in vadose zone soils (Note 1)
θ_{as} =	0.2	0.2	0.2	0.2	cm3-air/cm3-soil	Volumetric air content in the vadose zone soils (Note 1)
K_s =	795	125	N/A	1,258	cm3-H2O/g-soil	foc × Koc, or Chemical-specific soil-water sorption coefficient for the unsaturated zone (Note 2)
δ_{gw} =	200	200	200	200	cm	Groundwater mixing zone thickness (Note 1)
H =	0	0	0	0	(L-H2O)/(L-air)	Chemical-specific Henry's Law constant (N/A for metals)
U_{gw} =	834	834	834	834	cm/year	Groundwater Darcy Velocity (from Step 4)
I =	14.4	14.4	14.4	14.4	cm	Infiltration rate of water through soil (Note 3)
W =	4,267	4,267	4,267	4,267	cm	Length of source area parallel to groundwater flow
LF_{sw} =	0.00034	0.00215	--	0.00021		
SPLP-based LF_{sw} =	**0.00648**	**0.00117**	**0.00042**	**0.00112**		

Red values are used in the C_{soil} calculations (Note 4)

Notes
1. RM-1 default value obtained from ARBCA Manual Table 3-2.
2. Sorption coefficients for Cd, Co, and Ni are are the median value partition coefficients from http://nepis.epa.gov/Exe/ZyPDF.cgi/P1000GHE.PDF?Dockey=P1000GHE.PDF
3. Infiltration rate of water through soil (see note below): average of the Meyboom (4.6 inches/yr) and WHAT Recharge estimation methods (6.7 inches/yr) for Geologic Area 4 which is cited in the Geological Survey of Alabama publication entitled Groundwater Hydrogeology, Recharge, and Water Availability in the Tennessee River Watershed of Alabama, Open File Report 0910 by Cook, Marlon R., Moss, Neil E., and Jennings, Stephen P. (as cited on Page 30 of the pdf document).
4. SPLP-based LF_{sw} calculated using average of SPLP concentrations divided by average of total concentrations in soil samples on which SPLP was performed [(mg/L-H2O/mg/kg-soil)]. The higher (more conservative) of the SPLP-based LF_{sw} and LF_{sw} (calculated using the ARBCA method) values are used in the final C_{soil} calculation. The C_{soil} values calculated using the ARBCA LF_{sw} values are shown for reference only.

Calculation Input and Output

Source Dimension Inputs — Enter dimensions in ft to calculate C_{gws} (Step 5) and C_{soil} (Step 6)

source to stream (x_{poe})	**600**	ft	=	18,288 cm
source width (Y)	**80**	ft	=	2,438 cm
source length (W)	**140**	ft	=	4,267 cm
source to sentry (x_{poeSW})	**210**	ft	=	6,401 cm

Allowable source groundwater RBTL concentration (C_{gws})

C_{gws} (Cd) =	**0.15**	mg/l
C_{gws} (Co) =	**30.5**	mg/l
C_{gws} (Mn) =	**10.3**	mg/l
C_{gsw} (Ni) eco =	**26.0**	mg/l
C_{gsw} (Ni) HH=	**658**	mg/l

Allowable Sentry Well (MW-6) groundwater RBTL concentration (C_{sw})

C_{sw} (Cd) =	**0.007**	mg/l
C_{sw} (Co) =	**1.5**	mg/l
C_{sw} (Mn) =	**0.51**	mg/l
C_{sw} (Ni) eco =	**1.3**	mg/l
C_{sw} (Ni) HH=	**32.6**	mg/l

Allowable soil source RBTL concentration (C_{soil})

C_{soil} (Cd) =	**23**	mg/kg
C_{soil} (Co) =	**25,992**	mg/kg
C_{soil} (Mn) =	**24,652**	mg/kg
C_{soil} (Ni) eco =	**23,337**	mg/kg
C_{soil} (Ni) HH =	**589,937**	mg/kg

Table 3 (Page 1 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area C
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Calculation of Allowable Source Soil and Groundwater Concentrations

Calculations are based on numerous conservative assumptions, including:
1. steady-state groundwater plume;
2. steady-state flow in stream; and
3. no loss of COCs in the stream due to natural attenuation processes

Step 1: Identify streams potentially impacted by COCs at the site.
Shoal Creek

Step 2: Identify upstream (background) COC concentrations (C_{su})

C_{su} (Cd) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Co) =	10 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0
C_{su} (Mn) =	89.7	µg/l	=	0.09	mg/l	
C_{su} (Ni) =	5 U	µg/l	=	0.0	mg/l	non-detect assumed to be 0.0

Step 3: Estimate allowable concentration of COCs in stream (C_{sw}).
Determined per the Water Quality Criteria established in ADEM Admin Code 335-6-10-.07 (the "Consumption Fish/Water" pathway). In the absense of a COC addressed in 335-6-10, the most current version of the USEPA National Recommended Water Quality Criteria should be used.

