

# 2020 Annual Groundwater Summary

Brickhaven No. 2 Mine Tract "A" Structural Fill

Charah Solutions, Inc.

Moncure, Chatham County, North Carolina January 31, 2021

HDR Engineering, Inc. of the Carolinas 440 S Church Street, Suite 1000, Charlotte, NC 28202-2075 704.338.6700 NC License F0116

# 2020 Annual Groundwater Summary

## Brickhaven No.2 Mine Tract "A" Structural Fill Permit 19-10

The Brickhaven No.2 Mine Tract "A" Structural Fill groundwater monitoring system is designed to meet the requirements of the North Carolina Coal Ash Management Act of 2014 (CAMA) and North Carolina Department of Environmental Quality Rule 15A NCAC 13B Section .1631.

HDR conducted the required 2020 semi-annual sampling events on January 15-17 and July 6-8, 2020. Groundwater monitoring and sampling at the site is governed by the following:

- North Carolina Coal Ash Management Act (CAMA) of 2014 (Senate Bill 729)
- Water Quality Monitoring Plan Brickhaven No.2 Mine Tract "A" Structural Fill, approved March 2015
- North Carolina Department of Environmental Quality (NCDEQ) Permit No. 1910-STRUC-2015, issued June 5, 2015
- NCDEQ Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling, April 2008
- NCDEQ Division of Water Management memorandum concerning electronic document submittal for routine groundwater and surface water monitoring, November 5, 2014
- U.S. Environmental Protection Agency (EPA) Region I, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, January 19, 2010
- EPA 2009, Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance and CFR 40 257.93 (f)(3)

The First and Second Semi-Annual Reports with an EPA method of statistical analyses were submitted to the NCDEQ Division of Waste Management on June 24 and November 5, 2020 respectively. The reports are attached for reference and can be found on the NCDEQ website at this location <a href="https://deq.nc.gov/about/divisions/waste-management/laserfiche">https://deq.nc.gov/about/divisions/waste-management/laserfiche</a>. The following information has been provided in those reports:

- Status of the groundwater monitoring for the structural fill
- Site conditions and key actions completed during the reporting period
- · Key activities proposed for the upcoming year
- A map showing the background (or upgradient) and downgradient monitoring wells
- Monitoring data obtained from sampling of wells, including information on the samples collected

The findings of the groundwater sampling and laboratory testing conducted in 2020 indicate the presence of naturally occurring constituents that were detected at various levels both prior to and after placement of coal combustion products.

On June 21, 2019, the NCDEQ issued a letter to Charah, Inc. to begin assessment monitoring, citing exceedances of groundwater standards established in 15A NCAC 2L .0202 (2L Standards) and surface water standards established in 15A NCAC 2B .0211 and .0216 (2B Standards) at the Brickhaven No. 2 Mine Structural Fill. On August 16, 2019, Charah submitted a Groundwater and Surface Water Assessment Work Plan (Work Plan) to NCDEQ. The following assessment activities were proposed in the Work Plan:

- Soil samples from areas within the former General Shale mine, but beyond the area of coal combustion product (CCP) placement by Charah;
- Groundwater samples from proposed and existing monitoring wells;
- Surface water samples from proposed and existing locations;
- Leachate samples from the designated leachate sampling location;
- Geochemical analyses of soil and ash quality data; and,
- Construction of a three-dimensional groundwater flow and constituent transport model.

On July 24, 2020, Charah submitted an Assessment Monitoring Report to summarize the assessment monitoring activities and results. The Assessment Monitoring Report submitted to NCDEQ is attached.

As HDR's authorized representative, I have prepared or supervised the preparation of the referenced documents above; which have been prepared in general accordance with industry standards and practices; and the information contained therein is truthful and accurate to the best of my knowledge.

Mark P. Filardi, LG

Sr. Geologist

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A

Attachment A – 2020 First Semi-Annual Detection Monitoring Report

1.1	T.		
DENR USE ONLY:	☐Paper Report	☐Electronic Data - Email CD (data loaded: Yes / No )	Doc/Event #:
NC DENR			<b>Environmental Monitoring</b>
Division of Wast	e Management -	- Solid Waste	Reporting Form

Notice: This form and any information attached to it are "Public Records" as defined in NC General Statute 132-1. As such, these documents are available for inspection and examination by any person upon request (NC General Statute 132-6).

### Instructions:

Revised 6/2009

- Prepare one form for each individually monitored unit.
- Please type or print legibly.
- Attach a notification table with values that attain or exceed NC 2L groundwater standards or NC 2B surface water standards. The notification must include a preliminary analysis of the cause and significance of each value. (e.g. naturally occurring, off-site source, pre-existing
- Attach a notification table of any groundwater or surface water values that equal or exceed the reporting limits.
- Attach a notification table of any methane gas values that attain or exceed explosive gas levels. This includes any structures on or nearby the facility (NCAC 13B .1629 (4)(a)(i).
- Send the original signed and sealed form, any tables, and Electronic Data Deliverable to: Compliance Unit, NCDENR-DWM, Solid Waste

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Solid Waste Monitoring Da	ta Submittal Information boratory, consultant, facility owner):											
Green Meadow - Charah Solution												
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Jachi Killing F G		_/U4-3.30-00/4										
Facility name:	Facility Address:	Facility Permit #	NC Landfill Rule: (.0500 or .1600)	Actual sampling dates (e.g., October 20-24, 2006)								
Charah, LLC Brickhaven No. 2 Mine Tract "A"	1271 Moncure-Flatwood Road Chatham County Moncure, NC	1910-STRUT- 2015	CAMA	January 15-17, 2020								
Environmental Status: (Check all Initial/Background Monitoring Type of data submitted: (Check all	g X Detection Monitoring	X Assessment N	Monitoring	Corrective Action								
Groundwater monitoring data Groundwater monitoring data Leachate monitoring data	Groundwater monitoring data from private water supply wells Corrective action data (specify)											
Yes, a notification of values monitoring points, dates, and preliminary analysis of the ca	ce water standards were exceeded. exceeding a groundwater or surface water slytical values, NC 2L groundwater standar ause and significance of any concentration exceeding an explosive methane gas limit ne gas limits.	rd, NC 2B surface wa	ter standard or NC So	olid Waste GWPS and								
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Jacob Ruffing, P.G.	Senior Hydrogeologist	704-33		121519111111111111								
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Signature	Dat	te	[2/\	OF AL								
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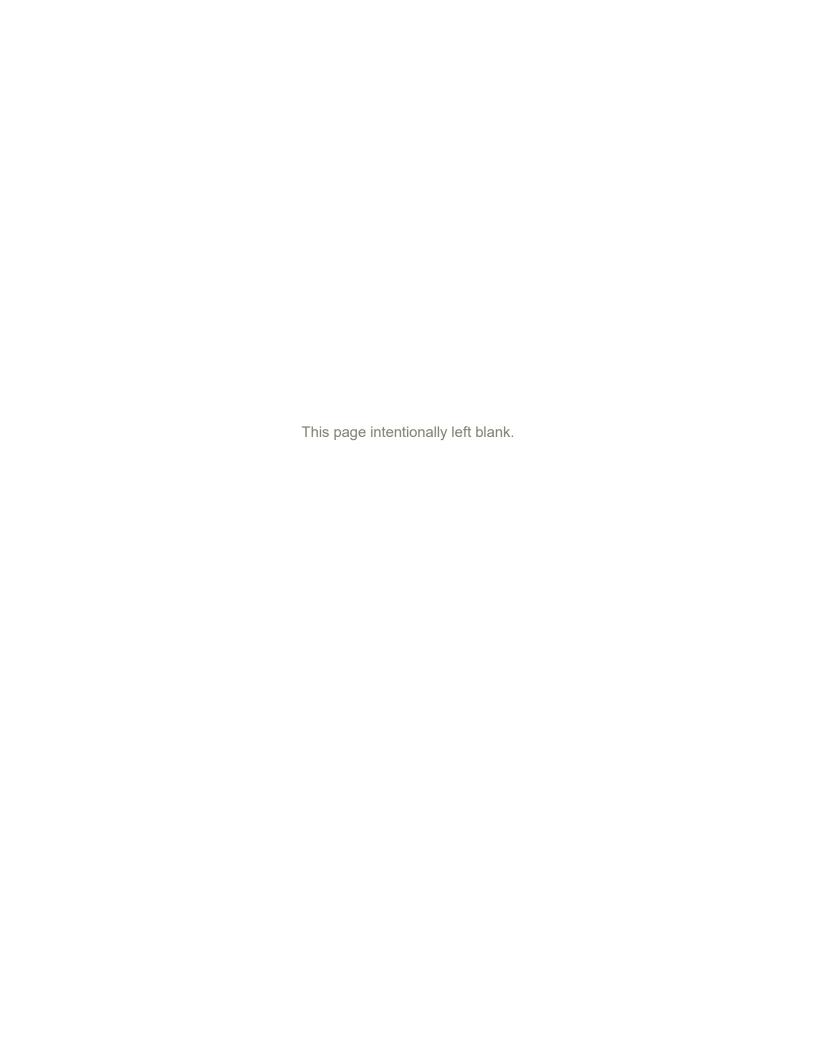
# 2020 First Semi-Annual Detection Monitoring Report

Brickhaven No.2 Mine Tract "A" Structural Fill

Charah Solutions, Inc.

Moncure, Chatham County, North Carolina June 26, 2020

HDR Engineering, Inc. of the Carolinas 440 S Church Street, Suite 1000, Charlotte, NC 28202-2075 704.338.6700 NC License F0116





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Appendix B – Concentration vs. Time Plots

Appendix C – Laboratory Reports, Chains of Custody, & Quality Control Data

Appendix D – Electronic Data Deliverables (CD-ROM only)

Appendix E – Statistical Analysis Memo



# Select Acronyms

μg/L micrograms per liter

CAMA North Carolina Coal Ash Management Act of 2014

CCP Coal Combustion Products
DEC Duke Energy Carolinas
DEP Duke Energy Progress
DO Dissolved Oxygen

EDD Electronic Data Deliverable

EPA United States Environmental Protection Agency

ID Inner Diameter

KM Kaplan-Meier Method

NCDENR North Carolina Department of Environment and Natural Resources

NCDEQ North Carolina Department of Environmental Quality NCGPS North Carolina groundwater protection standard

N Standard Penetration Resistance

ND Non-detects

NPPL Non-parametric Prediction Limit
NTU Nephelometric turbidity units
MCL Maximum Contaminant Levels

MDL Method Detection Limit

MLE Maximum Likelihood Estimate

msl mean sea level OD Outer Diameter

ORP Oxidation-Reduction Potential

PL Predictive Limit

PPL Parametric Prediction Limit

RCRA Resource Conservation and Recovery Act

ROS Regression on Order Statistics SSI Statistically Significant Increase

UPL Upper Prediction Limit

USCS Unified Soil Classification System



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# 1 Introduction

# 1.1 Purpose

The purpose of this 2020 First Semi-Annual Detection Monitoring Report is to summarize semi-annual detection monitoring at the Brickhaven No.2 Mine Tract "A" Structural Fill site in Moncure, Chatham County, North Carolina. The report includes results from the January 15-17, 2020 semi-annual detection monitoring event, as well as the statistical results calculated for this monitoring event.

The next semi-annual monitoring event will take place in July 2020.

# 1.2 Regulatory Compliance

Operating under Facility Permit #1910-STRUT-2015, Charah is required to monitor groundwater and surface water quality at designated locations. Per the Water Quality Monitoring Plan (Buxton, 2015a), groundwater samples are collected from 10 monitoring wells (MW-1 through MW-6, MW-7R, MW-8, BG-1, and BG-2) and two surface water locations (SW-1 and SW-2). Groundwater samples are analyzed for constituents listed in North Carolina Department of Environmental Quality (NCDEQ) Solid Waste Appendix I (except VOCs) and II, 40 CFR 257 Appendix IV.

On January 8, 2020, NCDEQ approved the discontinuation of Appendix I VOC analysis based on the historic non-detection of VOC constituents.

If sampling results indicate impacts to groundwater or surface water, Charah must notify NCDEQ within 14 days. If no impacts are observed, Charah must submit a report of the sampling results to NCDEQ with 120 days of the sampling event.

Groundwater monitoring and sampling at the site is governed by the following:

- North Carolina Coal Ash Management Act (CAMA) of 2014 (Senate Bill 729).
- Water Quality Monitoring Plan, Brickhaven No.2 Mine Tract "A" Structural Fill, approved March 2015 (Buxton, 2015a).
- North Carolina Department of Environment and Natural Resources (NCDENR)<sup>1</sup> Permit No. 1910-STRUC-2015, issued June 5, 2015.
- NCDENR Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling, April 2008 including Groundwater Rules .1600.
- NCDENR Division of Water Management memorandum concerning electronic document submittal for routine groundwater and surface water monitoring, November 5, 2014.

<sup>&</sup>lt;sup>1</sup> On September 18, 2015, the North Carolina Department of Environment and Natural Resources (NCDENR) became the North Carolina Department of Environmental Quality (NCDEQ). Both naming conventions are used in this report, as appropriate.



• U.S. Environmental Protection Agency (EPA) Region I, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, January 19, 2010.

Groundwater monitoring and sampling at the site is also conducted in general accordance with the U.S. EPA's "Disposal of Coal Combustion Residuals from Electric Utilities" rule (CCR Rule).

# 1.3 Site Location and Operation

The site is located in Chatham County, approximately four miles southeast of Moncure, North Carolina **Figure 1**. The owner of the site is Green Meadow, LLC (Green Meadow). Charah Solutions, Inc. (Charah) is responsible for the operation and maintenance of the site. The mine property is approximately 301 acres in total; of which 145 acres is permitted for structural fill placement of coal combustion products (CCP).

The property located within the structural fill area was previously owned by General Shale Brick, Inc., which operated the site and an adjacent property as a clay mine beginning in 1985 for their off-site brick manufacturing facility. Mined clay was stockpiled and then transported approximately 3.5 miles south to Brickhaven, North Carolina for brick manufacturing.

The area immediately surrounding the site primarily consists of rural residential (approximately 2,500 feet east, 1,000 feet southeast, and 1,000 feet southwest), commercial, industrial, wooded and agricultural property. According to information obtained from the Chatham County GIS website (October 2015), municipal water is available to the surrounding area.

Charah began CCP placement in the first composite liner containment system (Cell 1, Sub Cell 1A) on October 23, 2015. CCP placement has occurred in Cell 1, Cell 2, Cell 6A and Cell 6B. Charah has placed just over 7.3 million tons of CCP material in the structural fill. CCP materials (including fly ash, bottom ash, boiler slag, and/or flue gas desulfurization materials) were initially brought to the site by truck through October 2015 until transportation was changed to rail in January 2016. The CCP originated at the Duke Energy Carolinas (DEC) Riverbend Steam Station and Duke Energy Progress (DEP) L.V. Sutton Energy Complex (Sutton Plant) sites.

Leachate (i.e., product generated from the liquids present in the fill at the time of placement and/or stormwater that infiltrates the fill) is managed on-site through the collection, storage, and disposal of the resultant liquid. Green Meadow has approved pump and haul permits to dispose of leachate at the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant and the Town of Spring Lake's South Harnett Regional Wastewater Treatment Plant.

# 1.4 Groundwater Monitoring System

The groundwater monitoring system was designed to provide background groundwater quality data prior to the placement of CCP in the structural fill and early detection of potential CCP constituents subsequent to CCP placement to be protective of human health and the environment. The groundwater monitoring system is comprised of ten (10) wells: eight wells are located downgradient/cross-gradient (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7R and



MW-8) and two wells are considered to represent background groundwater quality (BG-1 and BG-2). Well construction details are presented in **Table 1**.

Background monitoring well BG-1 was installed in July of 2015 near the entrance of the site along Moncure-Flatwood Road. This location was selected to provide groundwater quality data in an area of the site presumed to not be impacted by historic or current usage of the site. Upon statistical analysis of groundwater quality data collected pre- and post-CCP placement, concentrations of target constituents in well BG-1 appear to be anonymously low when compared to pre-CCP conditions elsewhere on-site. With approval from NCDEQ, Charah installed a second background well (BG-2) southwest of the structural fill in December 2018 to evaluate spatial variability of inorganic concentrations across the site.

Well MW-7R was installed in April of 2017 as a replacement for monitoring well MW-7, as documented and approved in the May 25, 2017 memorandum to the NCDEQ Solid Waste Section. Well MW-7 will temporarily remain onsite for water level gauging purposes only.



Table 1: Well Construction, Survey, and Groundwater Elevations

Well ID	Northing	Easting	Pad Elev. (ft.)	TOC Elev. (ft.)	TD (ft. BGS)	TD (ft. BTOC)	Screen Length (ft.)	Screened Interval (ft. BGS)	DTW (ft. BTOC)	GW Elevation (ft. MSL)	Lithologic Unit
BG-1	670898.50	1996348.25	225.64	228.19	40.50	43.05	15	26-41	10.65	217.54	Layered Rock/PWR*
BG-2	669278.99	1990476.10	191.41	194.23	23.29	26.11	10	13-23	11.35	182.88	Layered Rock/PWR*
MW-1	674737.98	1993417.69	277.28	280.08	72.50	75.30	15	57-72	58.35	221.73	Layered Rock/PWR*
MW-2	673677.07	1994537.54	229.27	231.76	47.66	50.15	15	30-45	43.30	188.46	Layered Rock/PWR*
MW-3	672474.63	1994834.76	220.00	222.56	40.80	43.36	15	25-40	23.01	199.55	PWR
MW-4	671326.48	1994974.40	214.49	217.13	22.70	25.34	10	13-23	13.25	203.88	Residuum/PWR
MW-5	671081.19	1993779.03	242.72	244.86	44.00	46.14	10	34-44	23.03	221.83	PWR
MW-6	671267.60	1992793.34	228.63	231.10	27.00	29.47	15	12-27	6.45	224.50	Residuum/PWR
MW-7	672306.28	1992642.35	229.53	231.71	15.00	17.18	10	5-15	16.30	215.41	Residuum/PWR
MW-7R	672221.96	1992702.98	239.99	242.22	36.00	39.94	10	26-36	21.95	217.99	Residuum/PWR
MW-8	673304.83	1992200.37	233.41	236.47	46.00	49.06	15	31-46	33.97	202.50	PWR

### Notes:

- 1. Top-of-casing, ground surface elevations and horizontal locations at MW-4 (PZM-1), MW-5 (PZM-22) and MW-7 (PZM-27) surveyed by Lawrence Surveying of Monroe, NC.
- 2. Top-of-casing, ground surface elevations and horizontal locations at BG-1, MW-1, MW-3, MW-6, MW-8 and MW-7R surveyed by McAdams of Durham, NC.
- 3. Top-of-casing, ground surface elevations and horizontal location at monitoring well MW-2 surveyed by McAdams of Durham, NC.
- 4. Top-of-casing, ground surface elevations and horizontal location at monitoring well BG-2 surveyed by McAdams of Durham, NC.
- 5. TD=total depth; BGS=below ground surface; TOC=top of casing; DTW = Depth-to-Water; BTOC = below top-of-casing; GW = groundwater; MSL = mean sea level.
- 6. Depth to water measurements obtained on January 15, 2020, to the nearest 0.01 foot with a water level meter.
- 7. Well locations and elevations based on NAD 83 horizontal datum and NGVD88 vertical datum.
- 8. \* = interpreted lithologic unit based on relative drilling hardness and geologic judgment during well installation.



# 1.5 Site Topography and Geographical Setting

Based on review of the 1993 USGS topographic quadrangle (**Figure 2**) and GIS mapping, the topography of the site and immediately surrounding area can be characterized by moderately rolling hills, which are dissected by dendritic creeks. Prior to mining by General Shale, a topographic ridge was present within the site, extending from the northwestern corner of the present-day structural fill toward the southeast. Thus, historic drainage was to the north/northwest/west and to the northeast/east/southeast away from the ridge, as shown on **Figure 3**.

# 1.6 Geologic and Hydrogeologic Setting

### 1.6.1 Regional Geology

The site is located within the Piedmont physiographical province of North Carolina, which is a northeast-southwest trending region extending from New York to Alabama.

According to the 1985 North Carolina Geologic Map prepared by the North Carolina Geological Survey, the site is located in the Triassic Basin Belt of the Piedmont physiographic province. The basement rocks of the Triassic Basin Belt include conglomerate, sandstone, mudstone, limestone, coal, and shale. The majority of the subject property is located within the Sanford Formation which contains conglomerate, fanglomerate, sandstone, and mudstone. The far western portion of the site is located in the Cummock Formation which contains sandstone, mudstone, gray and black coal, and carbonaceous shale. The Triassic Basin is bounded by felsic metavolcanic rock within the Carolina Slate Belt approximately 6.5 miles to the northwest; and is contacted by metamorphosed granite and biotite gneiss and schist of the Raleigh Belt along a normal fault approximately 2.5 miles to the southeast. The Triassic Basin formations have been intruded by north northwest-south southeast trending igneous diabase dikes during the Jurassic Period (~144 to 208 Ma), and contain northeast-southwest trending normal faults. However, none of these faults were indicated to exist at the subject site on the 1985 geologic map (NCDENR, 1985).

In the Piedmont, the bedrock is typically overlain by a mantle of weathered rock (residuum/saprolite), which has an average thickness of approximately 25 feet. The residuum/saprolite consists of varying amounts of unconsolidated clays, silts, and sands, with lesser amounts of rock fragments. Due to the range of the parent rock composition and the variable susceptibility to weathering of each rock type, the residuum/saprolite range widely in color, texture, and thickness. Generally, the residuum/saprolite is thickest near inter-stream divides (ridges) and thins toward stream beds. In profile, the residuum/saprolite normally grades from clayey soils near the land surface to sandier, partially weathered rock above competent bedrock (Buxton, 2014).

### 1.6.2 Site Geology

The geology of the site can be subdivided into six units which include fill, flood plain, soil horizon, residuum, partially weathered rock, and layered rock. These units generally grade downward from a soil horizon, to residuum, to partially weathered rock and finally layered rock. Fill materials were limited to the road bed and berm located around the east and west sides of



MW-4. Flood plain sediments were only identified at MW-4 on the southeast corner of the site. The following summary of site-specific units is based on boring logs originally included in the *Design Hydrogeologic Report* (Buxton, March 2016).

### FILL

Fill materials were primarily identified in the road bed and berm located around the east and west sides near MW-4 and generally consisted of mottled reddish yellow, orange, brown, and light gray sandy silty clay with quartz and brick gravel.

### **FLOOD PLAIN**

Flood plain sediments were only located adjacent to MW-4 on the southeast corner of the site. Sediments were associated with a former adjacent intermittent tributary creek and can be generally characterized as mottled light gray fine sandy silty clay. The flood plain sediments were approximately 5 feet thick in this area and had been deposited above residuum. Based on geotechnical laboratory data, the flood plain sediments were identified as lean clay (CL) under the Unified Soil Classification System (USCS).