Target concentration for Cd is dependent on hardness
C_{sw} (Cd) = 0.094 µg/l conc. (µg/l) = (e(0.7409[ln(hardness in mg/l as $CaCO_3$)]-4.719))(CF) Admin Code 335-6-10-.07 Eq. 2 (freshwater chronic)
CF = 0.967 Conversion Factor (CF) = 1.101672-[ln(hardness)(0.041838)]
Hardness = 25.267 mg/L as $CaCO_3$ *site-specific value: avg. of three SW samples*

C_{sw} (Co) = 19 µg/l No established USEPA National Recommended Water Quality Criteria for cobalt and manganese. Values are from: US EPA Supplemental Guidance to ERAGS: Region 4,
C_{sw} (Mn) = 93 µg/l Ecological Risk Assessment - Region 4 Surface Water Screening Values for Hazardous Waste Sites, Updated 2015 (Table 1a - Freshwater Screening Values).
C_{sw} (Ni) eco = 16.2 µg/l conc. (µg/l) = (e(0.8460[ln(hardness in mg/l as CaCO3)]+0.0584))(CF); where CF = 0.997 Admin Code 335-6-10-.07 Eq. 10 (freshwater chronic)
C_{sw} (Ni) HH= 411 µg/l conc. (mg/l) = (HBW x RfD x RSC)/[(FCR x BCF) + WCR]; where Admin Code 335-6-10-.07 Eq. 16 (Consumption of water and fish)

HBW =	70	kg	human body weight
RfD =	0.02	mg/kg-day	reference dose
RSC =	1.0		relative source contribution
FCR =	0.03	kg/day	fish consumption rate
BCF =	47	1/kg	bioconcentration factor
WCR =	2	1/day	water consumption rate

Values above obtained from Admin Code 335-6-10-.07

Step 4: Estimate the allowable concentration in the groundwater at the point of dicharge (C_{gw})

RM-2 C_{gw}
For an RM-2 evaluation, mixing within the stream is used and the C_{gw} is estimated by the mass balance:
$C_{gw}=(C_{sw}*(Q_{gw}+Q_{sw})/Q_{gw})-C_{su}*(Q_{sw}/Q_{gw})$; where (Eq. D-4.1 ARBCA)

C_{gw} = Allowable concentration in groundwater at the point of discharge into the stream (mg/l)

C_{gw} (Cd) =	0.0	mg/l
C_{gw} (Co) =	4	mg/l
C_{gw} (Mn) =	1	mg/l
C_{sw} (Ni) eco =	4	mg/l
C_{sw} (Ni) HH=	90	mg/l

Q_{gw} = 259 cfd Impacted groundwater discharge into the stream cubic ft per day (cfd); where
Q_{gw} = Impacted groundwater discharge into the stream (ft^3/day); where
$Q_{gw} = U_{gw}*A_{gw}$; where (Eq. D-4.2 ARBCA, except cm/yr to ft/yr conversion factor not included)
U_{gw} = 0.075 ft/day Groundwater Darcy velocity
U_{gw}= K*i/n; where (Eq. D-4.3 ARBCA, except effective porosity included in calculation)

K =	0.5	ft/day	Hydraulic conductivity of the saturated zone (site-specific value)
i =	0.03	ft/ft	Hydraulic gradient (site-specific value)
n =	0.2		Effective porosity (site-specific value)

A_{gw} = 3,457 sf Cross-sectional area of impacted groundwater flow
A_{gw} = Lp*Dp (Eq. D-4.4 ARBCA)
Lp = 118.4 ft Width of the groundwater plume discharging to the stream; where
Lp = (*Y*/30.48)+(2*sqrt(α_y*X_s) where (Eq. D-4.5 ARBCA)

Y =	1,829	cm	width of soil source perpendicular to the groundwater flow direction
Xs = X_{poe}/30.48 =	160	ft	distance from downgradient edge of groundwater source to the stream
α_y =	5.3	ft	lateral dispersivity α_y = Xs/30

Dp = 29.2 ft Thickness of the groundwater plume discharging to the stream
Dp = (δ_{gw}/30.48)+(2*sqrt(α_z*X_s) where (Eq. D-4.6 ARBCA)