### **SOIL HORIZON**

The soil horizon is characterized as mottled yellowish, brown, orange, and red silty clay and clayey silt. Root structures were common. The soil horizon at the site is formed from the continued weathering and biologic reworking of residuum, and ranges from 2 to 15 feet in thickness, when present. Based on geotechnical laboratory data, the soil horizon consisted of clayey sand (SC), elastic silt (MH), and lean clay (CL) and had a hydraulic conductivity of 2.86 x  $10^{-7}$  cm/sec.

### **RESIDUUM**

Residuum is characterized as mottled (black and gray) red and reddish brown sandy silty clay with infrequent quartz gravel and cobbles. Residuum is characteristically fissile, often breaking in horizontal sheets. Residuum generally retains the remnant texture, structure and mineral content of the rock from which it was formed, and ranges from 5 to 15 feet in thickness. Residuum has a Standard Penetration Resistance (N) of less than 100 blows per foot. Based on geotechnical laboratory data, the residuum consisted of lean clay (CL) with hydraulic conductivity ranging from 7.69 x 10-8 cm/sec to 3.69 x 10-9 cm/sec.

### PARTIALLY WEATHERED ROCK

Partially weathered rock is characterized as mottled (light green and purple) brown, reddish gray, and weak red silty clay and weathered mudstone, which are often fissile. Partially weathered rock generally retains the remnant texture, structure, and mineral content of the rock from which it was formed, and ranges from 5 to 40 feet in thickness. Partially weathered rock has an N-value of 100 blows per foot or greater and can generally be drilled with standard hollow-stem auger drilling technology. Based on geotechnical laboratory data, partially weathered rock consisted of lean clay (CL). Hydraulic conductivity ranged from 2.433 x 10<sup>-4</sup> cm/sec to 7.154 x 10<sup>-8</sup> cm/sec, according to slug or recovery test data (for wells screened solely in partially weathered rock).



### LAYERED ROCK

Based on rock coring activities conducted near MW-7/MW-7R and visual inspection of the layered rock exposed on the north side of the MW-4 area, layered rock at the site is primarily composed of reddish to light tan gray mudstone, cross-bedded muddy sandstone, and muddy sandy conglomerate (rounded quartz gravel and cobbles). Layered rock generally occurs as horizontally oriented and relatively thin intermittent layers (especially within the upper 15 feet of contacting layered rock) across the site, based on rock coring and the horizontal fissile nature of residuum and partially weathered rock. Layered rock contained horizontal to near vertical fracturing. Large fractures, oriented approximately N 40° to 60° E at 70° northwest, were observed in weathered mudstone to the immediate northeast near MW-8. Rock Quality Designation (RQD) values for the MW-8 area rock core (21-inch recovery) were poor (47.6%). The occurrence of layered rock at the site was generally defined by auger refusal.

### 1.6.3 Regional Hydrogeology

The occurrence and movement of groundwater in the Piedmont physiographic province are within two separate but interconnected water-bearing zones that typically comprise one aquifer. A shallow water-bearing zone typically occurs within the residuum/saprolite and a deeper zone within the underlying bedrock.

Groundwater in the residuum/saprolite zone occurs in the interstitial pore spaces between the individual sediment grains. Groundwater in this zone generally flows from topographic highs to topographic lows. The occurrence and movement of groundwater in the underlying bedrock zone are controlled by joints and fractures within the bedrock. Groundwater within this deeper zone may occur under confined or semi-confined conditions, depending on the extent of fracturing at the saprolite/bedrock interface. Deeper groundwater movement is typically controlled by the distribution of openings in the bedrock and can be variable. Groundwater Flow Characteristics

On January 15, 2020, groundwater depth was measured in each well. Depths-to-water ranged from 6.45 feet (MW-6) to 58.35 feet (MW-1) below top of casing. Groundwater elevations ranged from 182.88 feet (BG-2) to 224.50 feet (MW-6) mean sea level **Table 1**. Historic groundwater elevations are shown in **Table 2**. Monitoring well locations are shown on **Figure 3**.



**Table 2: Historic Groundwater Elevations** 

Mall	тос		Groundwater Elevation														
Well ID	Elev.	Oct-15	Nov-15	lan 16	Feb-16	Apr 16	Jun-16	Jul-16	lon 17	Anr 17	Jul-17	Jan-18	Jul-18	lan 10	Jul-19	lan 20	
BG-1	228.19	215.70	216.83	<b>Jan-16</b> 218.14	218.94	<b>Apr-16</b> 218.46	218.46	218.74	<b>Jan-17</b> 217.08	<b>Apr-17</b> 216.61	216.76	211.96	215.37	<i>Jan-19</i> 218.50	218.63	<b>Jan-20</b> 217.54	
BG-2	194.23	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	NG	183.28	181.32	182.88	
MW-1	280.08	220.18	220.55	222.03	222.76	221.83	221.83	221.51	220.58	219.72	219.19	217.61	218.03	220.52	222.44	221.73	
MW-2	229.97	190.20	192.90	197.19	198.82	201.17	201.17	204.62	205.42	201.63	201.58	186.33	195.65	195.61	194.45	188.46	
MW-3	222.56	208.46	210.29	210.64	212.31	212.36	212.36	204.81	202.35	202.36	203.91	199.53	194.38	199.03	196.86	199.55	
MW-4	217.13	206.37	206.83	206.98	211.36	208.34	208.34	205.66	203.67	203.30	204.10	202.16	203.43	204.16	205.00	203.88	
MW-5	244.86	229.66	230.11	230.16	228.69	220.06	220.06	222.96	203.32	221.53	222.60	218.86	221.93	223.86	224.11	221.83	
MW-6	231.1	223.99	223.97	224.53	224.75	224.13	224.13	224.07	224.54	223.31	223.58	222.14	222.21	224.89	223.95	224.50	
MW-7	231.71	222.36	222.53	216.11	215.31	215.66	215.65	216.21	215.42	215.59	216.09	215.03	215.97	215.40	215.82	215.41	
MW- 7R	242.22	NG	NG	NG	NG	NG	NG	NG	NG	NG	220.92	217.54	220.30	219.82	219.46	217.99	
MW-8	236.47	200.58	201.35	200.60	200.55	199.49	199.49	199.82	199.31	199.11	198.98	198.75	198.45	201.85	198.91	202.50	

Note:

<sup>1.</sup> NG – Not Gauged; MW-7R installed April 2017 and BG-2 installed December 2018.



### 1.6.4 Groundwater Flow Direction

Groundwater at the site flows away from the historic north to south trending topographic ridge that was present prior to mine development by General Shale **Figure 4**. Groundwater elevations and general flow directions remain consistent with previous background and detection monitoring events.

### 1.6.5 Hydraulic Conductivity

Horizontal hydraulic conductivity of aquifer materials adjacent to the well screen were estimated through in-situ slug testing during the *Design Hydrogeologic Report* (Buxton, 2016). Results are provided in **Table 3**.

**Table 3: Hydraulic Conductivity** 

Well ID	Screen Length (ft)	Screened Interval (ft)	Estimated Effective Porosity (%)	Hydraulic Conductivity (K, cm/sec)	Lithologic Unit
BG-1	15	26-41	0.075	7.76E-05	Layered Rock/PWR*
BG-2	10	13-23	NA	NA	Layered Rock/PWR*
MW-1	15	57-72	0.075	4.11E-04	Layered Rock/PWR*
MW-2	15	30-45	0.05	3.41E-06	Layered Rock/PWR*
MW-3	15	25-40	0.05	4.08E-07	PWR
MW-4	10	13-23	0.14	1.41E-04	Residuum/PWR
MW-5	10	34-44	0.075	8.01E-06	PWR
MW-6	15	12-27	0.15	1.10E-04	Residuum/PWR
MW-7	10	5-15	0.15	1.26E-06	Residuum/PWR
MW-8	15	26-36	0.075	1.29E-04	PWR

### Notes:

- Hydraulic conductivity values determined by Buxton Environmental, Inc. on September 10, 2015, by conducting rising head slug tests; and solved utilizing the Bouwer-Rice (unconfined slug test) solution with AQTESOLV for Windows Version 4.50 software by Hydrosolv, Inc. (1996-2007).
- 2. Effective porosity values from geotechnical testing and the literature (McWhorter and Sunada, 1977; Sinhal and Gupta, 2010) where geotechnical data was not available.
- 3. MW-7R and BG-2 were installed after the Hydrogeologic Report was submitted; MW-7 was utilized for evaluation in lieu of data from MW-7R.
- 4. \* = interpreted lithologic unit based on relative drilling hardness during well installation.
- 5. NA=Not Analyzed

### 1.6.6 Horizontal Hydraulic Gradients

Horizontal hydraulic gradient is calculated by taking the difference in hydraulic head over the length of the flow path between two wells of similar construction and (generally) perpendicular to flow. Given that the historic ridge runs approximately north-south through the structural fill and that no monitoring wells have been installed through the liner system of the fill, horizontal hydraulic gradient was calculated between wells MW-5 and MW-4 and MW-1 to MW-2, recognizing that MW-1 to MW-2 is not truly perpendicular to flow, as shown on **Figure 4**. Hydraulic gradients at the site during this sampling event are depicted in **Table 4**.

Table 4: Horizontal Hydraulic Gradients (i, dh/dl)

Upgradient Well	Downgradient Well	Upgradient Groundwater Elevation (ft)	Downgradient Groundwater Elevation (ft)	Linear Flow Distance (ft)	Hydraulic Gradient
MW-1	MW-2	221.73	188.46	1,543	0.022
MW-5	MW-4	221.83	203.88	1,220	0.015

### Notes:

- 1. Horizontal hydraulic gradients calculated by dividing the difference in hydraulic head between a well pair by the length of the flow path between the well pair. (*i*= dh/dl)
- 2. All well pairs assumed to be screened in same surficial aquifer unit
- 3. Horizontal flow path distance calculated by

$$\sqrt{(Easting_1 - Easting_2)^2 + (Northing_1 - Northing_2)^2}$$

- 4. Top-of-casing elevation and horizontal location for well MW-5 surveyed by Lawrence Surveying of Monroe, NC.
- 5. Top-of-casing elevations and horizontal locations for wells MW-1 and MW-3 surveyed by McAdams of Durham, NC.
- 6. Top-of-casing elevation and horizontal location for well MW-2 surveyed by Gregory C. Bewley.
- 7. Groundwater elevations calculated for depth-to-water measurements recorded on January 15, 2020.

### 1.6.7 Groundwater Flow Velocity

The average linear velocity, or seepage velocity, of groundwater between wells at the site was calculated using Darcy's Law, as follows:

$$V_S = \frac{Ki}{P_e}$$

Where:

V<sub>s</sub> = seepage velocity K = horizontal hydraulic conductivity i = horizontal hydraulic gradient

P<sub>e</sub> = effective porosity

Seepage velocities for groundwater were calculated using horizontal hydraulic gradients, as referenced above, average horizontal hydraulic conductivity and estimated effective porosity values from geotechnical testing and from the literature where geotechnical data was not available (Buxton, 2014; Sinhal and Gupta, 2010).

Seepage velocity varies on a well-by-well basis and was calculated between the MW-1/MW-2 and MW-5/MW-4 well pairs, representing the two well pairs that are roughly perpendicular to the direction of groundwater flow. Seepage velocity was calculated at 13.3 feet per year (between MW-1 and MW-2) and 4.8 feet per year (between MW-5 and MW-4) for this sampling event. Historical seepage velocities are shown in **Table 5**.

**Table 5: Historical Seepage Velocity** 

		Seepage Velocity (ft/yr)													
Well Pair	2015 Dec	2016 May	2017 Jan	2017 Jul	2018 Jan			2019 Jul	2020 Jan						
MW-1/MW-2	62.8	6.78	6.1	7.1	12.5	9.0	10.0	11.2	13.3						
MW-4/MW-5	15.6	4.59	0.1	4.9	4.4	4.9	5.2	5.1	4.8						



# 2 Sampling Procedures

# 2.1 Groundwater Sampling Procedures

HDR collected groundwater samples from the monitoring well network between January 15 and 17, 2020. Purging was conducted via low-flow methods and was considered complete when the water table and field parameters had stabilized in accordance with the targets specified below.

- Turbidity (10% for values greater than 5 NTU (if three turbidity values are less than 5 NTU, the values are considered stabilized)
- DO (10% for values greater than 0.5 mg/L, if three DO values are less than 0.5 mg/L, the values are considered stabilized)
- Specific conductance (5%)
- Temperature (3%)
- pH (± 0.1 unit)
- ORP (± 20 millivolts)

In cases where water level in the well would not stabilize, the well was pumped dry and groundwater samples were collected with disposable bailers upon recovery of adequate volume for sampling. Field data sheets are provided in **Appendix A**.

All non-disposable equipment was decontaminated after each use by washing in a Liqunox® detergent solution followed by a tap-water rinse. Purge water was discharged to the ground surface adjacent to each well.

Samples were shipped under Chain of Custody (COC) procedures to Pace Analytical Services, LLC (Pace) for analysis. Sample handling and custody were performed according to the EPA Guidance for Field Samplers.

# 2.2 Surface Water Sampling Procedures

Surface water samples were collected from two locations outside of the structural fill boundary to evaluate potential groundwater to surface water interaction. Surface water sample SW-1 was collected approximately 500 feet south of the MW-4 outside of the property boundary along an unnamed tributary of Gulf Creek. Surface water sample SW-2 was collected south and adjacent to the rail spur west of the structural fill along an unnamed tributary of Shaddox Creek. Prior to sample collection, field parameters (temperature, specific conductance, DO, pH, turbidity, and ORP) were measured with a water quality meter and recorded on field data sheets **Appendix A**. Surface water sampling locations are shown on **Figure 3**.

# 2.3 Leachate Sampling Procedures

One leachate sample (Leachate) was collected from the on-site storage holding tanks. The leachate sample is used to evaluate potential on-site leachate impacts. The leachate sample location is shown on **Figures 3** 



# 3 Water Quality

Groundwater samples were collected from 10 of 11 monitoring wells (MW-1 through MW-6, MW-7R, MW-8, BG-1, and BG-2) and two surface water locations (SW-1 and SW-2). MW-7 is no longer sampled since it was replaced by MW-7R. Groundwater samples are analyzed for constituents listed in NCDEQ Solid Waste Appendix I (except VOCs) and II, 40 CFR 257 Appendix IV.

# 3.1 Background Site Conditions

Two groundwater sampling events were conducted prior to CCP placement (August and October 2015). The background sampling events consisted of sample collection and analysis from nine monitoring wells (MW-1 through MW-8 and BG-1) and two surface water sample locations (SW-1 and SW-2).

During these initial background monitoring events, chloride, pH, TDS, and vanadium were detected at concentrations that exceeded their North Carolina 2L Groundwater Protection Standards (2L Standard) or Interim Maximum Allowable Concentration (IMAC) in groundwater samples collected from background monitoring well BG-1. Antimony, barium, chloride, chromium, cobalt, pH, TDS, and vanadium were detected at concentrations that exceeded their respective 2L Standards or IMACs in other monitoring wells prior to ash placement. Additional target constituents were detected in the samples from well BG-1 and other wells; however, these concentrations did not exceed applicable standards.

Copper and cobalt concentrations that exceeded their respective NC Surface Water & Wetland Standards (2B Standards) were reported in surface water samples collected during the initial background monitoring events, prior to CCP placement. Additionally, all EPA Appendix III constituents were detected in the surface water samples collected prior to CCP material placement, but at concentrations below their respective 2B Standards (if applicable).

During the first monitoring event (August 2015), bromodichloromethane and dibromochloromethane were detected at concentrations above their respective 2L Standards in groundwater samples collected from MW-2, MW-3, and MW-7. Volatile organic compounds (VOCs), including trihalomethanes, are not present naturally at the site. These detections are attributed to the use of municipal water during previous well development activities. VOCs were not detected above laboratory method detection limits (MDLs) in any subsequent (2<sup>nd</sup> through 8<sup>th</sup>) background sampling events.

A detailed discussion of background groundwater conditions can be found in the *2016 Background Sampling Report* (HDR, 2016b). Additional discussion of the statistical results can be found in **Section 5** of this report for a better understanding of predictive limits for the background well locations (BG-1 and BG-2), as well as interwell interactions.

# 3.2 Groundwater Analytical Results

Concentrations of the following constituents have exceeded 2L Standards or IMACs in one or more wells: chloride, pH, TDS, barium, cobalt, and vanadium. Four constituents have an MDL



that exceed the IMAC (antimony, cobalt, thallium, and vanadium). The antimony MDL is 3.0  $\mu$ g/L, and the IMAC is 1.0  $\mu$ g/L. The cobalt MDL is 1.10  $\mu$ g/L, and the IMAC is 1  $\mu$ g/L. For wells MW-1 through MW-5 the thallium MDL (0.60  $\mu$ g/L) is higher than the IMACs 0.2 ( $\mu$ g/L). The vanadium MDL is 1.30  $\mu$ g/L and the IMAC is 0.3  $\mu$ g/L.

- Antimony and thallium did not have detections above the MDL.
- Chloride concentrations exceeded 2L Standards in the following wells: MW-1, MW-2, MW-3, MW-4, MW-7R, and MW-8. Concentrations increased in wells BG-2, MW-4, MW-6, MW-7R, and MW-8. MW-7R had a historical high of 297,000 μg/L.
- The pH values did not fall within 2L Standards for the following wells: BG-1, MW-4, and MW-6.
- TDS concentrations exceeded 2L Standards in all wells analyzed except MW-5. Concentrations increased in MW-2, MW-3, MW-4, MW-5, MW-6, MW-7R, and MW-8, as compared to the previous sampling event. MW-2 and MW-4 had historical high concentrations of 11,700,000 μg/L and 1,580,000 μg/L, respectively.
- Barium concentrations exceeded 2L Standards in well MW-8, increasing from the last sampling event.
- Cobalt concentrations exceeded IMACs in well MW-4 with a historical high of 9.30 µg/L.
- Vanadium concentrations exceeded IMACs in BG-1, increasing from the last sampling event.

Analytical results are presented in **Table 6**. Concentration versus time plots generated for three constituents (barium, chloride, and TDS) with the most frequent detections and/or exceedances are included in **Appendix B**.

The presence of naturally occurring inorganic constituents above regulatory criteria is common in North Carolina due to various geologic conditions. The presence of naturally occurring metals (i.e., weathering of crystalline parent material) is discussed in more detail in the *Initial Background Groundwater & Surface Water Monitoring Event* (Buxton, 2015c). The laboratory report for the current sampling event is provided in **Appendix C**. Electronic data deliverables (EDDs) are provided in **Appendix D**.

Table 6: Analytical Results January 2020

		2L Standard /	вту				(	3roundwa	ter Analys	sis				Quality Control		Surface Water Analysis			Leachate Analysis
Analyte	CAS Number	IMAC	(1Q2019)	BG-1	BG-2	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7R	MW-8	EQBL	DUP-1 (MW-6)	SW-1	SW-2	2B Standard	LEACHATE
EPA APPENDI	X III														(IVIVV O)				
Boron (µg/l)	7440-42-8	700	7.50	<2.60	<25.50	<25.50	<25.50	<25.50	<25.50	<25.50	<25.50	<25.50	<25.50	<2.60	<5.10	<25.50	<25.50	NE	3,070.00
Calcium (µg/l)	7440-70-2	NE	119,000	33,700.00	106,000.00	176,000.00	199,000.00	179,000.00	56,400.00	13,900.00	37,700.00	84,100.00	108,000.00	<24.20	33,600.00	6,460.00	6,590.00	NE	299,000.00
Chloride (µg/I)	16887-00-6	250,000	340,000	226,000	237,000	675,000	1,190,000	1,110,000	508,000	22,200	218,000	297,000	362,000	<600	221,000	20,200	40,000	250,000	18,100
Fluoride (µg/l)	16984-48-8	2,000	230	150	170	120	200	370	240	610	310	110	<50	<50	340	140	<50	1,800	190
pH (standard units)	pН	6.5-8.5	5.90 - 7.27	6.44	6.97	6.79	7.58	7.69	6.32	NT	6.48	7.46	7.24	NT	6.48	NT	NT	6.0-9.0	7.55
Sulfate (µg/I)	14808-79-8	250,000	135,000	22,200	102,000	6,600	102,000	57,800	10,800	3,100	26,800	16,500	7,500	<500	27,600	46,200	6,000	250,000	565,000
Total Dissolved Solids (µg/l)	TDS	500,000	1,120,000	576,000	922,000	1,570,000	11,700,000	2,700,000	1,580,000	225,000	624,000	810,000	1,060,000	<25,000	626,000	297,000	253,000	500,000	1,340,000
EPA APPENDIX	X IV																		
Antimony (µg/I)	7440-36-0	1	3.90	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	<3.00	5.6	<3.00
Arsenic (µg/I)	7440-38-2	10	5.00	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	10	10.40
Barium (µg/I)	7440-39-3	700	443	377.00	93.10	214.00	332.00	628.00	346.00	117.00	53.70	264.00	1,020.00	<1.00	47.90	129.00	117.00	1,000	64.10
Beryllium (µg/l)	7440-41-7	4	0.500	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	6.5	<0.20
Cadmium (µg/I)	7440-43-9	2	0.500	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	< 0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	2	<0.40
Chromium (µg/I)	7440-47-3	10	2.50	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	7.40	<1.00	<1.00	<1.00	<1.00	50	<1.00
Cobalt (µg/l)	7440-48-4	1	2.50	<1.10	<1.10	<1.10	<1.10	<1.10	9.30	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	<1.10	3	5.80
Fluoride (µg/l)	16984-48-8	2,000	230	150	170	120	200	370	240	610	310	110	<50	<50	340	140	<50	1,800	190
Lead (µg/I)	7439-92-1	15	14.10	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	<1.60	25	<1.60
Lithium (µg/I)	7439-93-2	NE	52.0	<0.42	<4.20	35.60	132.00	89.00	31.70	<4.20	26.40	27.60	<4.20	<0.42	22.90	<4.20	<4.20	NE	<8.40
Mercury (µg/I)	7439-97-6	1	0.100	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.012	<0.10
Molybdenum (µg/l)	7439-98-7	NE	13.60	<0.90	<0.90	9.00	41.00	35.70	20.90	<0.90	5.80	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	160	226.00
Selenium (µg/l)	7782-49-2	20	5.00	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	<4.70	5	<4.70
Thallium (µg/l)	7440-28-0	0.2	13.7	<0.06	<0.06	<0.60	<0.60	<0.60	<0.60	<0.60	<0.06	<0.06	<0.06	<0.06	<0.06	<0.60	<0.60	0.24	0.35
Radium 226 (pCi/l)	13982-63-3	NE	1.20	-0.0682	0.0668	0.0553	0.727	0.784	0.73	0.243	-0.225	-0.194	0.798	-0.0596	-0.0583	-0.0634	0.0617	NE	0.00
Radium 228 (pCi/l)	15262-20-1	NE	1.28	0.429	0.54	0.581	1.97	2.86	0.961	-0.0922	0.265	0.728	0.466	-0.16	0.422	0.257	-0.991	NE	0.703
Combined Radium (pCi/l)	7440-14-4	NE*	2.07	0.429	0.61	0.636	2.70	3.64	1.7	0.243	0.265	0.728	1.264	0.00	0.422	0.257	0.0617	NE	0.703
EPA APPENDIX I N	METALS																		
Copper (µg/I)	7440-50-8	1,000	11.40	<2.10	<2.10	<2.10	<2.10	9.20	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	<2.10	5.80	<2.10	7	<2.10
Nickel (µg/I)	7440-02-0	100	2.50	<0.90	<0.90	<0.90	<0.90	<0.90	11.10	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	<0.90	88	6.70
Silver (µg/I)	7440-22-4	20	2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	<2.50	0.06	<2.50
Vanadium (μg/l)	7440-62-2	0.3	8.30	6.40	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	<1.30	13.00	10.40	NE	5.50
Zinc (µg/I)	7440-66-6	1,000	34.2	<3.90	<3.90	<3.90	13.40	<3.90	14.50	<3.90	<3.90	<3.90	<3.90	<3.90	<3.90	16.20	15.60	50	<3.90

Notes

NE = not established

NT = not tested

μg/l = micrograms per liter

pCi/I = picocuries per liter

EQBL = Equipment Blank

Shaded = concentration reported above (or below for pH) established 2L Standard, IMAC, or 2B Standard

**Bold/Underlined** = concentration exceeded BTV

2L Standard = North Carolina Groundwater Protection Standard (T15A NCAC 02L .0202)

IMAC = Interim Allowable Maximum Concentration

2B Standard = North Carolina Surface Water and Wetland Standards (15A NCAC 02B) for Gulf Creek (SW-1) and Shaddox Creek (SW-2) which are both Class WS-IV Waters or are National Criteria per EPA pH was field tested

Groundwater, surface water, and leachate samples collected from January 15-17, 2020 and analyzed for above parameters by Pace Analytical Services, LLC

<sup>\* =</sup> no established 2L Standard. 5 pCi/l is the Federal Standard BTV = background threshold value calculated for January 2020



# 3.3 Surface Water Analytical Results

Surface water samples were compared to the North Carolina Water Quality Standards for Surface Waters established under T15A NCAC 02B (2B Standards) or the EPA National Criteria Standard (utilized by the North Carolina Division of Water Quality as default standards for parameters not listed in 15A NCAC 02B). Constituents did not exceed the 2B Standards for either SW-1 or SW-2. Mercury, thallium, and silver have an MDL that exceed the 2B Standard. The mercury MDL is 0.10  $\mu$ g/L, and the 2B Standard is 0.012  $\mu$ g/L. The MDL for thallium is 0.60  $\mu$ g/L, and the 2B Standard is 0.24  $\mu$ g/L. The silver MDL (2.50  $\mu$ g/L) is greater than the 2B Standard (0.06  $\mu$ g/L). These three constituents did not have detections above the MDL.

Standards have not been established under T15A NCAC 02B for the following constituents detected: boron, calcium, lithium, radium-226, radium-228, and vanadium. Laboratory results are presented in **Table 6**.

# 3.4 Leachate Analytical Results

One sample of leachate generated on-site was collected and analyzed this event. In general, results have shown a declining trend for EPA Appendix III, Appendix IV, and Appendix I Metal constituents when compared to results from previous events. The January 2020 Leachate sample had a slight increases in thallium, radium-228, and vanadium, but remain within historic values. Cobalt concentration were last detected in July 2018 and remain within historic values. Leachate sampling is required by the Permit to Operate and is disposed of in compliance with the Clean Water Act at either the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant or the Town of Spring Lake's South Harnett Regional Wastewater Treatment Plant.

# 4 Statistics

# 4.1 Methodology

Background groundwater quality was evaluated to establish statistically-derived background concentrations for the site. Groundwater quality in downgradient wells were then compared to background concentrations to determine if a statistically significant increase (SSI) over background has occurred, as required by Section .1600 rules of the North Carolina Solid Waste Management Rules 15A NCAC 13B.

Sampling results used to establish background threshold values (BTVs) were obtained during twenty monitoring events performed between October 2015 and January 2020. Downgradient sampling results from the detection monitoring event in January 2020 were used to evaluate for SSIs. Software packages ProUCL, NCSS, R and SPSS were used in the production of the statistics (ProUCL is offered by the USEPA; R is a free software environment; NCSS and SPSS are licensed software packages).

Groundwater samples collected as part of the monitoring program were analyzed for EPA Appendix I Metals, Appendix III and Appendix IV constituents. Only non-filtered sample results were utilized for the statistical analysis of monitored constituents.



### 4.1.1 Statistical Analysis

The background sample size (i.e., quantity of qualifying samples) was evaluated per constituent. Descriptive statistics were calculated for the background data set including non-detect (ND) values and excluding ND values. When NDs were included in the data set, the method detection limit (MDL) was substituted as the ND value for simple descriptive statistics. The analysis was performed with NDs removed to better understand the central tendency and range of the detected values. Note that for the trend analyses in **Section 5.1.4** and for the establishment of statistically-derived background concentration levels in **Section 5.2**, imputation methods using the maximum likelihood method (MLE) for NDs, regression on order statistics (ROS) or Kaplan-Meier (KM) methods, where appropriate, were used.

Following the calculation of descriptive statistics, the statistical analysis for the background data set was performed to evaluate for outliers, data distributions, trends, and spatial variability between the background wells for Appendix I Metals, Appendix III and Appendix IV constituents, where data quantity and quality permit. A total of 25 samples (twenty monitoring events from BG-1 and five monitoring events from BG-2) were included for the descriptive analysis of the background monitoring well results for the monitored constituents. The first sampling event conducted in August 2015 was not included in the analysis as data obtained during this event were not consistent with data from subsequent rounds; sample analyses for the August 2015 event were performed by a different laboratory, possibly accounting for the disparity in results. January 2020 samples for boron were removed from the analysis as they were diluted and could not be properly detected.

For downgradient monitoring results, the data analysis included the calculation of descriptive statistics for Appendix I Metals, Appendix III and Appendix IV constituents, (for the data sets including and excluding ND values), followed by an evaluation of outliers and trends. A total of nineteen monitoring events performed between November 2015 and January 2020 were included for the descriptive analysis of the downgradient monitoring well results for the monitored constituents.

### 4.1.2 Outliers

Outliers are values that are not representative of the population from which they are sampled. The background and downgradient data sets were screened for outliers using the Dixon's and Rosner's outlier tests. Dixon's outlier test is suitable for data sets containing less than 25 samples, while Rosner's test is suitable for data sets with 25 or more samples. The outlier test was conducted using a significance of one percent. For constituents that had NDs, the NDs were removed prior to testing for outliers.

Statistical outliers were identified in the background data set evaluated for three Appendix III constituents (calcium, sulfate, and total dissolved solids) and one Appendix IV constituent (barium). The constituent concentrations identified as statistical outliers were sampled from the newly installed background well BG-2, except for total dissolved solids.

Statistical outliers were identified intermittently for numerous Appendix III and Appendix IV constituents and Appendix I Metals, in the data sets evaluated for downgradient monitoring wells throughout the monitoring period.



The statistical outliers were investigated as possible data entry or measurement errors. The value for total dissolved solids was considered an outlier and removed from the analysis. The remaining values were all within one order of magnitude of other observations and deemed correct. Given the variable nature of groundwater samples, the small sample sizes and that it is common for groundwater quality samples to have very low or very high concentrations over time, statistical outliers are expected but do not necessarily signify that the outliers are from different distributions. As additional background samples are collected over time, outlier test results may change and earlier observations thought to be outliers may no longer be outliers.

### 4.1.3 Data Distribution

Groundwater data was fitted to known distribution models using Goodness-of-Fit (GOF) tests incorporated into ProUCL. For data sets comprised of 50 or fewer samples, ProUCL's GOF module incorporates the Shapiro-Wilk GOF test to determine normal or lognormal distribution and Anderson-Darling to determine gamma distribution. Normal, lognormal and gamma distributions are parametric distributions. If a data set could not be fit with any of these three parametric distributions, it was considered to follow a nonparametric distribution.

Note that ProUCL does not provide GOF results for data sets with less than three detected values due to insufficient data. For purposes of estimating background concentrations, these data sets were treated under non-parametric distribution assumptions with the maximum detected value chosen to represent the background concentrations.

### **4.1.4 Trends**

Background constituent concentrations in groundwater should demonstrate stationary conditions through time, free of trends. Constituents were analyzed for trends within the data set using a maximum likelihood estimate (MLE) regression for constituents which followed parametric distributions and Mann-Kendall tests for those that were treated under nonparametric distributional assumptions. The MLE regression can be applied to data sets that can be fitted to a specific distribution model, and that contain NDs with multiple MDLs. The Mann-Kendall test is suitable for data series with no discernable distributions and only one MDL value for NDs.

Constituents treated under nonparametric data assumptions (either tested as nonparametric or having more than 50 percent NDs) and with multiple MDLs or with less than three detected values were not assessed for trends.

The background well regression analysis showed a potential increasing trend for fluoride (an Appendix III and Appendix IV constituent) and a potential decreasing trend for two Appendix III constituents (chloride and sulfate) and three Appendix IV constituents (barium, lithium, and radium-226). There were no increasing or decreasing trends identified for other constituents with sufficient data quantity and quality for testing with the MLE analysis or Mann-Kendall test. Although statistical trends were identified for barium, chloride, fluoride, lithium, sulfate, and radium-226-, the results can be misleading due to the short duration of the sampling program.

Trends were also evaluated for constituents in each downgradient well using the same methods as described above for the background data set. Trends were identified for select constituents



at select monitoring well locations and should be monitored as additional downgradient groundwater data are collected at the site (**Section 4.2**).

### 4.1.5 Spatial Variability

Spatial variability refers to identifying whether or not there are statistically identifiable differences in mean concentrations or variance levels across the well field (i.e., the pooled background data). To evaluate the potential for spatial variability between the background wells, parametric and nonparametric analysis of variance (ANOVA) tests were used to test differences in sample mean or median levels at the 5 percent level of significance. Side-by-side box plots for each constituent were also used to determine if variation is significant from a visual perspective.

Potential spatial variability between background wells BG-1 and BG-2 was identified for six Appendix III or Appendix IV constituents (barium calcium, fluoride, pH (field), sulfate and total dissolved solids). The observed spatial variability is indicative of the hydrogeological regime at the site and values between the two wells are within an order of magnitude of each other. Given the small sample sizes of constituents in BG-2, the statistically-identified variability in concentrations for each constituent are preliminary and considered appropriate for the purpose of calculating background concentrations. The distributional patterns for constituents at the background wells will continue to be monitored for spatial variability and should be re-evaluated as the data set grows.

## 4.2 Evaluation for SSIs over Background

Based on the statistical evaluations performed, BTVs were calculated for the detection monitoring program at the site for Appendix I metals, Appendix III and Appendix IV constituents. For constituents that have all ND background values, the maximum MDL is chosen to represent background and the double quantification rule (DQR) is used to evaluate whether or not there is an SSI. The BTV provided for detection monitoring constituents is the statistically-derived background concentration (i.e., upper prediction limit [UPL]), the maximum detected value or the maximum MDL depending on the level of censorship in each of the background samples.

Downgradient sampling results from the first detection monitoring round in January 2020 were used to test for SSIs. Downgradient concentrations were compared to BTVs. For constituents that have all ND background values, the DQR is applied; that is, an SSI is registered for the well-constituent pair if the downgradient concentrations exhibit detects in two consecutive sampling events. Downgradient sampling results from the October 2019 and January 2020 sampling events were used to test for SSIs for constituents that have all ND background values.

# 4.3 Statistical Summary

BTVs were calculated using wells BG-1 and BG-2 as the background monitoring wells. However, eight monitoring wells (MW-1 through MW-8) were installed and sampled (October 2015) prior to ash placement, thus representing pre-ash conditions at the site.

SSIs were found for five Appendix III constituents (calcium, chloride, fluoride, pH (field), and total dissolved solids) and six Appendix IV constituents (barium, fluoride, lithium, molybdenum, radium-228, and total radium). When the January 2020 sampling event results are compared to



the pre-ash sampling results from those eight wells, current downgradient groundwater constituent concentrations are generally similar to concentrations reported prior to ash placement. Of the ten constituents with observed SSIs, one (barium) of them is within the range of pre-ash conditions.

Depending on the data distribution of the constituent, the BTVs have been computed to allow for one to three verification samples. With verification sampling, the validity of the SSIs can be confirmed. Additional details regarding statistical methodology and results is provided in **Appendix E**.

# 5 Summary and Conclusions

The 2020 First Semi-Annual Detection Monitoring Event was conducted at the Brickhaven No. 2 Mine Tract "A" Structural Fill site from January 15-17, 2020. A summary of the findings from is provided below.

### 5.1 Groundwater

- Groundwater concentrations of barium, chloride, cobalt, pH, TDS, and vanadium exceeded the 2L Standards or IMACs during the current sampling event.
- Concentrations of calcium, lithium, molybdenum, radium 226, radium 228, and combined radium were detected above the laboratory MDLs; however, standards have not been established by NCDEQ for these constituents.
- Barium concentrations increased in MW-8.
- Chloride concentrations increased in BG-2, MW-4, MW-6, MW-7R, and MW-8.
- Cobalt concentrations increased in MW-4.
- The pH values did not fall within 2L Standards for BG-1, MW-4, and MW-6.
- TDS concentrations increased in MW-2 through MW-8.
- Vanadium concentrations increased in BG-1.

### 5.2 Surface Water

- No constituents in SW-1 and SW-2 exceeded the 2B Standards, however, three have MDL values that are above the standards: mercury, thallium, and silver.
- Concentrations of calcium, radium 226, radium 228, and vanadium were detected above the laboratory MDLs; however, standards have not been established by NCDEQ for these constituents.

### 5.3 Leachate

 Leachate samples collected during this sampling event generally show a decrease in detected concentrations of EPA Appendix III, Appendix IV, and Appendix I Metals from the last sampling event. Constituents to show an increase from the previous sampling event include cobalt, thallium, radium-228, and vanadium.



# **5.4 Statistical Analysis**

- The analysis is based on an interwell analysis consisting of twenty monitoring events of the background well BG-1 and five monitoring events of the background well BG-2 (seventeen more than the required eight). Subsequent sampling events could provide greater refinement and confidence of statistical significance.
- Statistical outliers were identified in the background data set evaluated for barium, calcium, sulfate, and TDS. Intermittent statistical outliers for Appendix III and Appendix IV constituents and Appendix I Metals, in the data sets evaluated for downgradient monitoring wells, were noted throughout the monitoring period. As the sample size is very small from a statistical perspective, the variability in the concentrations of these constituents will change as additional samples are obtained.
- Groundwater quality in wells were compared to background concentrations to determine
  if a statistically significant increase (SSI) over background has occurred:
  - In the detection monitoring round in January 2020, 10 SSIs were found: barium, calcium, chloride, fluoride, lithium, molybdenum, pH (field), radium-228, total dissolved solids, and total radium. There are no samples for boron due to dilution.
    - When results of the January 2020 sampling event are compared to the pre-ash sampling results, barium and pH are within the range of pre-ash conditions.
- HDR believes that the presence of SSIs is the result of low background concentrations
  that may not represent data collected prior to CCP placement (August and October 2015
  sampling events) and is influenced by natural and seasonal variations at the site. In
  general, the SSIs reported during this sampling event are either consistent with those
  evaluated in the Alternate Source Demonstration (ASD) dated March 29, 2019 or are
  potential SSIs to be verified during the next sampling event.

# 6 Recommendations

Based on the findings, HDR makes the following recommendations:

- Continue to sample semi-annually in accordance with permit requirements.
- Evaluate the validity of SSIs by further assessing sampling protocols/performance, spatial variability, and seasonality of constituent concentrations as additional sampling rounds are conducted.
- HDR recommends that the site proceed to Assessment Monitoring and follow the Proposed Assessment Plan submitted to NCDEQ on August 16, 2019.



# 7 References

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# Figures

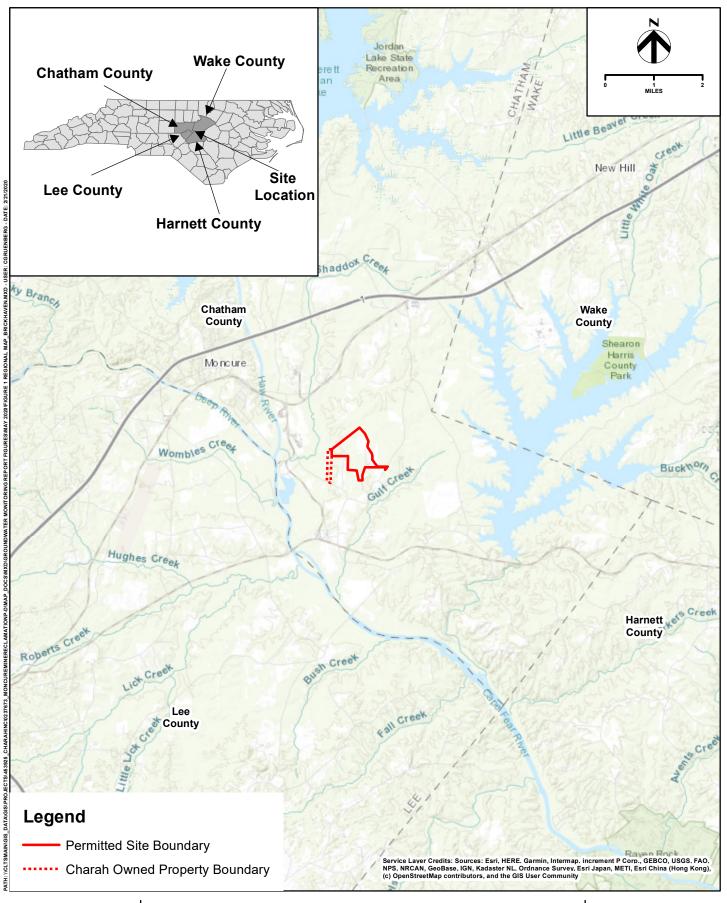
Figure 1: Regional Site Location Map

Figure 2: Regional USGS Topographic Map

Figure 3: Sample Location Map

Figure 4: Potentiometric Surface Map – January 2020

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REGIONAL SITE LOCATION MAP CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA

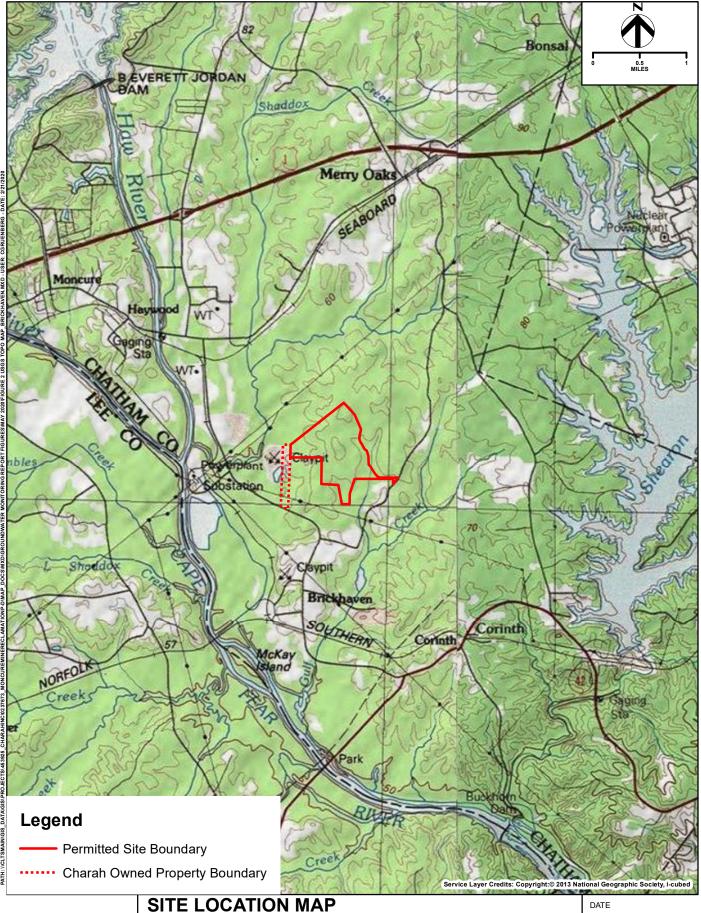
BRICKHAVEN NO. 2 MINE TRACT "A"

DATE

MAY 2020

FIGURE

1





SITE LOCATION MAP CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA

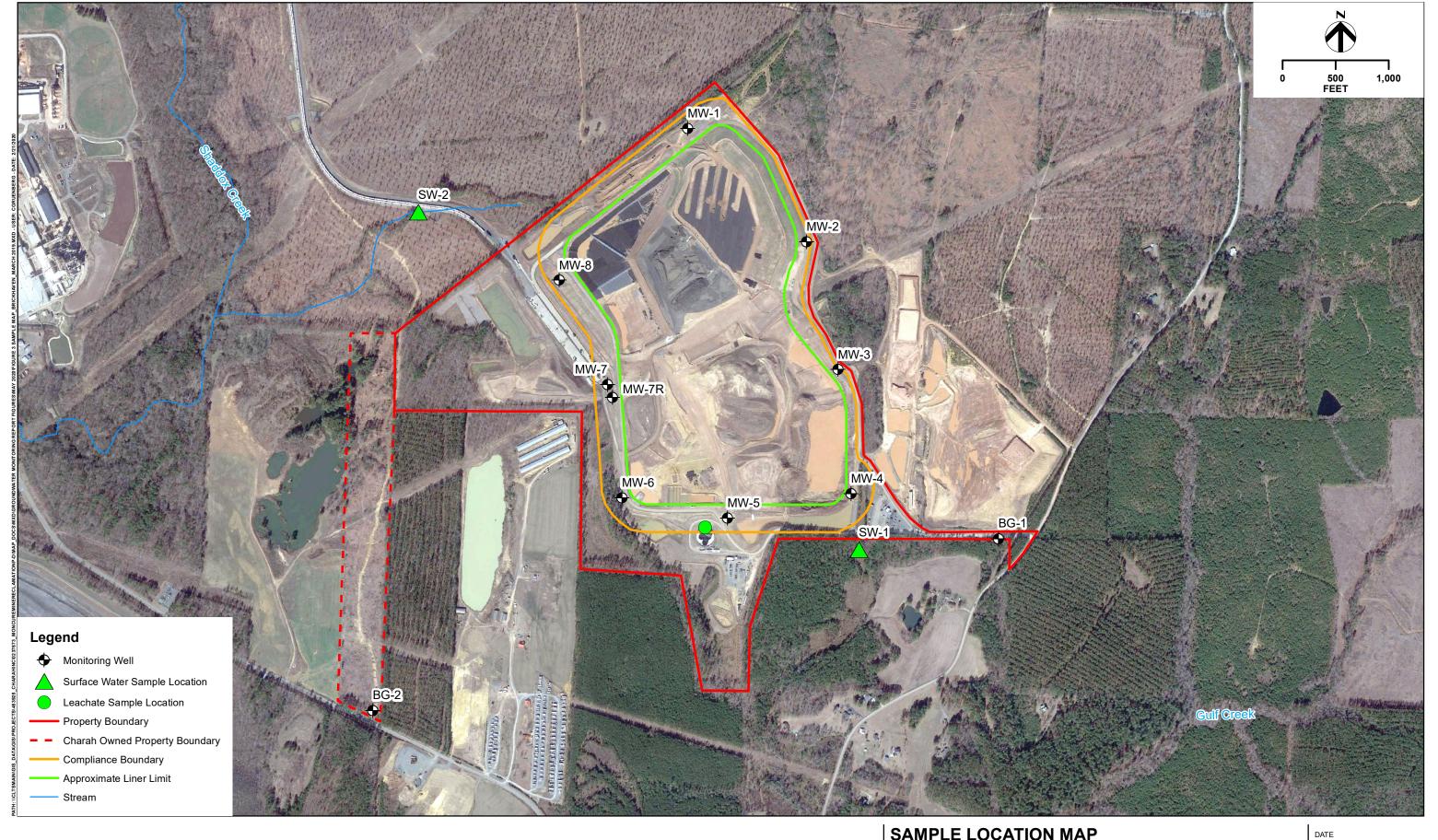
IOUDE

FIGURE

2

MAY 2020

BRICKHAVEN NO. 2 MINE TRACT "A"