δ_{gw} =	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
Xs = X_{poe}/30.48 =	160	ft	distance from downgradient edge of groundwater source to the stream
α_z =	0.8	ft	lateral dispersivity α_z = Xs/200

Q_{sw} = Stream flow rate upstream of the point of groundwater discharge (cfd)
Q_{sw} = 56,268 cfd
Q_{sw} = *7Q10*86,400 (Eq. D-4.10 ARBCA)
7Q10 = 0.65 cfs 7Q10 flow estimated using the method developed by Bingham (1982)
7Q10 = $0.0000015*(G-30)^{1.35} * A^{1.05} * (P-30)^{1.64}$; where

G =	140		Stream flow recession index (Bingham, 1982)
P =	55	in	Mean annual precipitation (Bingham, 1982)
A =	3.64	sq miles	Contributing drainage area (estimated drainage area to Shoal Creek at upstream point of groundwater discharge)

C_{sw} = Allowable downstream concentration at the downstream edge of the stream's mixing zone (from Step 3 above)

C_{sw} (Cd) =	0.000094	mg/l	
C_{sw} (Co) =	0.019	mg/l	
C_{sw} (Mn) =	0.093	mg/l	
C_{sw} (Ni) eco =	0.016	mg/l	
C_{sw} (Ni) HH=	0.411	mg/l	chronic

C_{su} = COC concentration upstream of the groundwater plume discharge (from Step 2 above)

C_{su} (Cd) =	0.0	mg/l
C_{su} (Co) =	0.0	mg/l
C_{su} (Mn) =	0.09	mg/l
C_{su} (Ni) =	0.0	mg/l

Table 3 (Page 2 of 2)
Protection of Surface Water RBTL Calculation Sheet - Soil Area C
Umicore CSM NA Facility
Arab, Alabama
H&H Job No. UMI-001

Step 5: Estimate the allowable concentration in the groundwater at the source (C_{gws})

RM-2 C_{gws}

C_{gws} (Cd) =	**0.1**	mg/l
C_{gws} (Co) =	**24**	mg/l
C_{gws} (Mn) =	**5**	mg/l
C_{gsw} (Ni) eco =	**21**	mg/l
C_{gsw} (Ni) HH=	**528**	mg/l

$C_{gws} = C_{gw}*DAF_{stream}$ Allowable concentration in groundwater below the source (mg/l); where (Eq. D-4.11 ARBCA)

C_{gw} = Allowable groundwater concentration (mg/l) at the point of discharge to the stream (from Step 4)

$DAF_{stream} = C_o/C(x_{poe})$ Dilution attenuation factor (without decay) in the saturated zone between the source and the stream

$C_o/C(x_{poe}) = erf[Y/(4*sqrt(\alpha_y*x_{poe}))]*erf[\delta_{gw}/(2*sqrt(\alpha_z*x_{poe}))]$; where From ARBCA Manual B-14: Domenico Model

$C_o = C_{gws}$

	Cd	Co	Mn	Ni		
x_{poe} =	4,877	4,877	4,877	4,877	cm	distance along the centerline from the downgradient edge of dissolved-plume source zone to the stream
α_y =	163	163	163	163	cm	lateral dispersivity = $x_{poe}/30$
α_z =	24	24	24	24	cm	vertical dispersivity = $x_{poe}/200$
Y =	1,829	1,829	1,829	1,829	cm	width of soil source perpendicular to the groundwater flow direction
δ_{gw} =	200	200	200	200	cm	groundwater mixing zone thickness (RM-1 default value obtained from ARBCA Manual Table 3-2)
DAF =	6	6	6	6		

Step 6: Estimate the allowable soil source concentration (C_{soil})

RM-2 C_{soil}

C_{soil} (Cd) =	**19**	mg/kg
C_{soil} (Co) =	**20,871**	mg/kg
C_{soil} (Mn) =	**11,383**	mg/kg
C_{soil} (Ni) eco =	**18,739**	mg/kg
C_{soil} (Ni) HH =	**473,706**	mg/kg

RM-2 C_{soil} (using ARBCA LF_{sw})

C_{soil} (Cd) =	**621**	mg/kg
C_{soil} (Co) =	**19,669**	mg/kg
C_{soil} (Mn) =	**--**	mg/kg
C_{soil} (Ni) eco =	**169,135**	mg/kg
C_{soil} (Ni) HH =	**4,275,582**	mg/kg

$C_{soil} = (C_{gw}*DAF_{stream})/LF_{sw}$ where C_{soil} = Allowable source soil concentration (mg/kg), and LF_{sw} = Leaching factor from soil to groundwater [(mg/L-H2O)/(mg/kg-soil)]

$LF_{sw} = P_s/(\theta_{ws}+K_s*P_s+H*\theta_{as})*(1+(U_{gw}*\delta_{gw})/I*W)$; where From ARBCA Manual B-15

	Cd	Co	Mn*	Ni		
P_s =	1.8	1.8	1.8	1.8	g-soil/cm3-soil	Dry soil bulk density (Note 1)
θ_{ws} =	0.1	0.1	0.1	0.1	cm3-H2O/cm3-soil	Volumetric water content in vadose zone soils (Note 1)
θ_{as} =	0.2	0.2	0.2	0.2	cm3-air/cm3-soil	Volumetric air content in the vadose zone soils (Note 1)
K_s =	795	125	N/A	1,258	cm3-H2O/g-soil	foc × Koc, or Chemical-specific soil-water sorption coefficient for the unsaturated zone (Note 2)
δ_{gw} =	200	200	200	200	cm	Groundwater mixing zone thickness (Note 1)
H =	0	0	0	0	(L-H2O)/(L-air)	Chemical-specific Henry's Law constant (N/A for metals)
U_{gw} =	834	834	834	834	cm/year	Groundwater Darcy Velocity (from Step 4)
I =	14.4	14.4	14.4	14.4	cm	Infiltration rate of water through soil (Note 3)
W =	2,134	2,134	2,134	2,134	cm	Length of source area parallel to groundwater flow
LF_{sw} =	0.00020	0.00124	--	0.00012		
SPLP-based LF_{sw} =	**0.00648**	**0.00117**	**0.00042**	**0.00112**		

Red values are used in the C_{soil} calculations (Note 4)

Notes

1. RM-1 default value obtained from ARBCA Manual Table 3-2.
2. Sorption coefficients for Cd, Co, and Ni are are the median value partition coefficients from http://nepis.epa.gov/Exe/ZyPDF.cgi/P1000GHE.PDF?Dockey=P1000GHE.PDF
3. Infiltration rate of water through soil (see note below): average of the Meyboom (4.6 inches/yr) and WHAT Recharge estimation methods (6.7 inches/yr) for Geologic Area 4 which is cited in the Geological Survey of Alabama publication entitled Groundwater Hydrogeology, Recharge, and Water Availability in the Tennessee River Watershed of Alabama, Open File Report 0910 by Cook, Marlon R., Moss, Neil E., and Jennings, Stephen P. (as cited on Page 30 of the pdf document).
4. SPLP-based LF_{sw} calculated using average of SPLP concentrations divided by average of total concentrations in soil samples on which SPLP was performed [(mg/L-H2O/mg/kg-soil)]. The higher (more conservative) of the SPLP-based LF_{sw} and LF_{sw} (calculated using the ARBCA method) values are used in the final C_{soil} calculation. The C_{soil} values calculated using the ARBCA LF_{sw} values are shown for reference only.

Calculation Input and Output

Source Dimension Inputs — Enter dimensions in ft to calculate C_{gws} (Step 5) and C_{soil} (Step 6)

source to stream (x_{poe})	**160**	ft	=	4,877 cm
source width (Y)	**60**	ft	=	1,829 cm
source length (W)	**70**	ft	=	2,134 cm

Allowable source groundwater RBTL concentration (C_{gws})

C_{gws} (Cd) =	**0.12**	mg/l
C_{gws} (Co) =	**24.5**	mg/l
C_{gws} (Mn) =	**4.8**	mg/l
C_{gsw} (Ni) eco =	**20.9**	mg/l
C_{gsw} (Ni) HH=	**528**	mg/l

Allowable soil source RBTL concentration (C_{soil})

C_{soil} (Cd) =	**19**	mg/kg
C_{soil} (Co) =	**20,871**	mg/kg
C_{soil} (Mn) =	**11,383**	mg/kg
C_{soil} (Ni) eco =	**18,739**	mg/kg
C_{soil} (Ni) HH =	**473,706**	mg/kg

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Umicore CSM NA
Arab, AL
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	27.3	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-04	(cm/sec)
Hydraulic Gradient	i	0.03	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	32.5	(ft)
(Alpha y) / (Alpha x)*	3.25	(-)
(Alpha z) / (Alpha x)*	2.E+00	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho		(kg/L)		
FractionOrganicCarbon, foc		(-)		
Partition Coefficient	Koc			
Dieldrin		(L/kg)	45.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)