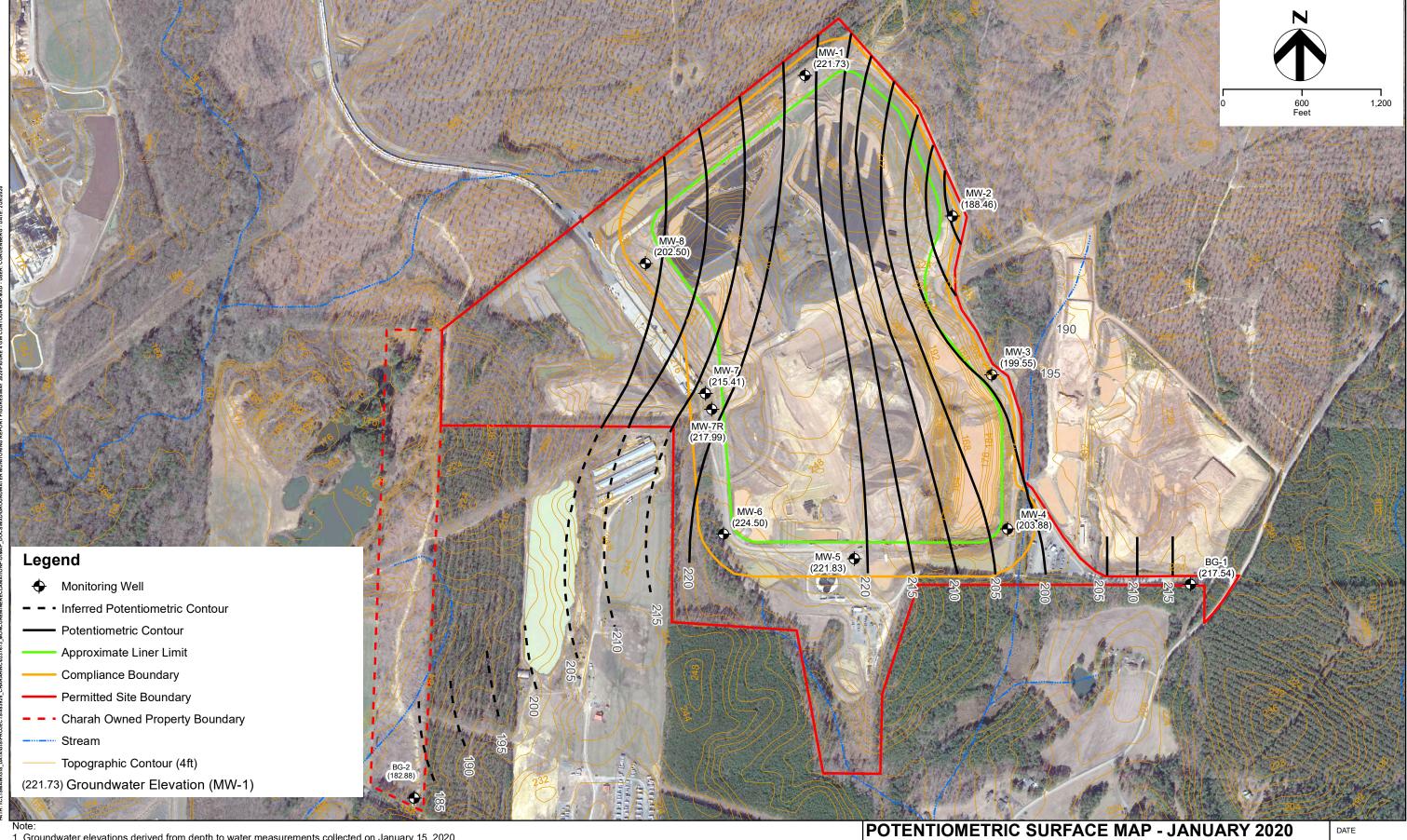
SAMPLE LOCATION MAP CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE TRACT "A"

MAY 2020

3

FIGURE



CHARAH SOLUTIONS, INC.
MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE TRACT "A"

MAY 2020

FIGURE

Groundwater elevations derived from depth to water measurements collected on January 15, 2020.
 Topography data for the site was obtained from NCDOT Geographic Information System (GIS) website (Dated 2007).





Appendix A – Field Data Sheets



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FDR	Groundwater Sampling Form	Sample ID: 30-				
	Site Information					
Site Name: CharaL	Project Number:					
Site Location: Brack Laver A	Sampling Personnel: Robert 1	MULL				
Date: 1/15/20	Weather: Partly Clocky	60'8				

Well Information				
Well Diameter (in): 2"	Purge Equipment: Musa Monsoon Pro			
Screened Interval (ft): てか、イロ	Pump Type: $\leq SP$			
Well Depth (ft): ~ Ч 🗥	Pump Depth (ft-bTOC): ~ 36			
Depth-to-Water (ft-bTOC): 10-71	Tubing Diameter (in):			
Water Column Thickness (ft): 30 つり	Well Volume (ft^3): 니, 9 3			
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity				
Well Capacity (gallons per feet): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (μS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1049	0	Ø	140	12.23	6.45	16-8	1020	1.87	99.4	789.4	6,00
1054	0.7	0.7	140	17.01	6.37	16.5	1032	1.44	957	282.8	Closed
1059	0.7	1.4	140	11.95	4.40	14.6	1029	1-41	97.4	718.4	(10.6)
1109	2.0	3-4	200	17.09	6.45	16.8	1076	0.85	85.4	129.9	Closery
1119	70	5.4	700	11.92	645	16.8	1035	0-55	27.2	64.40	Stightly Clocky
1127	7.0	7.4	200	12.03	6.45	14.9	1040	0.40	76.8	42.36	Slagetial Llock.
1139	7.0	9.4	200	12.13	6.46	17.0	1039	0.37	74.9	33.14	clear
1149	3.5	12.9	350	13.24	4.49	17.1	1037	0.59	74.6	75.4	Signify
1159	2.5	15.4	750	13.34	6.46	17.0	1047	0.50	74.5	54.6	Stighted Cloude are
1709	2.5	17.9	750	13.06	6.44	17.0	1040	85.0	71.8	5.59	clan
Pu	rging Equipm	ent Codes (circle	): B = Baile	r; BP = Bla	dder Pump;	ESP = Elec	tric Submers	ible Pump;	PP = Peristaltic	Pump; O=	Specify

		Sample Information	
Sample Number	Collection Time	Parameter Container	Preservative
	1220	Radion 776/228 2-14 Poly	HNOZ
	ľ	6010/7470 750ML poly	FINUS
		(1. F, KDy ZSONL poly	WIA
12/	N	TDS 500 nl 101,	WA
100	V		
Sampled By: Rob	pert Mull	Sample Time: 1770	
Date Sampled:	1/15/20	Sampler Signature: Kung Spull	

Notes: Pumprate= 140 mL/,--

1059 purpose = 200 melas. 1139 purpose = 350 melas. 1149 purpose = 350 melas.

					Purging In	formation	(Page 2)				
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C) (3%)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1212	0.75	18-65	750	12.94	6.45	17.0	1038	0.24	71.2	4.23	User
1715	0.75	1704	250	17.90	6.44	16-9	1036	0-2 2	70.4	4.83	Ula
1218	0.75	70.15	750	13.00	6.44	17.1	1033	0.21	70.0	4.38	clas
						0					
						200	11/11				
					1	100		State Column			
						ē					
											,
	-										
								-			
								-			
					4						



Sample ID:	136	- 7
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Site Information				
Site Name: (heram	Project Number:			
Site Location: Brackhave NC	Sampling Personnel: Tobut Mull			
Date: 1/15/10	Weather: Sunny US F			

Well Information					
Well Diameter (in): 2"	Purge Equipment: Mua monson Pro				
Screened Interval (ft): / 3'ース3'	Pump Type: ESP				
Well Depth (ft): してい	Pump Depth (ft-bTOC): 120				
Depth-to-Water (ft-bTOC): 11.35	Tubing Diameter (in): 3/5"				
Water Column Thickness (ft): 11 65	Well Volume (ft^3): 1.86				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02	2: 1" = 0.04: 1.25" = 0.06: 2" = 0.16: 3' = 0.37: 4" = 0.65: 5" = 1.02: 6" = 1.47				

	Purging Information										
Parame <sup>*</sup>	ter Instru	ment(s): Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (μS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1326	Ø	Ø	270	12.09	6.86	17.6	1922	1.00	89.1	142.1	Clouby
1326	1,08	1.08	270	12.19	6.85	17.6	1946	0.45	85.8	47.39	STEPPLY
1330	1.08	7.16	270	12.29	6.88	17.6	1913	0.34	82.0	23.25	Clar.
1334	1.08	3.24	270	12.54	6.92	17.6	1805	0.30	77.1	20.23	Chean
1338	1.2	4.44	300	12.58	6.93	17.7	1726	0.25	74.3	21.57	Ura
1348	3.0	7.44	300	12.54	6.95	17.6	1630	0.27	1.7.8	8.06	Clear
170										-8-66	6/60
1357	3.0	10.44	360	12.90	4.55	17.8	1677	0.24	65.0	34.40	clam
1401	0 · le	11,04	150	12.79	6.97	17.8	1591	0.19	61.8	5.69	Cha
1405	0.1	11.64	150	12.70	6.97	18.0	1563	0.15	60.0	3.38	Clea
Pu	rging Equipm	ent Codes (circle	): B = Baile	r; BP = Bla	idder Pump;	ESP = Elec	tric Submers	ible Pump;	PP = Peristaltic	Pump; O =	Specify
	Sarri										

	Sample Information					
Sample Number	Collection Time	Parameter	Container	Preservative		
	1408	Radium 726/228	7-16/0/4	HNOZ		
		Ratum 726/228 6010/6020/7470	resont por	HIWZ		
0,1		CI, F, 504	150 ML 10/4	NA		
B6-2	V	TDS	500 ML Poly	NA		
, =						
Sampled By: Rol	bert Mull	Sample Time: /408				

Sampler Signature:

Notes: Pumprate= 770 myon 1334 panpran: 300 myon

1752 - Pump Stopped

1355 Purprope : 300 milme



Sample ID: \_\_\_\_\_

Site Information				
Site Name: Cha-a-	Project Number:			
Site Location: Brickhau, NC	Sampling Personnel: [Zabut Mul]			
Date: 1/10/70	Weather: Sunny 65° F			

Well Information					
Well Diameter (in): 2"	Purge Equipment: Maya Monsoon Pro				
Screened Interval (ft): 57'- フィ`	Pump Type: ESP				
Well Depth (ft): つつつ	Pump Depth (ft-bTOC): ~つのい				
Depth-to-Water (ft-bTOC): ちくたら	Tubing Diameter (in): 3/8"				
Water Column Thickness (ft): パス. ゅらく	Well Volume (ft^3): て・1%				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47					

Purging Information											
Parameter Instrument(s): Hanna, YSI, Micro TPW											
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1502	Ø	0	150	58 HD	7.28	17.4	561.7	4-34	83.4	132.8	Clare,3
1512	1.5	1.5	150	58.40	7.14	17.8	557.0	2.46	73.7	92.08	Cloudy
1522	3.8	5.3	380	58.54	7.74	18.8	567.5	0.90	59.1	80.30	6-0-1 gray
1532	3.5	8.8	350	58.50	7.14	18.2	636	0.45	60.0	42.80	SINGLOULY
1542	3.5	12.3	350	58.51	7.06	18,4	1024	0.35	56.7	24.52	ulea'
1552	3.5	158	350	58.52	6.94	18.4	1507	0.34	55.1	21.69	clea
1602	3.5	19.3	350	58.54	4.87	18.4	1847	0.35	54.7	14.12	Clear
1612	3.5	22.8	350	58.54	4.82	18.3	2136	0.34	53.9	9.65	Clear
Ille	1.4	24.2	350	58.55	6.80	18.3	2268	0.35	53.5	9.33	Clea
1620	1.4	25.6	350	58.55	6.79	18.3	2352	034	53.0	8.63	clear
Pu	rging Equipm	ent Codes (circle	): B = Baile	r; BP = Bla	dder Pump;	ESP = Elec	tric Submers	ible Pump;	PP = Peristaltic	Pump; O =	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservativ
	1624	Radion Telliza	7-14 /2/1	HNOZ
1-wm		6010/6010/7470	1-750-619	H1003
		CI.F. 504	1-250ml 184	IVIA
Min	W	TDS	1-500me poly	SUIA
ampled By: Rob	l lert Mull	Sample Time: /67 4		
ate Sampled:	1/16/20	Sampler Signature:	In B Mall	

Date Sampled: 1/16/20

Notes: Pumprate=150 mymin
1517 /umpran: 380 mymin
1522 pumprak: 350 mymn



Sample ID:	MW-Z
------------	------

Site Information						
Site Name: Charac	Project Number:					
Site Location: Brickhaum, NC	Sampling Personnel: 72054 MM					
Date: 1/17/70	Weather: Sunny, 40°F					

Well Information					
Well Diameter (in): 2"	Purge Equipment: 15a:1-c				
Screened Interval (ft):	Pump Type:				
Well Depth (ft): 50ペスジ	Pump Depth (ft-bTOC):				
Depth-to-Water (ft-bTOC): イろって	Tubing Diameter (in):				
Water Column Thickness (ft): 🎁 🤫 🔌	Well Volume (ft^3): {,  O				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI , Micro TPW										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
+					7.58	16.3	4391	524	-82.1	91.14	cloudy
						•					
								- T			
								0			
Pu	ırging Equipn	nent Codes (circle	e): B = Baile	r; BP = Bla	dder Pump;	ESP = Elec	tric Submers	ible Pump;	PP = Peristaltic	Pump; O=	Specify

	Sample Information									
Sample Number	Collection Time	Parameter	Container	Preservative						
	0954	Rasion 226/228	7-16-801,	HWOZ						
		6010/102017470	1- 750 mc 1014	HWOZ						
MW.Z		11.F. 504	1-250 ML 1014	NA						
Mrc -	V	TDS	1- 500 NL 10/4	NIA						
<b>'</b>										
Sampled By: Rob	ert Mull	Sample Time: 0954								
Date Sampled:	1/17/7	Sampler Signature:	el Dolla							

Notes: Pumprate=



Sample	ID:	MW-3
Julipic	10.	, ,

Site Information							
Site Name: (LuraL	Project Number:						
Site Location: Brucharen, NC	Sampling Personnel: Robert Mill						
Date: 1/16[70	Weather: Sunn 45						

	Well Information				
Well Diameter (in): 2"	Purge Equipment: Baile				
Screened Interval (ft):	Pump Type:				
Well Depth (ft):	Pump Depth (ft-bTOC):				
Depth-to-Water (ft-bTOC): Tubing Diameter (in):					
Water Column Thickness (ft):	Well Volume (ft^3):				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	arameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
					7.69	18-3	4009	72-8	77.7	64.52	clo-l-
											Ĺ
											1
Pu	rging Equipm	nent Codes (circle	e): B = Baile	r; BP = Bla	ıdder Pump;	ESP = Elec	tric Submers	sible Pump;	PP = Peristaltic	Pump; O=	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	1470	Fatin 276/228	2-11-7012	H103
		6010/6020/7470	1-250 ml 101,	HIVOZ
MW-3		CI, F. SDy	1-250nc 1014	NA
	V	TOS	1-500 ML 1014	NIA
			,	
Sampled By: Rob		Sample Time: (470)	/	
Date Sampled:	1/16/20	Sampler Signature:	e Say	1

Notes: Pumprate=

Usice bailer

**FDR** 

## **Groundwater Sampling Form**

Sample ID: MW-4

Site Information						
Site Name: CharaL	Project Number:					
Site Location: Brickhaum, NC	Sampling Personnel: Robert Mull					
Date: 1/16/70	Weather: Partly Clocky, 63°F					

Well Information							
Well Diameter (in): 2"	Purge Equipment: Masa Monsoon Pro						
Screened Interval (ft): /フーフマ	Pump Type: FSP						
Well Depth (ft): でで	Pump Depth (ft-bTOC): $\sim  \omega$						
Depth-to-Water (ft-bTOC): /ろ. / ( )	Tubing Diameter (in):						
Water Column Thickness (ft): 🧌 🧏 ๒՝	Well Volume (ft^3): 1.47						
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity							
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47						

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI , Mico TPW										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1215	Ø	Ø	150	14.55	6.03	18.60	7019	7.02	78.0	300.8	Lloudy
1235	75	7.5	250	14.89	6.15	19.4	7063	7.76	1.3.7	117.9	Cloudy
1245	2.5	5.0	750	14.96	6.24	19.6	2114	2.08	56.5	53,15	517911414 Cloudy
1255	7.5	75	750	14.94	631	19.9	1160	1.40	53.7	35.01	Checo
1305	my . By	10.0	250	14.87	6.34	20.0	2165	1.13	55.2	21.90	Ura
1315	1.9	11.9	190	14.65	6.34	20.3	2160	1.20	58.1	14.12	Clea
1375	1.9	13.8	190	14.62	6.35	20.1	2149	1.16	59.0	6.97	Clear
1329	0.76	14.56	190	14.64	6.34	70.2	2144	1.15	60.0	6.15	Clear
1333	0.76	15.32	190	14.64	6.34	19.9	2145	1.11	599	6.80	Clear
1337	0.76	16.08	190	14.63	4.32	19.8	2143	1.0%	60.9	6.10	Uta
Pu	rging Equipm	ent Codes (circle	): B = Baile	r; BP = Bla	dder Pump;	ESP = Eleg	trjø Submers	ible Pump;	PP = Peristaltic	Pump; O =	Specify

Sample Information								
Sample Number	Collection Time	Parameter	Container	Preservative				
	1340	Ration 276/228	2-14-801-1	HIVUZ				
MW-M	1	6010/6020/7470	1-250 m_poly	HNOS				
	7	11,8,504	1-750 ml 201,	NIA				
	V.	TDS	1- SOUNL poly	NA				
			4 - 2					
6 1 10 5 1								
Sampled By: Rob		Sample Time: 1340						
Date Sampled	1/1/0/20	Sampler Signatures	K - 11					

Notes: Pumprate= 150 mulnin



Sample ID:	MW	-5
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	Site Information
Site Name: [ ]	Project Number:
Site Location: Brillham No	Sampling Personnel: Robert Mull
Date: 1/16/70	Weather: Partly Cloudy

Information puipment: Bailer Dost conflicts						
pulpment: Bailer Dost conflicte						
rpe: Crawation						
epth (ft-bTOC):						
Piameter (in):						
ume (ft^3):						
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity						
1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47						
1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47						

					Purging	Informa	tion				
Parame	ter Instru	ı <b>ment(s)</b> : Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
4				and the same of th	5.62	18.4	398-9			4.53	-
					7						
					5010	MIL					
Pi	urging Equipr	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O=5	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	1510	Palin 776/278	7-16 Poly	HNO3
_	Ì	6010/602017470	1-250 mc poly	HINDZ
		TIDS	1-250 n L Poly	NA
mw-5	A	CI.F. Soy	1-250 mc Poly	MA
ľ			10	
Sampled By: Rob	ert Mull	Sample Time: 1518		
Date Sampled:	1/16/20	Sampler Signature:	JE KULI	

Notes: Pumprate=

Version: 04/30/2019		Sheet 1 of 1
FDS	Groundwater Sampling Form	Sample ID:
	Site Information	
Site Name: CharaL	Project Number:	
Site Location: Brickham NC	Sampling Personnel: Cohert	M-11
Date: 1/16/70	Weather: Cloudy, 63	· F

Well Information							
Well Diameter (in): 2"	Purge Equipment: Mega Monsoon 700						
Screened Interval (ft): ノフ'ー て 7'	Pump Type: ESP						
Well Depth (ft):	Pump Depth (ft-bTOC): ~てつ						
Depth-to-Water (ft-bTOC): 6.34	Tubing Diameter (in): 3/8"						
Water Column Thickness (ft): 10.66	Well Volume (ft^3): 3.3\						
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity							
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; $1.25" = 0.06$ ; $2" = 0.16$ ; $3' = 0.37$ ; $4" = 0.65$ ; $5" = 1.02$ ; $6" = 1.47$						

	Purging Information											
Parame <sup>.</sup>	Parameter Instrument(s): Hanna, YSI, Mico TPW											
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (μS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)	
1022	Ø	Ø	700	7-61	6.61	16.9	1077	7.07	76.3	2917	Clarky	
1032	7.0	7.0	700	7.52	6.54	17.7	1068	10.28	778	54.0le	SISCHU	
1042	7.0	40	200	7.55	6.51	17.5	1051	5.91	72.1	29.60	Clea	
1052	7.0	6.0	200	7.58	6-49	17.8	1038	5 77	72.0	9.21	Wear	
1056	0.8	6.8	700	7.59	6.48	18.1	1034	5.62	72.5	6.52	Clear	
1100	0.8	7.4	700	7.60	6.48	18.1	1031	5.55	72.6	5.18	Clear	
1104	0.8	8.2	200	7.61	6.48	18.1	1030	5.23	74.0	6.51	Clear	
					1	- 0 -	21					
-					1	11	16-6			and the same of th		
					-							
Pui	rging Equipm	ent Codes (circle	e): B = Baile	r; BP = Bla	dder Pump;	ESP = Elec	ctric Submers	sible Pump;	PP = Peristaltic	Pump; O=	Specify	