Common R (used in model)* = 45.00

4. BIOTRANSFORMATION -1st Order Decay Coefficient*

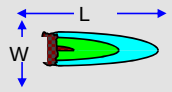
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	1000	(yr)
Modeled Area Width*	160	(ft)
Modeled Area Length*	325	(ft)
Zone 1 Length*	325	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous Single Planar

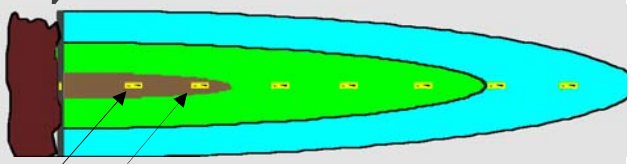
Source Options

Source Thickness in Sat. Zone* 6.6 (ft)

Width* (ft) Y1 80

Conc. (ug/L)*	C1	k_s* (1/yr)
Cadmium	643.0	0
		0
		0
		0
		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

Distance from Source (ft)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | *Help* | Restore | RESET | *SEE OUTPUT* | Paste

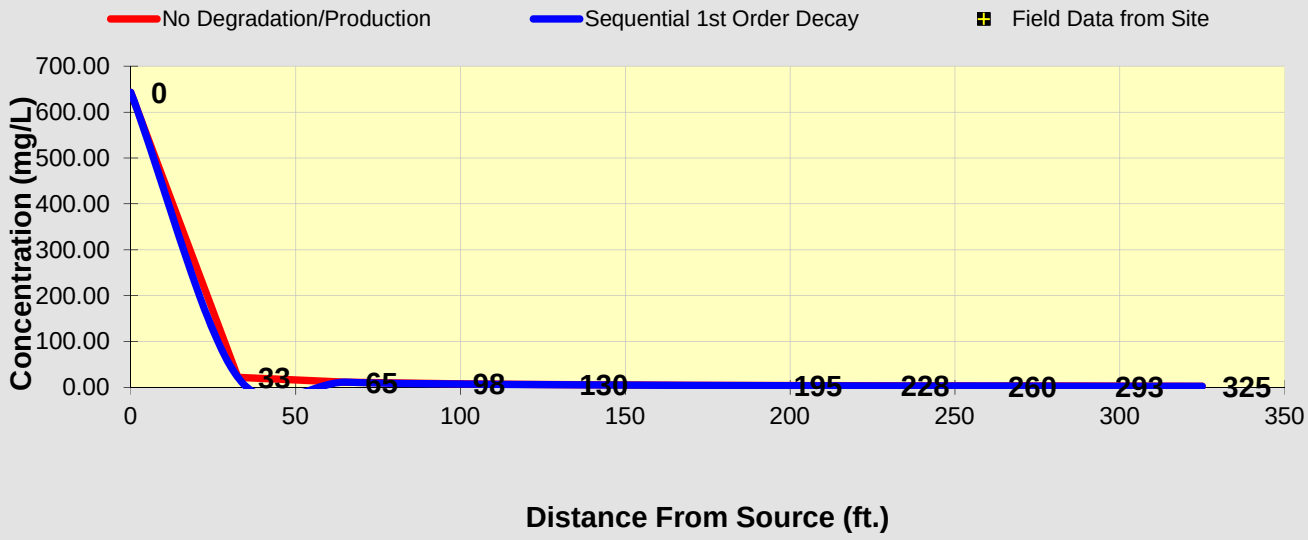
DISSOLVED CADMIUM CONCENTRATIONS ALONG PLUME CENTERLINE (Ug/L) at Z=0

Distance from Source (ft)

Cadmium	0	33	65	98	130	163	195	228	260	293	325
No Degradation	643.000	21.376	10.900	7.311	5.495	4.395	3.655	3.119	2.709	2.382	2.110
Biotransformation	643.0000	21.376	10.900	7.311	5.495	4.395	3.655	3.119	2.709	2.382	2.110

Monitoring Well Locations (ft)

Field Data from Site											



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

Umicore CSM NA
Arab, AL
Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	27.3	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-04	(cm/sec)
Hydraulic Gradient	i	0.03	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	32.5	(ft)
(Alpha y) / (Alpha x)*	3.25	(-)
(Alpha z) / (Alpha x)*	2.E+00	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho		(kg/L)		
FractionOrganicCarbon, foc		(-)		
Partition Coefficient	Koc			
Dieldrin		(L/kg)	180.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)