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	1106	Ration 116/178	Z-IL Poly	HIVOS
and late		6010/6000/7470	1-250 me 10/4	H100-
MW-W		C1. F. 504	1-250 NL 1014	NA
MW-le +DUP-1	of l	TDS	1-500 MR poly	NIA
1001				
Sampled By: Rob	l l pert Mull	Sample Time: 1106		
Date Sampled:	1/14/20		1 5 B Rull	
	1 / Kat			

Notes: Pumprate= 100 mb/mb



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Site Information							
Site Name: Charan	Project Number:						
Site Location: Brickhave, NC	Sampling Personnel: ROSert MJ						
Date: 1/14/70	Weather: Clock, Coof						

, Well Information					
Well Diameter (in): 2"	Purge Equipment: Mega Monsoon Pro				
Screened Interval (ft): 74'-34'	Pump Type: ESP				
Well Depth (ft): 30	Pump Depth (ft-bTOC): / 35-1				
Depth-to-Water (ft-bTOC): 1,40	Tubing Diameter (in): 3/8"				
Water Column Thickness (ft): 「片んo	Well Volume (ft^3): てる4				
1 Well Volume	= (Total Depth - Static Water Level) * Well Capacity				
Well Capacity (gallons per feet): 0.75" = 0.02	; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI , M:C-O TPW										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1804		0	600	75.35	7.49	18-2	1521	11.02	67.0	78.77	( 0,0%
0808	1.0	7.0	500	-64-81	7.49	18.4	1515	9.30	65.4	17.49	Clan
0217	7.0	4.0	500	78.07	7.48	18.5	1512	9.03 1	65.5	15.24	clean
0816	7.0	80.0	500	29.30	7-48	18.5	1506	8.83	65.7	7.82	clea
0820	7.0	8.0	కోంప	30:13	7.48	18.6	1503	8.68	65.9	4.76	Clea
0274	1.4	9.4	350	30.44	7.48	18.5	1500	8.57	66.1	4.11	clea
0828	1.4	10.8	350	30.63	7.45	18,5	1502	8.47	67.1	4-411	Clean
0832	1,4	7	350	30.88	7.45	18.5	1506	8.37	67.3	6.80	clean
0836	1,4	13.6	350	31.17	7.46	18.5	1506	8-28	67.4	6.75	Clea
0840	1.04	14-64	260	31.36	7.46	184	1509	8.74	608.	5.86	CLCE
Pu	rging Equipm	nent Codes (circle	e): B = Baile	r; BP = Bla	adder Pump;	ESP = Elec	ctric Submers	sible Pump;	PP = Peristaltic	Pump; O=	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	0850	Fudien 126/228	7-16/019	HILLOS
7	1	6010/6020 17470	1-750 NL Poly	HNOZ
MW-7R		W.F. SO4	1-250 mc Poly	NIA
10,000	V	TDS	1-500 ML 10/4	MA
		590		
		7		
Sampled By: Rob		Sample Time: 0350		
Date Sampled: 1	116/20	Sampler Signature:	1 8 /Ul	

Notes: Pumprate=100 mc/wn 0834 pumprate = 260 mc/mm

0820 pangan = 350 mb/m

	Purging Information (Page 2)										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C) (3%)	COND. (μS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
0244	1.04	15.68	260	31.52	7.46	18.4	150 le	8.16	68.6	7.69	Clean
0848	1-04	16.72	760	31.64	7.46	18.2	1506	8-18	69.1	7.64	Clean
,				T	MIL					ment a motivative to	
					poc						
						4					
									•		
					-						
-											· —
-					4	- V					
	×								v		
		78									
						-					
								,			
										-	



1W-8	
	1W-8

Site Information					
Site Name: , Charah	Project Number:				
Site Location: BrickLann, NC	Sampling Personnel: Robert Muli				
Date: 1/17 / 10	Weather: 5 can 31° F				

	Well Information			
Well Diameter (in): 2"	Purge Equipment: Mya manson Pro			
Screened Interval (ft): 31' - 46'	Pump Type: ESP			
Well Depth (ft): ႷႱ゙	Pump Depth (ft-bTOC): ~ 4ン			
Depth-to-Water (ft-bTOC): ろ仏・とく	Tubing Diameter (in): $3/\delta''$			
Water Column Thickness (ft): 1\. 71	Well Volume (ft^3):   . 🎖 🗇			
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity				
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47			

	Purging Information										
Parame	Parameter Instrument(s): 村anna, YSI 、M. いってアル										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (µS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
0876	0	Ø	150	35.07	7.30	14.8	7567	10.88	578	61.06	Cluby
0834	1.5	1.5	150	3505	7.22	15.0	7574	9.34	64.5	26.61	Uta
0846	4.0	5.5	400	35.57	7.20	17.2	2447	8.69	6x.1	25.80	clear
0856	4.0	9.5	400	35 85	7.21	17.2	2110	8.36	68.8	12.74	Clear
0906	4.0	13.5	400	36.01	7.22	16.9	1809	8.00	68.3	7.61	Uras
0910	1.6	15.1	400	36.06	7.23	17.0	1713	7.93	47.7	6.03	Clea
0914	1.6	16.7	400	36.10	7.24	17.1	1643	7.79	66.	4.74	Clear
0918	1.le	18.3	400	36.14	7.24	17.0	1597	7.67	65.7	3-37	Uzan
			Antile State State Section 1	******	6	·	110				
				-	1	8	2			***************************************	THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COL
Pui	rging Equipm	nent Codes (circle	e): B = Baile	r; BP = Bla	idder Pump;	ESP = Elec	tric Submers	ible Pump;	PP = Peristaltic	Pump; O=	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	0977	Ration 226/128	2-16-6017	416003
1/167-8		1010/6020/7470	750 mm poly	HNO3
		C1, F, G04	750 ml 101,	NA
1000	W	TDS	500 ML 204	NIA
				125
Sampled By: Pol	hort Mull	Sample Times & Com		
			1-1 1.	1/
Sampled By: Rol Date Sampled:	bert Mull	Sample Time: 0927 Sampler Signature:	I Bo Ke	-/

Notes: Pumprate= 150 hulium
0836 pundraka 400 mulain



Sheet of Sample ID: Leach + C

	Site Information	
Site Name: Charah	Project Number:	
Site Location: Monecole	Sampling Personnel: J. P. F. C. N.	
Date: ///5/20	Weather: Sunny	

Well Information					
Well Diameter (in): 2"	Purge Equipment:				
Screened Interval (ft):	Pump Type:				
Well Depth (ft):	Pump Depth (ft-bTOC):				
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):				
Water Column Thickness (ft):	Well Volume (ft^3):				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

Parame	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI		Purging	Informa	tion				
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C)	COND. (μS/cm) (5%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±20mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1400	_				7.55	17.2	1696	12.72	124.7	_	clear
Pu	rging Equipm	nent Codes (circle	e): B = Baile	r; BP = Bla	adder Pump;	ESP = Ele	ctric Submers	sible Pump;	PP = Peristaltic	Pump; O =	Specify

	Sample Information								
Sample Number	Collection Time	Parameter	Container	Preservative					
,									
Leachote									
Sampled By: Robert Mull J. R. Chq		. R-IC, ng Sample Time: 1400	Sample Time: 1400						
Date Sampled:		Sampler Signature:							

Notes: Pumprate= /



FDS	Groundwater Sampling Form	Sample ID: _ らいー
	Site Information	
Site Name: Charal	Project Number:	
Site Location: Brickham NI	Sampling Personnel: Robert	Mull
Date: 1/16/70	Weather: Yarty Clou	Ly

	Well Information	
Well Diameter (in):	Purge Equipment:	$C = \begin{bmatrix} 1 & 1 & 1 \end{bmatrix}$
Screened Interval (ft):	Pump Type:	Jurace Work
Well Depth (ft):	Pump Depth (ft-bTOC):	O de
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):	Carre
Water Column Thickness (ft):	Well Volume (ft^3):	
1 Well	Volume = (Total Depth - Static Water Level	l) * Well Capacity
Well Capacity (gallons per feet): 0.7!	5" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.	16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47

					Purging	Informa	tion				
Parame	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (μS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) ⊦(±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
		7			5.14	16.6	176-3	and a college of the said of the little		288	
				<	-gon	11-c					
				/							
-											
Pu	urging Equipn	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = 5	Specify

		Sample Information	
Sample Number	Collection Time	Parameter Container	Preservative
4).\	09.50	Ration VILIER 2-14 Poly	HNOS
		1010/1020 17470 1-250 mc Bly	HNUZ
		775 1-250 nv 12/4	NIA
1	V	CL. FF. SOY 1-750NL POLY	WIA
		* * * * * * * * * * * * * * * * * * * *	1 35
Sampled By: Rob	ert Mull	Sample Time: 0930	
Date Sampled:	1/16/	To Sampler Signature: Kew IS /W!	

Notes: Pumprate=



Notes: Pumprate=

F)? Grou	undwater Sampling Form Sample ID:						
	Site Information						
Site Name: / hara	Project Number:						
Site Location: Brick Luden NL	Sampling Personnel:						
Date: 1/11e/70	Weather: Sally Clo-by						

Well Information						
Well Diameter (in):	Purge Equipment:					
Screened Interval (ft):	Pump Type:					
Well Depth (ft):	Pump Depth (ft-bTOC):					
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):					
Water Column Thickness (ft):	Well Volume (ft^3):					
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity						
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; $1.25" = 0.06$ ; $2" = 0.16$ ; $3' = 0.37$ ; $4" = 0.65$ ; $5" = 1.02$ ; $6" = 1.47$					

	tou loctu	ı <b>ment(s)</b> : Ha	nna VCI		Purging	Informa	tion				
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP, (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
					4.86	15.0	131.4			765	المعامد ال
							<i>t</i> :				
						~ 11	-Ai				
					Jack	1710	And the second				
P	urging Equipr	nent Codes (circle	e): B = Baile	er: BP = BI	adder Pump;	ESP = Ele	ctric Submer	sible Pump:	PP = Peristaltic	Pump: 0 = 1	Specify

	Sample Information								
Sample Number	Collection Time	Parameter Container	Preservative						
162-7	1070	Radin 274/228 2-14 Poly	HIVOS						
			DI, HWOZ						
	N	705 1-750 ml DO	1, NA						
5	U	U.F. SOY 1-750 A	I WIA						
Sampled By: Rob	Sampled By: Robert Mull Sample Time: 1070								
Date Sampled:	1/16	120 Sampler Signature: //av B A	11						

## **GROUNDWATER DEPTH**

Project Name:	Charah – Brickhaven	Date: 1/5/20	
Project Address:	Moncure, NC	Project No: 237673-019	
Time Started:		Time Finished:	
Dorooppol:	D Mull		

	Donth to T	Total
Well ID	Depth to Water	Depth
BG-1	10.65	
BG-2	11.35	
MW-1		
MW-2	58.35	
MW-3	23.01	
MW-4	13.25	
MW-5	23.03	
MW-6	6,45	
MW-7	16.30	
MW-7R	16.30	
MW-8	33.97	
	-	
4		

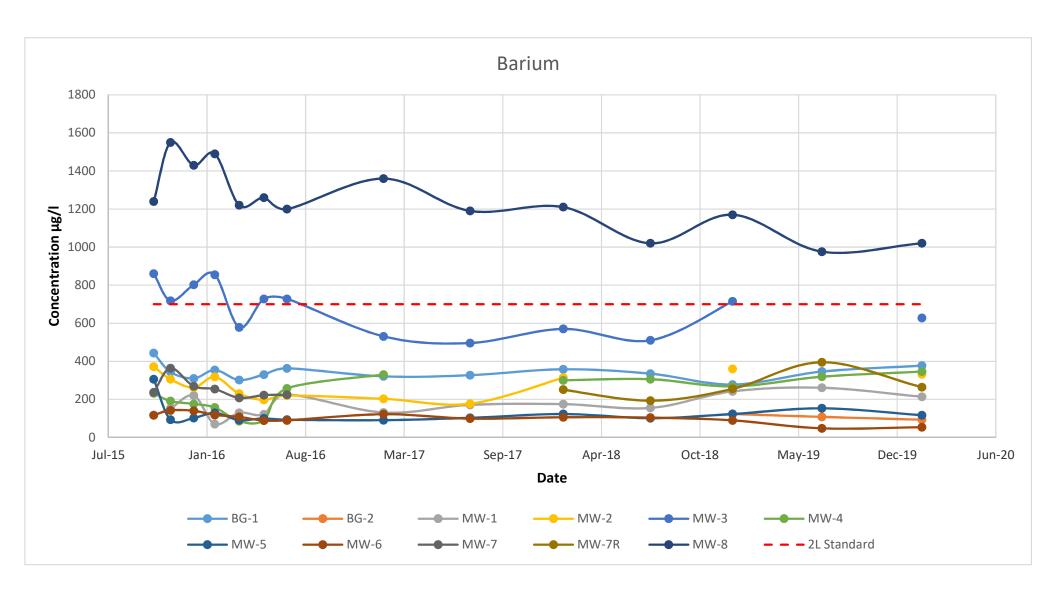
Well ID	Depth to Water	Total Depth
	25 =	
	41	

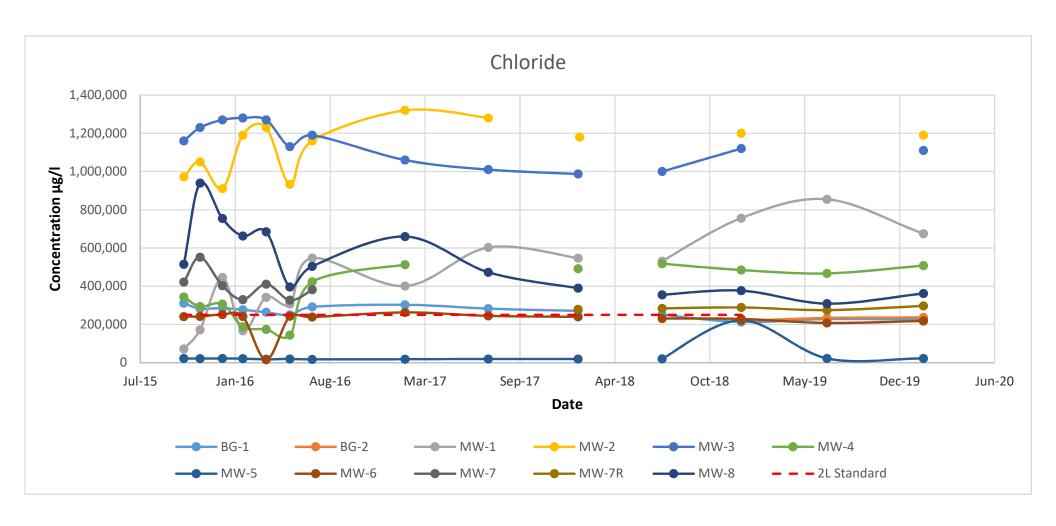
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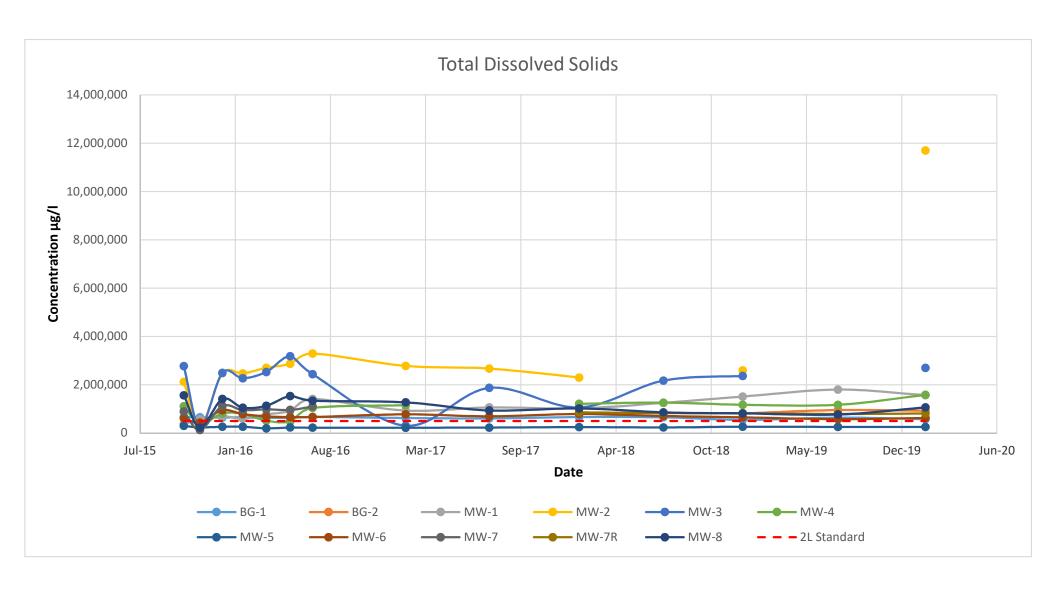
Appendix B – Concentration vs. Time Plots



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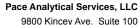


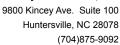
C

Appendix C – Laboratory Reports, Chains of Custody, & Quality Control Data



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February 03, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH

Pace Project No.: 92461278

#### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on January 17, 2020. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Tyler Forney for Kevin Herring

tegh Jagar

kevin.herring@pacelabs.com

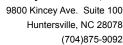
1(704)875-9092

**HORIZON** Database Administrator

Enclosures

cc: Mike Plummer, HDR Jacob Ruffing







#### **CERTIFICATIONS**

Project: CHARAH
Pace Project No.: 92461278

#### Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

ANAB DOD-ELAP Rad Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

**Arkansas Certification** 

California Certification #: 04222CA Colorado Certification #: PA01547 Connecticut Certification #: PH-0694

Delaware Certification EPA Region 4 DW Rad

Florida/TNI Certification #: E87683 Georgia Certification #: C040 Florida: Cert E871149 SEKS WET

Guam Certification Hawaii Certification Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: KY90133 KY WW Permit #: KY0098221 KY WW Permit #: KY0000221

Louisiana DHH/TNI Certification #: LA180012 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: 2017020 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457 Michigan/PADEP Certification #: 9991 Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888

New Mexico Certification #: PA01457 New York/TNI Certification #: 10888 North Carolina Certification #: 42706 North Dakota Certification #: R-190 Ohio EPA Rad Approval: #41249

Missouri Certification #: 235

Oregon/TNI Certification #: PA200002-010 Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification
Tennessee Certification #: 02867

Texas/TNI Certification #: T104704188-17-3 Utah/TNI Certification #: PA014572017-9 USDA Soil Permit #: P330-17-00091 Vermont Dept. of Health: ID# VT-0282 Virgin Island/PADEP Certification Virginia/VELAP Certification #: 9526 Washington Certification #: C868 West Virginia DEP Certification #: 143 West Virginia DHHR Certification #: 9964C

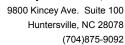
Wisconsin Approve List for Rad Wyoming Certification #: 8TMS-L

#### Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222

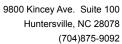




## **SAMPLE SUMMARY**

Project: CHARAH
Pace Project No.: 92461278

Lab ID	Sample ID	Matri	x Date Collected	Date Received
92461278001	MW-1	Wate	er 01/16/20 16:24	01/17/20 13:52
92461278002	MW-2	Wate	er 01/17/20 09:54	01/17/20 13:52
92461278003	MW-3	Wate	er 01/16/20 14:20	01/17/20 13:52
92461278004	MW-4	Wate	er 01/16/20 13:40	01/17/20 13:52
92461278005	MW-5	Wate	er 01/16/20 15:10	01/17/20 13:52
92461278006	MW-6	Wate	er 01/16/20 11:06	01/17/20 13:52
92461278007	MW-7R	Wate	er 01/16/20 08:50	01/17/20 13:52
92461278008	MW-8	Wate	er 01/17/20 09:22	01/17/20 13:52
92461278009	BG-1	Wate	er 01/15/20 12:20	01/17/20 13:52
92461278010	BG-2	Wate	er 01/15/20 14:08	01/17/20 13:52
92461278011	LEACHATE	Wate	er 01/15/20 14:00	01/17/20 13:52
92461278012	EQBL	Wate	er 01/17/20 10:20	01/17/20 13:52
92461278013	DUP-1	Wate	er 01/16/20 00:00	01/17/20 13:52

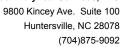




## **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92461278

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92461278001		EPA 6010D		16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278002	MW-2	EPA 6010D	DS, SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278003	MW-3	EPA 6010D	DS, SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278004	MW-4	EPA 6010D	DS	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278005	MW-5	EPA 6010D	DS	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278006	MW-6	EPA 6010D	DS	16	PASI-A
			JOR		PASI-A





## **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92461278

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470A		1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278007	MW-7R	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278008	MW-8	EPA 6010D	DS, SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278009	BG-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278010	BG-2	EPA 6010D	DS, SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
2461278011	LEACHATE	EPA 6010D	DS, SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA



## **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92461278

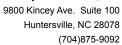
Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
92461278012	EQBL	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
92461278013	DUP-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A