Common R (used in model)* = 180.00

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

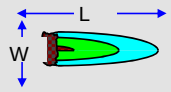
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	1000	(yr)
Modeled Area Width*	160	(ft)
Modeled Area Length*	325	(ft)
Zone 1 Length*	325	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

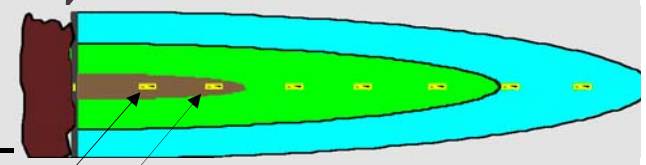
6. SOURCE DATA TYPE: Continuous Single Planar

Source Options

Source Thickness in Sat. Zone* 6.6 (ft)

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations

	Y1	k_s* (1/yr)
Width* (ft)	80	
Conc. (ug/L)*	C1	
Cadmium	643.0	0
		0
		0
		0
		0



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

Distance from Source (ft)											

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | *Help* | Restore | RESET | *SEE OUTPUT* | Paste

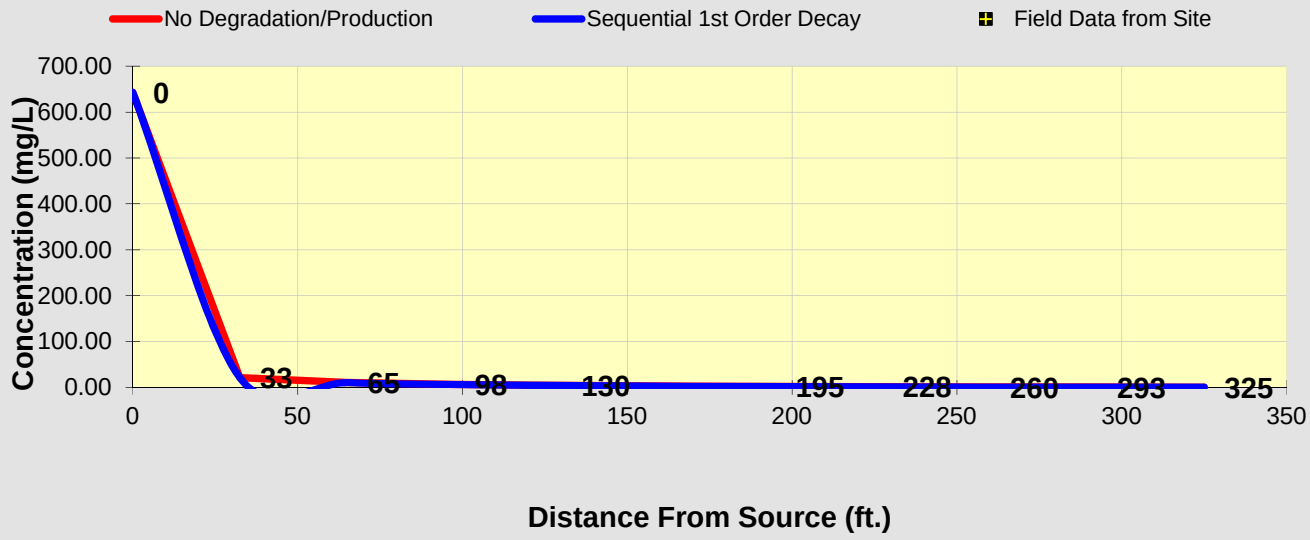
DISSOLVED CADMIUM CONCENTRATIONS ALONG PLUME CENTERLINE (Ug/L) at Z=0

Distance from Source (ft)

Cadmium	0	33	65	98	130	163	195	228	260	293	325
No Degradation	643.000	20.769	9.991	6.066	3.915	2.526	1.578	0.936	0.520	0.269	0.128
Biotransformation	643.0000	20.769	9.991	6.066	3.915	2.526	1.578	0.936	0.520	0.269	0.128

Monitoring Well Locations (ft)

Field Data from Site											



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
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Run Name

Data Input Instructions:

115 → 1. Enter value directly....or
↑ *or* 2. Calculate by filling in gray
0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	27.3	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-04	(cm/sec)
Hydraulic Gradient	i	0.03	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	32.5	(ft)
(Alpha y) / (Alpha x)*	3.25	(-)
(Alpha z) / (Alpha x)*	2.E+00	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho		(kg/L)		
FractionOrganicCarbon, foc		(-)		
Partition Coefficient	Koc			
Dieldrin		(L/kg)	675.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)

Common R (used in model)* = 675.00

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

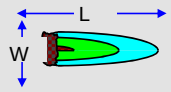
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	1000	(yr)
Modeled Area Width*	160	(ft)
Modeled Area Length*	325	(ft)
Zone 1 Length*	325	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous Single Planar

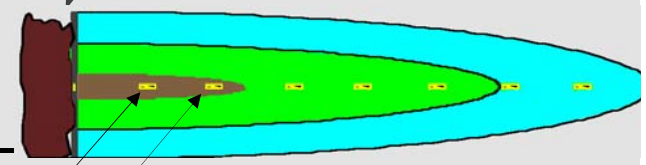
Source Options

Source Thickness in Sat. Zone* 6.6 (ft)

	Y1
Width* (ft)	80

Conc. (ug/L)*	C1	k_s* (1/yr)
Manganese	7100.0	0
		0
		0
		0
		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

Manganese	7100.0	1660.0									
Distance from Source (ft)	0	230									

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore | RESET | SEE OUTPUT | Paste

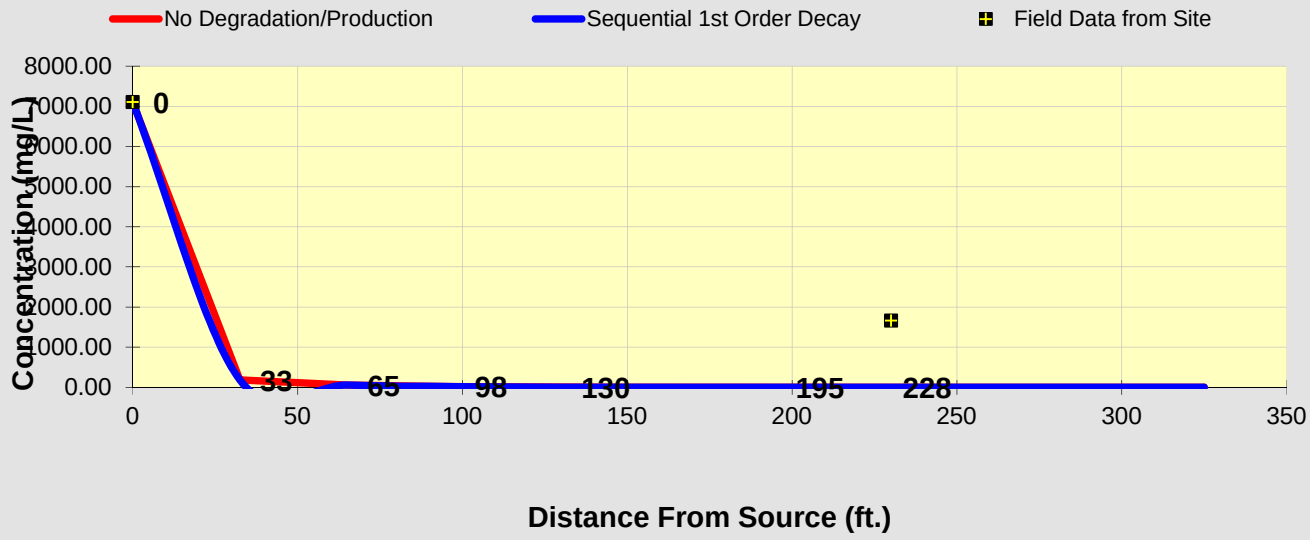
DISSOLVED MANGANESE CONCENTRATIONS ALONG PLUME CENTERLINE (Ug/L) at Z=0

Distance from Source (ft)

Manganese	0	33	65	98	130	163	195	228	260	293	325
No Degradation	7100.000	182.251	55.731	16.535	3.926	0.695	0.088	0.008	0.000	0.000	0.000
Biotransformation	7099.9997	182.251	55.731	16.535	3.926	0.695	0.088	0.008	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	230									
Field Data from Site	7100.000	1660.000									



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array

BIOCHLOR Natural Attenuation Decision Support System

Version 2.2
Excel 2000

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Run Name

Data Input Instructions:

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0.02 cells. Press Enter, then C
(To restore formulas, hit "Restore Formulas" button)
Variable* → Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ◉ Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	27.3	(ft/yr)
or			
Hydraulic Conductivity	K	1.8E-04	(cm/sec)
Hydraulic Gradient	i	0.03	(ft/ft)
Effective Porosity	n	0.2	(-)

2. DISPERSION

Alpha x*	32.5	(ft)
(Alpha y) / (Alpha x)*	3.25	(-)
(Alpha z) / (Alpha x)*	2.E+00	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R
or