## **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461278

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2461278001	MW-1					
EPA 6010D	Barium	214	ug/L	5.0	01/22/20 06:40	
EPA 6010D	Calcium	176000	ug/L	500	01/24/20 11:45	
EPA 6010D	Molybdenum	9.0	ug/L	5.0	01/22/20 06:40	
EPA 6020B	Lithium	35.6	ug/L	25.0	01/28/20 15:36	
EPA 903.1	Radium-226	0.0553 ± 0.252 (0.514)	pCi/L		01/31/20 12:11	
		C:NA T:95%				
EPA 904.0	Radium-228	0.581 ± 0.328 (0.593) C:85% T:92%	pCi/L		01/31/20 16:03	
SM 2540C-2011	Total Dissolved Solids	1570	mg/L	250	01/22/20 14:46	
EPA 300.0 Rev 2.1 1993	Chloride	675	mg/L		01/22/20 21:24	
EPA 300.0 Rev 2.1 1993	Fluoride	0.12	mg/L	0.10	01/21/20 18:11	
EPA 300.0 Rev 2.1 1993	Sulfate	6.6	mg/L	1.0	01/21/20 18:11	
2461278002	MW-2	0.0	mg/L	1.0	0 1/2 1/20 10:11	
EPA 6010D	Barium	332	ua/l	5.0	01/22/20 06:43	
EPA 6010D		199000	ug/L		01/24/20 00:43	
EPA 6010D EPA 6010D	Calcium	41.0	ug/L	500	01/22/20 11:48	
	Molybdenum		ug/L		01/22/20 06:43	
EPA 6010D	Zinc	13.4	ug/L	10.0		
EPA 6020B EPA 903.1	Lithium Radium-226	132 0.727 ± 0.433	ug/L pCi/L	25.0	01/28/20 15:40 01/31/20 12:11	
		(0.412) C:NA T:85%				
EPA 904.0	Radium-228	1.97 ± 0.610 (0.809)	pCi/L		01/31/20 16:03	
		C:82% T:85%				
SM 2540C-2011	Total Dissolved Solids	11700	mg/L	500	01/22/20 14:51	
EPA 300.0 Rev 2.1 1993	Chloride	1190	mg/L	100	01/22/20 21:39	
EPA 300.0 Rev 2.1 1993	Fluoride	0.20	mg/L	0.10	01/21/20 18:56	
EPA 300.0 Rev 2.1 1993	Sulfate	102	mg/L	100	01/22/20 21:39	
2461278003	MW-3					
EPA 6010D	Barium	628	ug/L	5.0	01/22/20 06:46	
EPA 6010D	Calcium	179000	ug/L	500	01/24/20 11:51	
EPA 6010D	Copper	9.2	ug/L	5.0	01/22/20 06:46	
EPA 6010D	Molybdenum	35.7	ug/L	5.0	01/22/20 06:46	
EPA 6020B	Lithium	89.0	ug/L	25.0	01/28/20 15:44	
EPA 903.1	Radium-226	0.784 ± 0.523	pCi/L		01/31/20 12:11	
		(0.649) C:NA T:85%				





## **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461278

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2461278003	MW-3					
EPA 904.0	Radium-228	2.86 ± 0.767 (0.821) C:76% T:83%	pCi/L		01/31/20 16:03	
SM 2540C-2011	Total Dissolved Solids	2700	mg/L	500	01/22/20 14:46	
EPA 300.0 Rev 2.1 1993	Chloride	1110	mg/L	23.0	01/22/20 21:54	
EPA 300.0 Rev 2.1 1993	Fluoride	0.37	mg/L	0.10	01/21/20 19:11	
EPA 300.0 Rev 2.1 1993	Sulfate	57.8	mg/L	1.0	01/21/20 19:11	
2461278004	MW-4					
PA 6010D	Barium	346	ug/L	5.0	01/22/20 07:02	
EPA 6010D	Calcium	56400	ug/L	100	01/22/20 07:02	
EPA 6010D	Cobalt	9.3	ug/L	5.0	01/22/20 07:02	
PA 6010D	Molybdenum	20.9	ug/L	5.0	01/22/20 07:02	
PA 6010D	Nickel	11.1	ug/L	5.0	01/22/20 07:02	
EPA 6010D	Zinc	14.5	ug/L	10.0	01/22/20 07:02	
PA 6020B	Lithium	31.7	ug/L	25.0	01/28/20 15:55	
PA 903.1	Radium-226	0.730 ± 0.680 (1.06) C:NA	pCi/L		01/31/20 11:59	
PA 904.0	Radium-228	T:83% 0.961 ± 0.440 (0.752) C:86% T:85%	pCi/L		01/31/20 16:03	
SM 2540C-2011	Total Dissolved Solids	1580	mg/L	250	01/22/20 14:46	
PA 300.0 Rev 2.1 1993	Chloride	508	mg/L	10.0	01/22/20 22:08	
PA 300.0 Rev 2.1 1993	Fluoride	0.24	mg/L	0.10	01/21/20 19:26	
EPA 300.0 Rev 2.1 1993	Sulfate	10.8	mg/L	1.0	01/21/20 19:26	
2461278005	MW-5					
PA 6010D	Barium	117	ug/L	5.0	01/22/20 07:06	
PA 6010D	Calcium	13900	ug/L	100	01/22/20 07:06	
EPA 903.1	Radium-226	0.243 ± 0.278 (0.164) C:NA T:88%	pCi/L		01/31/20 12:11	
PA 904.0	Radium-228	-0.0922 ± 0.320 (0.759) C:87% T:86%	pCi/L		01/31/20 16:03	
SM 2540C-2011	Total Dissolved Solids	255	mg/L	25.0	01/22/20 14:46	
EPA 300.0 Rev 2.1 1993	Chloride	22.2	mg/L		01/21/20 19:41	
PA 300.0 Rev 2.1 1993	Fluoride	0.61	mg/L		01/21/20 19:41	
PA 300.0 Rev 2.1 1993	Sulfate	3.1	mg/L		01/21/20 19:41	
2461278006	MW-6		,			
PA 6010D	Barium	53.7	ug/L	5.0	01/22/20 07:09	
EPA 6010D	Calcium	37700	ug/L		01/22/20 07:09	

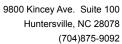
(704)875-9092



## **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461278

ab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2461278006	MW-6					
EPA 6010D	Molybdenum	5.8	ug/L	5.0	01/22/20 07:09	
EPA 6020B	Lithium	26.4	ug/L	25.0	01/28/20 16:03	
EPA 903.1	Radium-226	-0.225 ±	pCi/L		01/31/20 11:59	
EPA 904.0	Radium-228	0.272 (0.738) C:NA T:91% 0.265 ± 0.354	pCi/L		01/31/20 16:02	
		(0.757) C:83% T:84%				
M 2540C-2011	Total Dissolved Solids	624	mg/L	50.0	01/22/20 14:46	
PA 300.0 Rev 2.1 1993	Chloride	218	mg/L	5.0	01/22/20 22:23	
PA 300.0 Rev 2.1 1993	Fluoride	0.31	mg/L	0.10	01/21/20 19:56	
PA 300.0 Rev 2.1 1993	Sulfate	26.8	mg/L	1.0	01/21/20 19:56	
2461278007	MW-7R					
PA 6010D	Barium	264	ug/L	5.0	01/24/20 20:22	
PA 6010D	Calcium	84100	ug/L	100	01/24/20 20:22	
PA 6020B	Lithium	27.6	ug/L	25.0	01/28/20 16:07	
PA 903.1	Radium-226	-0.194 ± 0.458 (1.03) C:NA	pCi/L		01/31/20 11:59	
		T:81%				
PA 904.0	Radium-228	0.728 ± 0.394 (0.718) C:86% T:88%	pCi/L		01/31/20 16:02	
M 2540C-2011	Total Dissolved Solids	810	mg/L	125	01/22/20 14:46	
PA 300.0 Rev 2.1 1993	Chloride	297	mg/L		01/22/20 14:40	M6
PA 300.0 Rev 2.1 1993	Fluoride	0.11	mg/L		01/21/20 20:11	IVIO
PA 300.0 Rev 2.1 1993	Sulfate	16.5	mg/L	1.0	01/21/20 20:11	M1
461278008	MW-8		··· <b>g</b> ·-			
PA 6010D	Barium	1020	ug/L	5.0	01/24/20 20:25	
PA 6010D	Calcium	108000	ug/L	500	01/25/20 15:12	
PA 6010D	Chromium	7.4	ug/L		01/24/20 20:25	
PA 903.1	Radium-226	0.798 ± 0.505 (0.570)	pCi/L		01/31/20 12:11	
PA 904.0	Radium-228	C:NA T:82% 0.466 ± 0.347 (0.681) C:84%	pCi/L		01/31/20 16:03	
M 2540C-2011	Total Dissolved Solids	T:87% 1060	mg/L	125	01/22/20 14:51	
PA 300.0 Rev 2.1 1993	Chloride	362	mg/L		01/22/20 14:51	
PA 300.0 Rev 2.1 1993	Sulfate	7.5	mg/L		01/21/20 20:56	
461278009	BG-1					





## **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461278

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2461278009	BG-1					
EPA 6010D	Calcium	33700	ug/L	100	01/24/20 20:34	
EPA 6010D	Vanadium	6.4	ug/L	5.0	01/24/20 20:34	
EPA 903.1	Radium-226	-0.0682 ±	pCi/L		01/31/20 11:59	
		0.354	•			
		(0.819)				
-DA 004 0	Dadium 220	C:NA T:85% 0.429 ±	~ C:/I		04/04/00 40.50	
EPA 904.0	Radium-228	0.429 ±	pCi/L		01/31/20 12:58	
		(0.645)				
		C:83%				
		T:93%				
SM 2540C-2011	Total Dissolved Solids	576	mg/L	25.0	01/21/20 00:32	
EPA 300.0 Rev 2.1 1993	Chloride	226	mg/L	5.0	01/23/20 00:07	
EPA 300.0 Rev 2.1 1993	Fluoride	0.15	mg/L		01/21/20 21:11	
PA 300.0 Rev 2.1 1993	Sulfate	22.2	mg/L	1.0	01/21/20 21:11	
2461278010	BG-2					
EPA 6010D	Barium	93.1	ug/L	5.0	01/24/20 20:37	
EPA 6010D	Calcium	106000	ug/L	500	01/25/20 15:15	
EPA 903.1	Radium-226	0.0668 ±	pCi/L		01/31/20 11:59	
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	radiam 220	0.305	POILE		01/01/2011:00	
		(0.492)				
		C:NA T:80%				
EPA 904.0	Radium-228	0.540 ±	pCi/L		01/31/20 12:58	
		0.374 (0.729)				
		C:84%				
		T:85%				
SM 2540C-2011	Total Dissolved Solids	922	mg/L	50.0	01/21/20 00:32	
PA 300.0 Rev 2.1 1993	Chloride	237	mg/L	5.0	01/23/20 00:21	
EPA 300.0 Rev 2.1 1993	Fluoride	0.17	mg/L	0.10	01/22/20 10:16	
EPA 300.0 Rev 2.1 1993	Sulfate	102	mg/L	5.0	01/23/20 00:21	
2461278011	LEACHATE					
PA 6010D	Arsenic	10.4	ug/L	10.0	01/24/20 20:40	
PA 6010D	Barium	64.1	ug/L	5.0	01/24/20 20:40	
PA 6010D	Calcium	299000	ug/L	500	01/25/20 15:18	
PA 6010D	Cobalt	5.8	ug/L	5.0	01/24/20 20:40	
EPA 6010D	Molybdenum	226	ug/L	5.0	01/24/20 20:40	
EPA 6010D	Nickel	6.7	ug/L	5.0	01/24/20 20:40	
EPA 6010D	Vanadium	5.5	ug/L	5.0	01/24/20 20:40	
EPA 6020B	Boron	3070	ug/L	500	01/28/20 16:23	
EPA 6020B	Thallium	0.35	ug/L	0.10	01/25/20 00:01	
EPA 903.1	Radium-226	0.000 ±	pCi/L		01/31/20 11:59	
		0.258				
		(0.526)				
EPA 904.0	Radium-228	C:NA T:95% 0.703 ±	nCi/l		01/31/20 12:58	
-FA 304.0	Naululli-220	0.703 ±	pCi/L		01/31/20 12.36	
		(0.632)				
		C:84%				
		T:89%				

## **REPORT OF LABORATORY ANALYSIS**

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# **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461278

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2461278011	LEACHATE					
SM 2540C-2011	Total Dissolved Solids	1340	mg/L	50.0	01/21/20 00:32	
EPA 300.0 Rev 2.1 1993	Chloride	18.1	mg/L	1.0	01/22/20 10:32	
EPA 300.0 Rev 2.1 1993	Fluoride	0.19	mg/L	0.10	01/22/20 10:32	
EPA 300.0 Rev 2.1 1993	Sulfate	565	mg/L	12.0	01/23/20 00:36	
2461278012	EQBL					
EPA 903.1	Radium-226	-0.0596 ± 0.387 (0.840) C:NA T:84%	pCi/L		01/31/20 12:32	
EPA 904.0	Radium-228	-0.160 ± 0.353 (0.843) C:76% T:90%	pCi/L		01/31/20 11:35	
2461278013	DUP-1					
EPA 6010D	Barium	47.9	ug/L	5.0	01/24/20 20:46	
EPA 6010D	Calcium	33600	ug/L	100	01/24/20 20:46	
PA 6020B	Lithium	22.9	ug/L	2.5	01/25/20 01:51	
EPA 903.1	Radium-226	-0.0583 ± 0.266 (0.541) C:NA T:85%	pCi/L		01/31/20 11:59	
EPA 904.0	Radium-228	0.422 ± 0.308 (0.598) C:83% T:87%	pCi/L		01/31/20 12:58	
SM 2540C-2011	Total Dissolved Solids	626	mg/L	50.0	01/22/20 14:46	
PA 300.0 Rev 2.1 1993	Chloride	221	mg/L	5.0	01/23/20 00:51	
PA 300.0 Rev 2.1 1993	Fluoride	0.34	mg/L	0.10	01/22/20 11:17	
PA 300.0 Rev 2.1 1993	Sulfate	27.6	mg/L	1.0	01/22/20 11:17	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-1	Lab ID: 9246	1278001	Collected: 01/16/2	20 16:24	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: El	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:40	7440-38-2	
Barium	214	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 06:40	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 06:40	7440-43-9	
Calcium	176000	ug/L	500	5	01/21/20 01:33	01/24/20 11:45	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7439-92-1	
Molybdenum	9.0	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:40	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:40	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:40	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 15:36	7440-42-8	
Lithium	35.6	ug/L	25.0	10	01/21/20 02:15	01/28/20 15:36	7439-93-2	
Thallium	ND	ug/L	1.0	10	01/21/20 02:15	01/28/20 15:36	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	ethod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:21	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 25	40C-2011					
Total Dissolved Solids	1570	mg/L	250	1		01/22/20 14:46		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	675	mg/L	14.0	14		01/22/20 21:24	16887-00-6	
Fluoride	0.12	mg/L	0.10	1		01/21/20 18:11	16984-48-8	
Sulfate	6.6	mg/L	1.0	1		01/21/20 18:11	1/18/08-70-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-2	Lab ID: 9246	6127800 <sup>2</sup>	Collected: 01/17/2	20 09:54	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:43	7440-38-2	
Barium	332	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33			
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 06:43	7440-43-9	
Calcium	199000	ug/L	500	5	01/21/20 01:33	01/24/20 11:48	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7439-92-1	
Molybdenum	41.0	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:43	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:43	7440-62-2	
Zinc	13.4	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:43	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	020B Preparation Me	thod: E	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 15:40	7440-42-8	D3
Lithium	132	ug/L	25.0	10	01/21/20 02:15	01/28/20 15:40	7439-93-2	
Thallium	ND	ug/L	1.0	10	01/21/20 02:15	01/28/20 15:40	7440-28-0	D3
7470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:28	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	11700	mg/L	500	1		01/22/20 14:51		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	1190	mg/L	100	100		01/22/20 21:39	16887-00-6	
Fluoride	0.20	mg/L	0.10	1		01/21/20 18:56		
Sulfate	102	mg/L	100	100		01/22/20 21:39		



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-3	Lab ID: 9246	61278003	Collected: 01/16/2	20 14:20	Received: 01	/17/20 13:52 N	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:46	7440-38-2	
Barium	628	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 06:46	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 06:46	7440-43-9	
Calcium	179000	ug/L	500	5	01/21/20 01:33	01/24/20 11:51	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-48-4	
Copper	9.2	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-50-8	
∟ead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7439-92-1	
Molybdenum	35.7	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:46	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-22-4	
/anadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 06:46	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 06:46	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 15:44	7440-42-8	
Lithium	89.0	ug/L	25.0	10	01/21/20 02:15	01/28/20 15:44	7439-93-2	
Γhallium	ND	ug/L	1.0	10	01/21/20 02:15	01/28/20 15:44	7440-28-0	
470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	ethod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:30	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	2700	mg/L	500	1		01/22/20 14:46		
800.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	1110	mg/L	23.0	23		01/22/20 21:54	16887-00-6	
Fluoride	0.37	mg/L	0.10	1		01/21/20 19:11		
Sulfate	57.8	9, =	3.10	•		01/21/20 19:11	. 555 6	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-4	Lab ID: 9246	1278004	Collected: 01/16/2	20 13:40	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Mo	ethod: El	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:02	7440-38-2	
Barium	346	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:02	2 7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:02	7440-43-9	
Calcium	56400	ug/L	100	1	01/21/20 01:33	01/22/20 07:02	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-47-3	
Cobalt	9.3	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7439-92-1	
Molybdenum	20.9	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7439-98-7	
Nickel	11.1	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:02	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:02	7440-62-2	
Zinc	14.5	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:02	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 15:55	7440-42-8	
Lithium	31.7	ug/L	25.0	10	01/21/20 02:15	01/28/20 15:55	7439-93-2	
Thallium	ND	ug/L	1.0	10	01/21/20 02:15	01/28/20 15:55	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	ethod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:32	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	1580	mg/L	250	1		01/22/20 14:46	5	
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	508	mg/L	10.0	10		01/22/20 22:08	16887-00-6	
Fluoride	0.24	mg/L	0.10	1		01/21/20 19:26	16984-48-8	
Sulfate	10.8	mg/L	1.0	1		01/21/20 19:26	1/18/18-70-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-5	Lab ID: 9246	1278005	Collected: 01/16/2	20 15:10	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:06	7440-38-2	
Barium	117	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:06	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:06	7440-43-9	
Calcium	13900	ug/L	100	1	01/21/20 01:33	01/22/20 07:06	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:06	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:06	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:06	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 15:59	7440-42-8	
Lithium	ND	ug/L	25.0	10	01/21/20 02:15	01/28/20 15:59	7439-93-2	
Thallium	ND	ug/L	1.0	10	01/21/20 02:15	01/28/20 15:59	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	ethod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:35	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 25	40C-2011					
Total Dissolved Solids	255	mg/L	25.0	1		01/22/20 14:46	5	
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	22.2	mg/L	1.0	1		01/21/20 19:41	16887-00-6	
Fluoride	0.61	mg/L	0.10	1		01/21/20 19:41	16984-48-8	
Sulfate	3.1	mg/L	1.0	1		01/21/20 19:41	14808-79-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-6	Lab ID: 9246	1278006	Collected: 01/16/2	20 11:06	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	10D Preparation M	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:09	7440-38-2	
Barium	53.7	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:09	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/22/20 07:09	7440-43-9	
Calcium	37700	ug/L	100	1	01/21/20 01:33	01/22/20 07:09	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7439-92-1	
Molybdenum	5.8	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:09	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/22/20 07:09	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/22/20 07:09	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 16:03	7440-42-8	D3
Lithium	26.4	ug/L	25.0	10	01/21/20 02:15	01/28/20 16:03	7439-93-2	
Thallium	ND	ug/L	0.10	1	01/21/20 02:15	01/24/20 23:42	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	ethod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:37	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	624	mg/L	50.0	1		01/22/20 14:46		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	0.0 Rev 2.1 1993					
Chloride	218	mg/L	5.0	5		01/22/20 22:23	16887-00-6	
Fluoride	0.31	mg/L	0.10	1		01/21/20 19:56	16984-48-8	
Sulfate	26.8	mg/L	1.0	1		01/21/20 19:56		



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-7R	Lab ID: 9246	61278007	Collected: 01/16/2	0 08:50	Received: 01	/17/20 13:52 N	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	thod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:22	7440-38-2	
Barium	264	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:22	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:22	7440-43-9	
Calcium	84100	ug/L	100	1	01/21/20 01:33	01/24/20 20:22	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:22	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:22	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:22	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	thod: E	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 16:07	7440-42-8	D3
Lithium	27.6	ug/L	25.0	10	01/21/20 02:15	01/28/20 16:07	7439-93-2	
Thallium	ND	ug/L	0.10	1	01/21/20 02:15	01/24/20 23:46	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:44	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	810	mg/L	125	1		01/22/20 14:46		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	297	mg/L	6.0	6		01/22/20 23:08	16887-00-6	M6
Fluoride	0.11	mg/L	0.10	1		01/21/20 20:11		· · · · ·
Sulfate	16.5	mg/L	1.0	1		01/21/20 20:11		M1



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: MW-8	Lab ID: 9246	6127800 <mark>8</mark>	Collected: 01/17/2	20 09:22	Received: 01	/17/20 13:52 N	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:25	7440-38-2	
Barium	1020	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:25	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:25	7440-43-9	
Calcium	108000	ug/L	500	5	01/21/20 01:33	01/25/20 15:12	7440-70-2	
Chromium	7.4	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:25	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:25	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:25	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	020B Preparation Me	thod: E	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 16:11	7440-42-8	D3
Lithium	ND	ug/L	25.0	10	01/21/20 02:15	01/28/20 16:11	7439-93-2	D3
Thallium	ND	ug/L	0.10	1	01/21/20 02:15	01/24/20 23:50	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:47	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	1060	mg/L	125	1		01/22/20 14:51		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	362	mg/L	8.0	8		01/22/20 23:52	16887-00-6	
Fluoride	ND	mg/L	0.10	1		01/21/20 20:56	16984-48-8	
Sulfate	7.5	mg/L	1.0	1		01/21/20 20:56		



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: BG-1	Lab ID: 9246	1278009	Collected: 01/15/2	0 12:20	Received: 01	/17/20 13:52 N	/latrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	thod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:34	7440-38-2	
Barium	377	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:34	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:34	7440-43-9	
Calcium	33700	ug/L	100	1	01/21/20 01:33	01/24/20 20:34	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:34	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-22-4	
√anadium	6.4	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:34	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:34	7440-66-6	
020 MET ICPMS	Analytical Meth	od: EPA 60	020B Preparation Me	thod: El	PA 3010A			
Boron	ND	ug/L	25.0	1	01/21/20 02:15	01/28/20 16:15	7440-42-8	
Lithium	ND	ug/L	2.5	1	01/21/20 02:15	01/28/20 16:15	7439-93-2	
Γhallium	ND	ug/L	0.10	1	01/21/20 02:15	01/28/20 16:15	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:49	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 25	40C-2011					
Total Dissolved Solids	576	mg/L	25.0	1		01/21/20 00:32		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	226	mg/L	5.0	5		01/23/20 00:07	16887-00-6	
Fluoride	0.15	mg/L	0.10	1		01/21/20 21:11	16984-48-8	
Sulfate	22.2	mg/L	1.0	1		01/21/20 21:11	14808-79-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: BG-2	Lab ID: 9246	1278010	Collected: 01/15/2	0 14:08	Received: 01	/17/20 13:52 N	/latrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Metho	od: EPA 60	110D Preparation Me	thod: El	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:37	7440-38-2	
Barium	93.1	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:37	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:37	7440-43-9	
Calcium	106000	ug/L	500	5	01/21/20 01:33	01/25/20 15:15	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:37	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:37	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:37	7440-66-6	
6020 MET ICPMS	Analytical Metho	od: EPA 60	20B Preparation Me	thod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/21/20 02:15	01/28/20 16:19	7440-42-8	D3
Lithium	ND	ug/L	25.0	10	01/21/20 02:15	01/28/20 16:19	7439-93-2	D3
Γhallium	ND	ug/L	0.10	1	01/21/20 02:15	01/24/20 23:57	7440-28-0	
7470 Mercury	Analytical Metho	od: EPA 74	70A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:51	7439-97-6	
2540C Total Dissolved Solids	Analytical Metho	od: SM 254	10C-2011					
Total Dissolved Solids	922	mg/L	50.0	1		01/21/20 00:32		
300.0 IC Anions 28 Days	Analytical Metho	od: EPA 30	0.0 Rev 2.1 1993					
Chloride	237	mg/L	5.0	5		01/23/20 00:21	16887-00-6	
Fluoride	0.17	mg/L	0.10	1		01/22/20 10:16		
Sulfate	102	mg/L	5.0	5		01/23/20 00:21		