Soil Bulk Density, rho		(kg/L)		
FractionOrganicCarbon, foc		(-)		
Partition Coefficient	Koc			
Dieldrin		(L/kg)	2700.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)
		(L/kg)	1.00	(-)

Common R (used in model)* = 2700.00

4. BIOTRANSFORMATION **-1st Order Decay Coefficient***

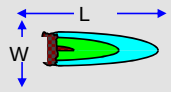
Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE	0.000	
TCE → DCE	0.000	
DCE → VC	0.000	
VC → ETH	0.000	

λ HELP

5. GENERAL

Simulation Time*	1000	(yr)
Modeled Area Width*	160	(ft)
Modeled Area Length*	325	(ft)
Zone 1 Length*	325	(ft)
Zone 2 Length*	0	(ft)



Zone 2= L - Zone 1

6. SOURCE DATA TYPE: Continuous Single Planar

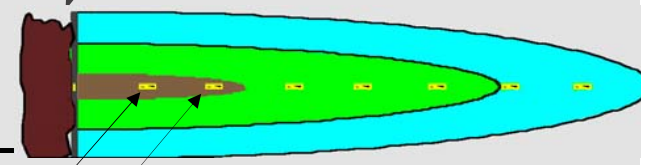
Source Options

Source Thickness in Sat. Zone* 6.6 (ft)

Width* (ft) Y1 80

Conc. (ug/L)*	C1	k_s* (1/yr)
Manganese	7100.0	0
		0
		0
		0
		0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

Manganese	7100.0	1660.0									
Distance from Source (ft)	0	230									

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | *Help* | Restore | RESET | *SEE OUTPUT* | Paste

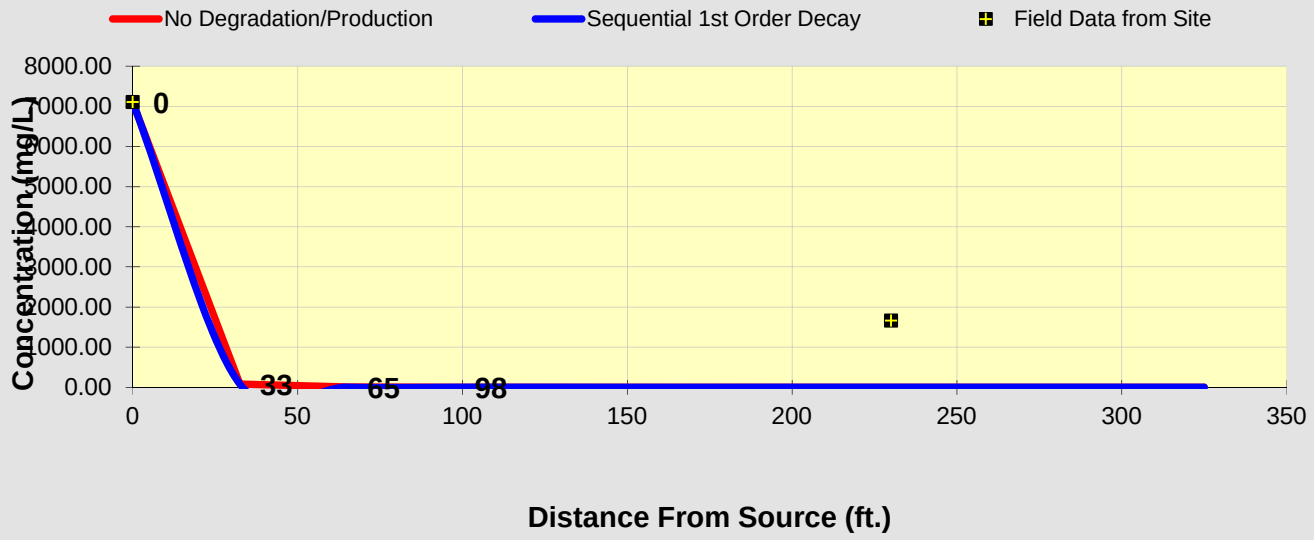
DISSOLVED MANGANESE CONCENTRATIONS ALONG PLUME CENTERLINE (Ug/L) at Z=0

Distance from Source (ft)

Manganese	0	33	65	98	130	163	195	228	260	293	325
No Degradation	7099.999	76.106	3.452	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	7099.9987	76.106	3.452	0.048	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Monitoring Well Locations (ft)

	0	230									
Field Data from Site	7100.000	1660.000									



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1,000.0 Years

Log ⟺ Linear

Return to Input

To All

To Array