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: LEACHATE	Lab ID: 9246	31278011	Collected: 01/15/2	20 14:00	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: El	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-36-0	
Arsenic	10.4	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:40	7440-38-2	
Barium	64.1	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-39-3	
Beryllium	ND	ug/L	1.0	1		01/24/20 20:40		
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:40	7440-43-9	
Calcium	299000	ug/L	500	5	01/21/20 01:33	01/25/20 15:18	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-47-3	
Cobalt	5.8	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-50-8	
₋ead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7439-92-1	
Molybdenum	226	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7439-98-7	
Nickel	6.7	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:40	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-22-4	
/anadium	5.5	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:40	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:40	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	020B Preparation Me	thod: El	PA 3010A			
Boron	3070	ug/L	500	20	01/21/20 02:15	01/28/20 16:23	7440-42-8	
Lithium	ND	ug/L	50.0	20	01/21/20 02:15	01/28/20 16:23	7439-93-2	D3
Γhallium	0.35	ug/L	0.10	1	01/21/20 02:15	01/25/20 00:01	7440-28-0	
470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:54	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 25	40C-2011					
Total Dissolved Solids	1340	mg/L	50.0	1		01/21/20 00:32		
800.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	18.1	mg/L	1.0	1		01/22/20 10:32	16887-00-6	
Fluoride	0.19	mg/L	0.10	1		01/22/20 10:32		
Sulfate	565	mg/L	12.0	12			14808-79-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

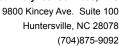
Sample: EQBL	Lab ID: 9246	1278012	Collected: 01/17/2	0 10:20	Received: 01	/17/20 13:52 N	/latrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Metho	od: EPA 60	010D Preparation Me	thod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:43	7440-38-2	
Barium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:43	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:43	7440-43-9	
Calcium	ND	ug/L	100	1	01/21/20 01:33	01/24/20 20:43	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:43	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-22-4	
√anadium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:43	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:43	7440-66-6	
6020 MET ICPMS	Analytical Metho	od: EPA 60	020B Preparation Me	thod: El	PA 3010A			
Boron	ND	ug/L	25.0	1	01/21/20 02:15	01/28/20 16:26	7440-42-8	
_ithium	ND	ug/L	2.5	1	01/21/20 02:15	01/28/20 16:26	7439-93-2	
Γhallium	ND	ug/L	0.10	1	01/21/20 02:15	01/28/20 16:26	7440-28-0	
470 Mercury	Analytical Methor	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:56	7439-97-6	
2540C Total Dissolved Solids	Analytical Metho	od: SM 25	40C-2011					
Total Dissolved Solids	ND	mg/L	25.0	1		01/22/20 14:51		
300.0 IC Anions 28 Days	Analytical Metho	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	ND	mg/L	1.0	1		01/22/20 10:47	16887-00-6	
Fluoride	ND	mg/L	0.10	1		01/22/20 10:47	16984-48-8	
Sulfate	ND	mg/L	1.0	1		01/22/20 10:47	14808-79-8	



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Sample: DUP-1	Lab ID: 9246	31278013	Collected: 01/16/	20 00:00	Received: 01	/17/20 13:52 N	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation M	ethod: El	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:46	7440-38-2	
Barium	47.9	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-39-3	
Beryllium	ND	ug/L	1.0	1		01/24/20 20:46		
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:46	7440-43-9	
Calcium	33600	ug/L	100	1	01/21/20 01:33	01/24/20 20:46	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:46	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-22-4	
Vanadium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:46	7440-62-2	
Zinc	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:46	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation M	ethod: El	PA 3010A			
Boron	ND	ug/L	50.0	2	01/22/20 01:55	01/28/20 16:46	7440-42-8	
Lithium	22.9	ug/L	2.5	1	01/22/20 01:55	01/25/20 01:51	7439-93-2	
Thallium	ND	ug/L	0.10	1	01/22/20 01:55	01/25/20 01:51	7440-28-0	
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 15:59	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 25	40C-2011					
Total Dissolved Solids	626	mg/L	50.0	1		01/22/20 14:46		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	221	mg/L	5.0	5		01/23/20 00:51	16887-00-6	
Fluoride	0.34	mg/L	0.10	1		01/22/20 11:17	16984-48-8	
Sulfate	27.6	mg/L	1.0	1		01/22/20 11:17	14808-79-8	





Project: CHARAH
Pace Project No.: 92461278

Mercury

Date: 02/03/2020 01:20 PM

QC Batch: 520252 Analysis Method: EPA 7470A

QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

METHOD BLANK: 2783833 Matrix: Water

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

Parameter Units Blank Reporting Result Limit Analyzed Qualifiers

ug/L ND 0.20 01/21/20 15:16

LABORATORY CONTROL SAMPLE: 2783834

Spike LCS LCS % Rec

ParameterUnitsConc.Result% RecLimitsQualifiersMercuryug/L2.52.610480-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2783835 2783836 MS MSD

MS 92461278001 Spike Spike MS MSD MS MSD % Rec Max RPD Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** Qual Mercury ND 2.5 2.5 2.3 2.6 90 101 75-125 11 25 ug/L

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

QC Batch: 520386 Analysis Method: EPA 6010D QC Batch Method: EPA 3010A Analysis Description: 6010 MET

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

METHOD BLANK: 2784758 Matrix: Water

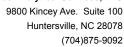
Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND ND	5.0	01/22/20 06:02	
Arsenic	ug/L	ND	10.0	01/22/20 06:02	
Barium	ug/L	ND	5.0	01/22/20 06:02	
Beryllium	ug/L	ND	1.0	01/22/20 06:02	
Cadmium	ug/L	ND	1.0	01/22/20 06:02	
Calcium	ug/L	ND	100	01/22/20 06:02	
Chromium	ug/L	ND	5.0	01/22/20 06:02	
Cobalt	ug/L	ND	5.0	01/22/20 06:02	
Copper	ug/L	ND	5.0	01/22/20 06:02	
Lead	ug/L	ND	5.0	01/22/20 06:02	
Molybdenum	ug/L	ND	5.0	01/22/20 06:02	
Nickel	ug/L	ND	5.0	01/22/20 06:02	
Selenium	ug/L	ND	10.0	01/22/20 06:02	
Silver	ug/L	ND	5.0	01/22/20 06:02	
Vanadium	ug/L	ND	5.0	01/22/20 06:02	
Zinc	ug/L	ND	10.0	01/22/20 06:02	

LABORATORY CONTROL SAMPLE:	2784759					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	ug/L	500	500	100	80-120	
Arsenic	ug/L	500	478	96	80-120	
Barium	ug/L	500	495	99	80-120	
Beryllium	ug/L	500	494	99	80-120	
Cadmium	ug/L	500	492	98	80-120	
Calcium	ug/L	5000	4950	99	80-120	
Chromium	ug/L	500	496	99	80-120	
Cobalt	ug/L	500	501	100	80-120	
Copper	ug/L	500	504	101	80-120	
Lead	ug/L	500	500	100	80-120	
Molybdenum	ug/L	500	480	96	80-120	
Nickel	ug/L	500	497	99	80-120	
Selenium	ug/L	500	468	94	80-120	
Silver	ug/L	250	243	97	80-120	
Vanadium	ug/L	500	493	99	80-120	
Zinc	ug/L	500	478	96	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

MATRIX SPIKE & MATRIX	SPIKE DUPI	LICATE: 2784	760 MS	MSD	2784761							
		92460380001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qua
Antimony	ug/L		500	500	515	541	103	108	75-125	5	20	
Arsenic	ug/L	ND	500	500	501	525	99	104	75-125	5	20	
Barium	ug/L	52.7	500	500	551	574	100	104	75-125	4	20	
Beryllium	ug/L	ND	500	500	506	530	101	106	75-125	5	20	
Cadmium	ug/L	ND	500	500	509	537	102	107	75-125	5	20	
Calcium	ug/L	18400	5000	5000	22800	23900	88	109	75-125	4	20	
Chromium	ug/L	ND	500	500	507	531	101	106	75-125	5	20	
Cobalt	ug/L	ND	500	500	505	527	101	105	75-125	4	20	
Copper	ug/L	ND	500	500	516	539	102	107	75-125	5	20	
_ead	ug/L	ND	500	500	511	532	102	106	75-125	4	20	
Molybdenum	ug/L	ND	500	500	482	499	96	100	75-125	3	20	
Nickel	ug/L	ND	500	500	503	526	100	105	75-125	4	20	
Selenium	ug/L	ND	500	500	511	560	102	112	75-125	9	20	
Silver	ug/L	ND	250	250	252	266	101	106	75-125	5	20	
√anadium	ug/L	ND	500	500	506	531	101	106	75-125	5	20	
Zinc	ug/L	20.8	500	500	513	541	98	104	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

QC Batch: 520387 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012

METHOD BLANK: 2784762 Matrix: Water

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	ND ND	25.0	01/24/20 17:51	
Lithium	ug/L	ND	2.5	01/24/20 17:51	
Thallium	ug/L	ND	0.10	01/24/20 17:51	

LABORATORY CONTROL SAMPLE.	2/04/03	Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Boron	ug/L	50	47.6	95	80-120	
Lithium	ug/L	50	48.4	97	80-120	
Thallium	ug/L	10	10.0	100	80-120	

MATRIX SPIKE & MATRIX SI	PIKE DUPL	ICATE: 2784	764		2784765							
			MS	MSD								
		92460828001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	ND	50	50	48.9	48.4	94	93	75-125	1	20	
Thallium	ug/L	ND	10	10	10.8	10.5	108	104	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

QC Batch: 520647 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET

Associated Lab Samples: 92461278013

METHOD BLANK: 2785829 Matrix: Water

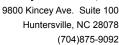
Associated Lab Samples: 92461278013

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	ND ND	25.0	01/28/20 16:30	
Lithium	ug/L	ND	2.5	01/28/20 16:30	
Thallium	ua/L	ND	0.10	01/28/20 16:30	

LABORATORY CONTROL SAMPLE:	2785830					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Boron	ug/L	50	52.8	106	80-120	
Lithium	ug/L	50	52.5	105	80-120	
Thallium	ug/L	10	10.7	107	80-120	

MATRIX SPIKE & MATRIX S	PIKE DUPLI	CATE: 2785	831		2785832							
			MS	MSD								
		92461124003	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	ND	50	50	65.1	65.0	85	85	75-125	0	20	E
Lithium	ug/L	6.5	50	50	51.5	51.5	90	90	75-125	0	20	E
Thallium	ug/L	ND	10	10	11.3	11.2	113	112	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461278

QC Batch: 520339 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Associated Lab Samples: 92461278009, 92461278010, 92461278011

METHOD BLANK: 2784480 Matrix: Water

Associated Lab Samples: 92461278009, 92461278010, 92461278011

Blank Reporting

Parameter Units Result Limit Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 01/21/20 00:30

LABORATORY CONTROL SAMPLE: 2784481

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers **Total Dissolved Solids** mg/L 250 268 107 90-110

SAMPLE DUPLICATE: 2784482

92461139002 Dup Max **RPD RPD** Parameter Units Result Result Qualifiers 94.0 3 25 **Total Dissolved Solids** 97.0 mg/L

SAMPLE DUPLICATE: 2784483

Date: 02/03/2020 01:20 PM

92461361001 Dup Max RPD RPD Parameter Units Result Result Qualifiers 65.0 **Total Dissolved Solids** mg/L 66.0 2 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461278

QC Batch: 520656 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Associated Lab Samples: 92461278001, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007, 92461278013

METHOD BLANK: 2785840 Matrix: Water

Associated Lab Samples: 92461278001, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007, 92461278013

Blank Reporting

Parameter Units Result Limit Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 01/22/20 14:43

LABORATORY CONTROL SAMPLE: 2785841

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers **Total Dissolved Solids** mg/L 250 250 100 90-110

SAMPLE DUPLICATE: 2785842

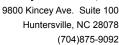
Parameter Units Pesult Perundent Units Pesult Pesul

SAMPLE DUPLICATE: 2785843

Date: 02/03/2020 01:20 PM

92460490079 Dup Max RPD RPD Parameter Units Result Result Qualifiers 1040 **Total Dissolved Solids** mg/L 930 11 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461278

QC Batch: 520658 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Associated Lab Samples: 92461278002, 92461278008, 92461278012

METHOD BLANK: 2785844 Matrix: Water

Associated Lab Samples: 92461278002, 92461278008, 92461278012

Blank Reporting

Parameter Units Result Limit Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 01/22/20 14:51

LABORATORY CONTROL SAMPLE: 2785845

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers **Total Dissolved Solids** mg/L 250 274 109 90-110

SAMPLE DUPLICATE: 2785846

92461540001 Dup Max **RPD RPD** Parameter Units Result Result Qualifiers 1610 25 D6 **Total Dissolved Solids** 2610 47 mg/L

SAMPLE DUPLICATE: 2785847

Date: 02/03/2020 01:20 PM

ParameterUnits92461146012 ResultDup ResultRPDMax RPDQualifiersTotal Dissolved Solidsmg/L427443425

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

QC Batch: 520369 Analysis Method: EPA 300.0 Rev 2.1 1993

QC Batch Method: EPA 300.0 Rev 2.1 1993 Analysis Description: 300.0 IC Anions

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

METHOD BLANK: 2784682 Matrix: Water

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278012, 92461278013

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Chloride	mg/L	ND ND	1.0	01/21/20 15:30	
Fluoride	mg/L	ND	0.10	01/21/20 15:30	
Sulfate	mg/L	ND	1.0	01/21/20 15:30	

LABORATORY CONTROL SAMPLE:	2784683					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Chloride	mg/L	50	50.9	102	90-110	
Fluoride	mg/L	2.5	2.4	97	90-110	
Sulfate	mg/L	50	52.8	106	90-110	

MATRIX SPIKE & MATRIX SP	IKE DUPLI	CATE: 2784	684		2784685							
			MS	MSD								
		92460490077	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	24.9	50	50	79.5	79.8	109	110	90-110	0	10	
Fluoride	mg/L	0.052J	2.5	2.5	2.5	2.6	98	100	90-110	2	10	
Sulfate	mg/L	10.9	50	50	67.3	67.7	113	114	90-110	1	10	M1

MATRIX SPIKE & MATRIX SP	IKE DUPL	_ICATE: 2784	686		2784687							
			MS	MSD								
		92461278007	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	297	50	50	338	338	83	82	90-110	0	10	M6
Fluoride	mg/L	0.11	2.5	2.5	2.6	2.6	100	101	90-110	1	10	
Sulfate	mg/L	16.5	50	50	71.6	71.8	110	111	90-110	0	10	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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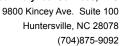


## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: MW-1 Collected: 01/16/20 16:24 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278001

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.0553 ± 0.252 (0.514) C:NA T:95%	pCi/L	01/31/20 12:11	13982-63-3	
Radium-228	EPA 904.0	0.581 ± 0.328 (0.593) C:85% T:92%	pCi/L	01/31/20 16:03	15262-20-1	





## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461278

Sample: MW-2 Lab ID: 92461278002 Collected: 01/17/20 09:54 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.727 ± 0.433 (0.412) C:NA T:85%	pCi/L	01/31/20 12:11	13982-63-3	
Radium-228	EPA 904.0	1.97 ± 0.610 (0.809) C:82% T:85%	pCi/L	01/31/20 16:03	15262-20-1	

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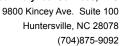


## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: MW-3 Collected: 01/16/20 14:20 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278003

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.784 ± 0.523 (0.649) C:NA T:85%	pCi/L	01/31/20 12:11	13982-63-3	
Radium-228	EPA 904.0	2.86 ± 0.767 (0.821) C:76% T:83%	pCi/L	01/31/20 16:03	15262-20-1	





## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: MW-4 Collected: 01/16/20 13:40 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278004

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.730 ± 0.680 (1.06) C:NA T:83%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.961 ± 0.440 (0.752) C:86% T:85%	pCi/L	01/31/20 16:03	15262-20-1	

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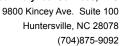


#### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Collected: 01/16/20 15:10 Received: 01/17/20 13:52 Matrix: Water Sample: MW-5 Lab ID: 92461278005

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.243 ± 0.278 (0.164) C:NA T:88%	pCi/L	01/31/20 12:11	13982-63-3	
Radium-228	EPA 904.0	-0.0922 ± 0.320 (0.759) C:87% T:86%	pCi/L	01/31/20 16:03	15262-20-1	





## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: MW-6 Collected: 01/16/20 11:06 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278006

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.225 ± 0.272 (0.738) C:NA T:91%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.265 ± 0.354 (0.757) C:83% T:84%	pCi/L	01/31/20 16:02	15262-20-1	

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## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461278

Sample: MW-7R Lab ID: 92461278007 Collected: 01/16/20 08:50 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.194 ± 0.458 (1.03) C:NA T:81%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.728 ± 0.394 (0.718) C:86% T:88%	pCi/L	01/31/20 16:02	15262-20-1	

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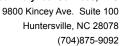


## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: MW-8 Collected: 01/17/20 09:22 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278008

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.798 ± 0.505 (0.570) C:NA T:82%	pCi/L	01/31/20 12:11	13982-63-3	
Radium-228	EPA 904.0	0.466 ± 0.347 (0.681) C:84% T:87%	pCi/L	01/31/20 16:03	15262-20-1	



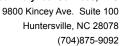


## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: BG-1 Collected: 01/15/20 12:20 Received: 01/17/20 13:52 Matrix: Water Lab ID: 92461278009

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.0682 ± 0.354 (0.819) C:NA T:85%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.429 ± 0.325 (0.645) C:83% T:93%	pCi/L	01/31/20 12:58	15262-20-1	





## **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461278

Sample: BG-2 Lab ID: 92461278010 Collected: 01/15/20 14:08 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.0668 ± 0.305 (0.492) C:NA T:80%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.540 ± 0.374 (0.729) C:84% T:85%	pCi/L	01/31/20 12:58	15262-20-1	

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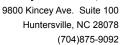


### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: LEACHATE Lab ID: 92461278011 Collected: 01/15/20 14:00 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.000 ± 0.258 (0.526) C:NA T:95%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.703 ± 0.358 (0.632) C:84% T:89%	pCi/L	01/31/20 12:58	15262-20-1	



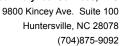


### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461278

Sample: EQBL Lab ID: 92461278012 Collected: 01/17/20 10:20 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.0596 ± 0.387 (0.840) C:NA T:84%	pCi/L	01/31/20 12:32	13982-63-3	
Radium-228	EPA 904.0	-0.160 ± 0.353 (0.843) C:76% T:90%	pCi/L	01/31/20 11:35	15262-20-1	



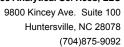


### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.: 92461278

Sample: DUP-1 Lab ID: 92461278013 Collected: 01/16/20 00:00 Received: 01/17/20 13:52 Matrix: Water

PWS:	Site ID:	Sample Type:				
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.0583 ± 0.266 (0.541) C:NA T:85%	pCi/L	01/31/20 11:59	13982-63-3	
Radium-228	EPA 904.0	0.422 ± 0.308 (0.598) C:83% T:87%	pCi/L	01/31/20 12:58	15262-20-1	





Project:

CHARAH

Pace Project No.:

92461278

QC Batch:

380406

Analysis Method:

EPA 904.0

QC Batch Method:

EPA 904.0

Analysis Description:

904.0 Radium 228

Associated Lab Samples:

92461278012

METHOD BLANK: 1844249

Matrix: Water

Associated Lab Samples:

92461278012

Parameter

Act ± Unc (MDC) Carr Trac

Units pCi/L Analyzed

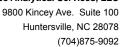
Qualifiers

Radium-228

0.0855 ± 0.309 (0.698) C:77% T:86%

01/31/20 11:32

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461278

QC Batch: 380404 Analysis Method: EPA 904.0

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278013

METHOD BLANK: 1844246 Matrix: Water

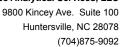
Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278013

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 0.0516 ± 0.306 (0.701) C:83% T:82%
 pCi/L
 01/31/20 11:36

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461278

QC Batch: 380403 Analysis Method: EPA 903.1

QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226

Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278013

METHOD BLANK: 1844245 Matrix: Water

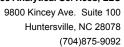
Associated Lab Samples: 92461278001, 92461278002, 92461278003, 92461278004, 92461278005, 92461278006, 92461278007,

92461278008, 92461278009, 92461278010, 92461278011, 92461278013

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-226
 0.0521 ± 0.339 (0.684) C:NA T:77%
 pCi/L
 01/31/20 11:47

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH Pace Project No.: 92461278

QC Batch: 380405

QC Batch Method: EPA 903.1 Analysis Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

Associated Lab Samples: 92461278012

METHOD BLANK: 1844248

Matrix: Water

Associated Lab Samples:

92461278012

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

Radium-226

 $0.0979 \pm 0.333$  (0.642) C:NA T:77%

pCi/L 01/31/20 12:32

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALIFIERS**

Project: CHARAH
Pace Project No.: 92461278

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **LABORATORIES**

PASI-A Pace Analytical Services - Asheville
PASI-PA Pace Analytical Services - Greensburg

### **ANALYTE QUALIFIERS**

Date: 02/03/2020 01:20 PM

D3 Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

D6 The precision between the sample and sample duplicate exceeded laboratory control limits.

E Analyte concentration exceeded the calibration range. The reported result is estimated.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

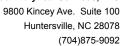
_ab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytica Batch		
2461278001	MW-1	EPA 3010A	520386	EPA 6010D	520404		
2461278002	MW-2	EPA 3010A	520386	EPA 6010D	520404		
2461278003	MW-3	EPA 3010A	520386	EPA 6010D	520404		
2461278004	MW-4	EPA 3010A	520386	EPA 6010D	520404		
2461278005	MW-5	EPA 3010A	520386	EPA 6010D	520404		
2461278006	MW-6	EPA 3010A	520386	EPA 6010D	520404		
2461278007	MW-7R	EPA 3010A	520386	EPA 6010D	520404		
2461278008	MW-8	EPA 3010A	520386	EPA 6010D	520404		
2461278009	BG-1	EPA 3010A	520386	EPA 6010D	520404		
2461278010	BG-2	EPA 3010A	520386	EPA 6010D	520404		
2461278011	LEACHATE	EPA 3010A	520386	EPA 6010D	520404		
2461278012	EQBL	EPA 3010A	520386	EPA 6010D	520404		
2461278013	DUP-1	EPA 3010A	520386	EPA 6010D	520404		
2461278001	MW-1	EPA 3010A	520387	EPA 6020B	520411		
2461278002	MW-2	EPA 3010A	520387	EPA 6020B	520411		
2461278003	MW-3	EPA 3010A	520387	EPA 6020B	520411		
2461278004	MW-4	EPA 3010A	520387	EPA 6020B	520411		
2461278005	MW-5	EPA 3010A	520387	EPA 6020B	520411		
2461278006	MW-6	EPA 3010A	520387	EPA 6020B	520411		
2461278007	MW-7R	EPA 3010A	520387	EPA 6020B	520411		
2461278008	MW-8	EPA 3010A	520387	EPA 6020B	520411		
2461278009	BG-1	EPA 3010A	520387	EPA 6020B	520411		
2461278010	BG-2	EPA 3010A	520387	EPA 6020B	520411		
2461278011	LEACHATE	EPA 3010A	520387	EPA 6020B	520411		
2461278012	EQBL	EPA 3010A	520387	EPA 6020B	520411		
2461278013	DUP-1	EPA 3010A	520647	EPA 6020B	520664		
2461278001	MW-1	EPA 7470A	520252	EPA 7470A	520294		
2461278002	MW-2	EPA 7470A	520252	EPA 7470A	520294		
2461278003	MW-3	EPA 7470A	520252	EPA 7470A	520294		
2461278004	MW-4	EPA 7470A	520252	EPA 7470A	520294		
2461278005	MW-5	EPA 7470A	520252	EPA 7470A	520294		
2461278006	MW-6	EPA 7470A	520252	EPA 7470A	520294		
2461278007	MW-7R	EPA 7470A	520252	EPA 7470A	520294		
2461278008	MW-8	EPA 7470A	520252	EPA 7470A	520294		
2461278009	BG-1	EPA 7470A	520252	EPA 7470A	520294		
2461278010	BG-2	EPA 7470A	520252	EPA 7470A	520294		
2461278011	LEACHATE	EPA 7470A	520252	EPA 7470A	520294		
2461278012	EQBL	EPA 7470A	520252	EPA 7470A	520294		
2461278013	DUP-1	EPA 7470A	520252	EPA 7470A	520294		
2461278001	MW-1	EPA 903.1	380403				
2461278002	MW-2	EPA 903.1	380403				
2461278003	MW-3	EPA 903.1	380403				
2461278004	MW-4	EPA 903.1	380403				
2461278005	MW-5	EPA 903.1	380403				
2461278006	MW-6	EPA 903.1	380403				
2461278007	MW-7R	EPA 903.1	380403				
2461278008	MW-8	EPA 903.1	380403				



Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

ab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytica Batch
2461278009	BG-1	EPA 903.1	380403		
2461278010	BG-2	EPA 903.1	380403		
2461278011	LEACHATE	EPA 903.1	380403		
2461278012	EQBL	EPA 903.1	380405		
2461278013	DUP-1	EPA 903.1	380403		
2461278001	MW-1	EPA 904.0	380404		
2461278002	MW-2	EPA 904.0	380404		
2461278003	MW-3	EPA 904.0	380404		
2461278004	MW-4	EPA 904.0	380404		
2461278005	MW-5	EPA 904.0	380404		
2461278006	MW-6	EPA 904.0	380404		
2461278007	MW-7R	EPA 904.0	380404		
2461278008	MW-8	EPA 904.0	380404		
2461278009	BG-1	EPA 904.0	380404		
2461278019	BG-1 BG-2	EPA 904.0	380404		
2461278010 2461278011	LEACHATE	EPA 904.0 EPA 904.0	380404		
2461278012	EQBL	EPA 904.0	380406		
2461278013	DUP-1	EPA 904.0	380404		
2461278001	MW-1	SM 2540C-2011	520656		
2461278002	MW-2	SM 2540C-2011	520658		
2461278003	MW-3	SM 2540C-2011	520656		
2461278004	MW-4	SM 2540C-2011	520656		
2461278005	MW-5	SM 2540C-2011	520656		
2461278006	MW-6	SM 2540C-2011	520656		
2461278007	MW-7R	SM 2540C-2011	520656		
2461278008	MW-8	SM 2540C-2011	520658		
2461278009	BG-1	SM 2540C-2011	520339		
2461278010	BG-2	SM 2540C-2011	520339		
2461278011	LEACHATE	SM 2540C-2011	520339		
2461278012	EQBL	SM 2540C-2011	520658		
2461278013	DUP-1	SM 2540C-2011	520656		
2461278001	MW-1	EPA 300.0 Rev 2.1 1993	520369		
2461278002	MW-2	EPA 300.0 Rev 2.1 1993	520369		
2461278003	MW-3	EPA 300.0 Rev 2.1 1993	520369		
2461278004	MW-4	EPA 300.0 Rev 2.1 1993	520369		
2461278005	MW-5	EPA 300.0 Rev 2.1 1993	520369		
2461278006	MW-6	EPA 300.0 Rev 2.1 1993	520369		
2461278007	MW-7R	EPA 300.0 Rev 2.1 1993	520369		
2461278008	MW-8	EPA 300.0 Rev 2.1 1993	520369		
2461278009	BG-1	EPA 300.0 Rev 2.1 1993	520369		
2461278019 2461278010	BG-2	EPA 300.0 Rev 2.1 1993 EPA 300.0 Rev 2.1 1993	520369		
470 I4100 IU	DG-2	LI A 300.0 NEV 4.1 1993	J20J03		





Project: CHARAH
Pace Project No.: 92461278

Date: 02/03/2020 01:20 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92461278012	EQBL	EPA 300.0 Rev 2.1 1993	520369		
92461278013	DUP-1	EPA 300.0 Rev 2.1 1993	520369		

# Pace Analytical\*

Project Manager SRF Review:

### Document Name:

### Sample Condition Upon Receipt(SCUR)

Document No.:

Document Revised: February 7, 2018

Page 1 of 2

Issuing Authority:

	F-CAR-CS-03	13-Rev.06	Pace Carolinas Quality	Office
aboratory receiving samples:				
Asheville Eden	Greenwood 🗌	Huntersville 🗹	Raleigh	Mechanics ville _
- Sample-Condition Client Name:	_	1	10# : 0046	4070
Upon Receipt	R	Project #:	J0# : 9246	12/8
ourier: Fed Ex DUPS Commercial Pace	USPS Other:	☐ Client	<b>[                                     </b>	
tody Seal Present? Yes No Sea	als Intact?	ONO		
		Da	te/Initials Person Examining (	Contents: MC 1-1
ermometer:	Subble Bags None	e □ Other  Wet □Blue □None	Blological Tissue ☐Yes ☐No ☐	
□ (R Gun ID: 92T058				
oler Temp (°C): 2,5,3,3 Correction Fact oler Temp Corrected (°C): 2,5,3,3,3,3		Temp sho	ould be above freezing to 6 nples out of temp criteria. Sam gun	
samples originate in a quarantine zone within the Ur ☐Yes ☐No	nited States: CA, NY, or SC		es originate from a foreign sou Hawaii and Puerto Rico)?	irce (internationally,
			Comments/Discrepa	
Chain of Custody Present?	Yes No	□N/A 1.		20 2 7
Samples Arrived within Hold Time?	⊟Yes □No	□N/A 2.		
Short Hold Time Analysis (<72 hr.)?	□Yes □No	□N/A 3.		2
Rush Turn Around Time Requested?	□Yes □No	□N/A 4.		
Sufficient Volume?	Yes 🔲 No	□n/A 5.		
Correct Containers Used?	□YES □No	□N/A 6.		
-Pace Containers Used?	□ Yes □ No	□N/A		
Containers Intact?	Yes No	□N/A⁄ 7.		
Dissolved analysis: Samples Field Flitered?	□Yes □No	□N/A 8.		
Sample Labels Match COC?	☑Yes □No	□N/A 9.		
-Includes Date/Time/ID/Analysis Matrix:			7	
Headspace in VOA Vials (>5-6mm)?	□Yes □No	☑N/A 10.	(g. 1).83	
Trip Blank Present?	□Yes □No	□N/A 11		-
Trip Blank Custody Seals Present?	☐Yes ☐No	□N/A		
MMENTS/SAMPLE DISCREPANCY			Floid Data Ba	auland2
	(*)		Field Data Re	quired? Yes No
		-		
NT NOTIFICATION/RESOLUTION		Lot ID of split	containers:	
rson contacted:		Date/Time:		, A . K

Date:



### Document Name:

## Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

> Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

W0#:92461278

PM: KLH1

ue Date: 01/24/20

CLIENT: 92-HDR

	tem#	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	_ BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG15-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)	BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AG0U-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)
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12			l			/	N					7				1									X	1			

Sample ID						
Sample 10	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #
			å			
			77355		***	

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.



### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

> Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

WO#:92461278

PM: KLH1

Due Date: 01/24/20

CLIENT: 92-HDR

1	Item# BP4U-125 mL Plastic Unpreserved (N/A) (Cl-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG15-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4C! (N/A)(CI-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)	BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AGOU-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)
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11	$\setminus$			$\rightarrow$	7	1	7	7		_	1		7	7	7	-	+	+	$\dashv$	+	,	-		$\langle \cdot \rangle$	+	+	+	
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	pH Adjustment Log for Preserved Samples														
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation edjusted	Amount of Preservative added	Lot #									
- 1															
			- B												

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.

# CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Pace Analytical

Samples ntact SAMPLE CONDITIONS ŏ Regulatory Agency Custody State / Location Received on Residual Chlorine (Y/N) Page: TEMP in C TIME Requested Analysis Filtered (Y/N 1730 0747/0203/0108 X Samuelle Radium 226/228 kevin.herring@pacelabs.com ACCEPTED BY / AFFILIATION SQI CI' E' 204 N/A Analyses Test Ofher Methanol 3 Na2S2O3 HOBN Pace Project Manager: Pace Profile #: 7672 HCI Invoice Information iloha Company Name: Address: ниоз ~ M 3 3 Pace Quote: 1250¢ 1322 Unpreserved TIME 3 3 5 2 2 17 10 \$ 红 to # OF CONTAINERS m N 10 10 13 1 5 10 SAMPLER NAME AND SIGNATURE C1/1/1 SAMPLE TEMP AT COLLECTION PRINT Name of SAMPLER: DATE TIME END DATE 2011 COLLECTED RELINQUISHED BY / AFFILIATION K291 0241/02/11/19 WG 1/20/1340 TIME HS50 02/11/ G 1/10/20 1510 MG 14/20 0850 5 HAZO OLFINO 0551 05/21/10/N NT 6 1/15/20 1408 6 Nutro 1106 NG 1/15/20 1400 N/6 1/17/2/1020 START 1/16/20 h Required Project Information: Report To: Robert Mull DATE Charah らずる 0 SAMPLE TYPE (G=GRAB C=COMP) Purchase Order #: MATRIX CODE (see valid codes to left) 冯 Project Name: Project #: Section B Copy To: CODE WY WW SP P WW OL OL TS MATRIX
Drinking Water
Waster
Waste Water
Product
Soil/Soild
Oil
Wipe
An
Other
Tissue Leachart MW-SI MW-Y Eagl MW-6 MW-8 136-7 MM-3 136-1 ADDITIONAL COMMENTS One Character per box. (A-Z, 0-9 / , -) Sample Ids must be unique NW-7 NS-MM Fax SAMPLE ID Address: 440 S. Church St Suite 900, Charlotte, NC 28202 Required Client Information: (706)266-0551 Requested Due Date: HDR Company: Phone: n # M3TI 2 4 2 9 9 12 ~ 8 6 7

Page 58 of 59

(N/Y)

(N/A)

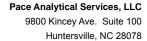
(N/Y)

20

DATE Signed:

SIGNATURE of SAMPLER:

Cooler belses



(704)875-9092



February 10, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH

Pace Project No.: 92461280

### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on January 17, 2020. The results relate only to the samples included in this report. Results reported herein conform to the most current, applicable TNI/NELAC standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Herring

kevin.herring@pacelabs.com

1(704)875-9092

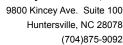
Kein Herry

**HORIZON Database Administrator** 

Enclosures

cc: Mike Plummer, HDR Jacob Ruffing







### **CERTIFICATIONS**

Project: CHARAH
Pace Project No.: 92461280

### Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

ANAB DOD-ELAP Rad Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

**Arkansas Certification** 

California Certification #: 04222CA Colorado Certification #: PA01547 Connecticut Certification #: PH-0694

Delaware Certification EPA Region 4 DW Rad

Florida/TNI Certification #: E87683 Georgia Certification #: C040 Florida: Cert E871149 SEKS WET

Guam Certification Hawaii Certification Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: KY90133 KY WW Permit #: KY0098221 KY WW Permit #: KY0000221

Louisiana DHH/TNI Certification #: LA180012 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: 2017020 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457 Michigan/PADEP Certification #: 9991 Montana Certification #: Cert0082 Nebraska Certification #: NE-OS-29-14 Nevada Certification #: PA014572018-1 New Hampshire/TNI Certification #: 297617 New Jersey/TNI Certification #: PA051 New Mexico Certification #: PA01457

New Mexico Certification #: PA01457 New York/TNI Certification #: 10888 North Carolina Certification #: 42706 North Dakota Certification #: R-190 Ohio EPA Rad Approval: #41249

Missouri Certification #: 235

Oregon/TNI Certification #: PA200002-010 Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification
Tennessee Certification #: 02867

Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C

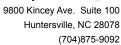
Wisconsin Approve List for Rad Wyoming Certification #: 8TMS-L

### Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222





### **SAMPLE SUMMARY**

Project: CHARAH
Pace Project No.: 92461280

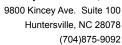
Lab ID	Sample ID	Matrix	Date Collected	Date Received	
92461280001	SW-1	Water	01/16/20 09:30	01/17/20 13:52	
92461280002	SW-2	Water	01/16/20 10:20	01/17/20 13:52	



### **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92461280

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92461280001	SW-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A
92461280002	SW-2	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	CJL	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	3	PASI-A





### **SUMMARY OF DETECTION**

Project: CHARAH
Pace Project No.: 92461280

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92461280001	SW-1					
EPA 6010D	Barium	129	ug/L	5.0	01/24/20 20:49	
EPA 6010D	Calcium	6460	ug/L	100	01/24/20 20:49	
EPA 6010D	Copper	5.8	ug/L	5.0	01/24/20 20:49	
EPA 6010D	Vanadium	13.0	ug/L	5.0	01/24/20 20:49	
EPA 6010D	Zinc	16.2	ug/L	10.0	01/24/20 20:49	
EPA 903.1	Radium-226	-0.0634 ± 0.412 (0.894) C:NA T:85%	pCi/L		01/31/20 11:47	
EPA 904.0	Radium-228	0.257 ± 0.434 (0.945) C:78% T:71%	pCi/L		01/31/20 11:36	
Total Radium Calculation	Total Radium	0.257 ± 0.846 (1.84)	pCi/L		02/03/20 10:38	
SM 2540C-2011	Total Dissolved Solids	` 297	mg/L	25.0	01/22/20 14:46	
EPA 300.0 Rev 2.1 1993	Chloride	20.2	mg/L	1.0	01/22/20 11:32	
EPA 300.0 Rev 2.1 1993	Fluoride	0.14	mg/L	0.10	01/22/20 11:32	
EPA 300.0 Rev 2.1 1993	Sulfate	46.2	mg/L	1.0	01/22/20 11:32	
2461280002	SW-2					
EPA 6010D	Barium	117	ug/L	5.0	01/24/20 20:52	
EPA 6010D	Calcium	6590	ug/L	100	01/24/20 20:52	
EPA 6010D	Vanadium	10.4	ug/L	5.0	01/24/20 20:52	
EPA 6010D	Zinc	15.6	ug/L	10.0	01/24/20 20:52	
EPA 903.1	Radium-226	0.0617 ± 0.320 (0.664) C:NA T:91%	pCi/L		01/31/20 11:47	
EPA 904.0	Radium-228	-0.991 ± 0.743 (1.93) C:75% T:32%	pCi/L		01/31/20 11:36	
Total Radium Calculation	Total Radium	0.0617 ± 1.06 (2.59)	pCi/L		02/03/20 10:38	
SM 2540C-2011	Total Dissolved Solids	253	mg/L	25.0	01/22/20 14:46	
EPA 300.0 Rev 2.1 1993	Chloride	40.0	mg/L	1.0	01/22/20 11:47	
EPA 300.0 Rev 2.1 1993	Sulfate	6.0	mg/L	1.0	01/22/20 11:47	



### **ANALYTICAL RESULTS**

Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

Sample: SW-1	Lab ID: 9246	61280001	Collected: 01/16/2	20 09:30	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	010D Preparation Me	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:49	7440-38-2	
Barium	129	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:49	7440-41-7	
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:49	7440-43-9	
Calcium	6460	ug/L	100	1	01/21/20 01:33	01/24/20 20:49	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-48-4	
Copper	5.8	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:49	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-22-4	
Vanadium	13.0	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:49	7440-62-2	
Zinc	16.2	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:49	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	thod: El	PA 3010A			
Boron	ND	ug/L	250	10	01/22/20 01:55	01/28/20 16:50	7440-42-8	D3
Lithium	ND	ug/L	25.0	10	01/22/20 01:55	01/28/20 16:50	7439-93-2	D3
Thallium	ND	ug/L	1.0	10	01/22/20 01:55	01/28/20 16:50	7440-28-0	D3
7470 Mercury	Analytical Meth	od: EPA 74	170A Preparation Me	thod: El	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 16:01	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	40C-2011					
Total Dissolved Solids	297	mg/L	25.0	1		01/22/20 14:46		
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	00.0 Rev 2.1 1993					
Chloride	20.2	mg/L	1.0	1		01/22/20 11:32	16887-00-6	
Fluoride	0.14	mg/L	0.10	1		01/22/20 11:32	16984-48-8	
Sulfate	46.2	mg/L	1.0	1		01/22/20 11:32		



### **ANALYTICAL RESULTS**

Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

Sample: SW-2	Lab ID: 9246	1280002	Collected: 01/16/	20 10:20	Received: 01	/17/20 13:52 I	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 60	10D Preparation M	ethod: E	PA 3010A			
Antimony	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-36-0	
Arsenic	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:52	7440-38-2	
Barium	117	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-39-3	
Beryllium	ND	ug/L	1.0	1	01/21/20 01:33			
Cadmium	ND	ug/L	1.0	1	01/21/20 01:33	01/24/20 20:52	7440-43-9	
Calcium	6590	ug/L	100	1	01/21/20 01:33	01/24/20 20:52	7440-70-2	
Chromium	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	2 7440-47-3	
Cobalt	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-48-4	
Copper	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-50-8	
Lead	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7439-98-7	
Nickel	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-02-0	
Selenium	ND	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:52	7782-49-2	
Silver	ND	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-22-4	
Vanadium	10.4	ug/L	5.0	1	01/21/20 01:33	01/24/20 20:52	7440-62-2	
Zinc	15.6	ug/L	10.0	1	01/21/20 01:33	01/24/20 20:52	7440-66-6	
6020 MET ICPMS	Analytical Meth	od: EPA 60	20B Preparation Me	ethod: E	PA 3010A			
Boron	ND	ug/L	250	10	01/22/20 01:55	01/28/20 16:54	7440-42-8	D3
Lithium	ND	ug/L	25.0	10	01/22/20 01:55	01/28/20 16:54	7439-93-2	D3
Thallium	ND	ug/L	1.0	10	01/22/20 01:55	01/28/20 16:54	7440-28-0	D3
7470 Mercury	Analytical Meth	od: EPA 74	70A Preparation Me	ethod: E	PA 7470A			
Mercury	ND	ug/L	0.20	1	01/20/20 11:23	01/21/20 16:03	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	od: SM 254	10C-2011					
Total Dissolved Solids	253	mg/L	25.0	1		01/22/20 14:46	3	
300.0 IC Anions 28 Days	Analytical Meth	od: EPA 30	0.0 Rev 2.1 1993					
Chloride	40.0	mg/L	1.0	1		01/22/20 11:47	16887-00-6	
Fluoride	ND	mg/L	0.10	1		01/22/20 11:47		
Sulfate	6.0	mg/L	1.0	1		01/22/20 11:47		



Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

QC Batch: 520252 Analysis Method: EPA 7470A

QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury

Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 2783833 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

Blank Reporting
Parameter Units Result Limit Analyzed Qualifiers

Mercury ug/L ND 0.20 01/21/20 15:16

LABORATORY CONTROL SAMPLE: 2783834

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers Mercury ug/L 2.5 2.6 104 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2783836 2783835 MS MSD MSD MS 92461278001 Spike Spike MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual ND 2.5 2.3 2.6 90 75-125 25 Mercury ug/L 2.5 101 11

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

QC Batch: 520386 Analysis Method: EPA 6010D
QC Batch Method: EPA 3010A Analysis Description: 6010 MET

Associated Lab Samples: 92461280001, 92461280002

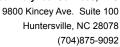
METHOD BLANK: 2784758 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND -	5.0	01/22/20 06:02	·
Arsenic	ug/L	ND ND	10.0	01/22/20 06:02	
Barium	ug/L	ND	5.0	01/22/20 06:02	
Beryllium	ug/L	ND	1.0	01/22/20 06:02	
Cadmium	ug/L	ND	1.0	01/22/20 06:02	
Calcium	ug/L	ND	100	01/22/20 06:02	
Chromium	ug/L	ND	5.0	01/22/20 06:02	
Cobalt	ug/L	ND	5.0	01/22/20 06:02	
Copper	ug/L	ND	5.0	01/22/20 06:02	
Lead	ug/L	ND	5.0	01/22/20 06:02	
Molybdenum	ug/L	ND	5.0	01/22/20 06:02	
Nickel	ug/L	ND	5.0	01/22/20 06:02	
Selenium	ug/L	ND	10.0	01/22/20 06:02	
Silver	ug/L	ND	5.0	01/22/20 06:02	
Vanadium	ug/L	ND	5.0	01/22/20 06:02	
Zinc	ug/L	ND	10.0	01/22/20 06:02	

LABORATORY CONTROL SAMPLE:	2784759					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	ug/L	500	500	100	80-120	
Arsenic	ug/L	500	478	96	80-120	
Barium	ug/L	500	495	99	80-120	
Beryllium	ug/L	500	494	99	80-120	
Cadmium	ug/L	500	492	98	80-120	
Calcium	ug/L	5000	4950	99	80-120	
Chromium	ug/L	500	496	99	80-120	
Cobalt	ug/L	500	501	100	80-120	
Copper	ug/L	500	504	101	80-120	
Lead	ug/L	500	500	100	80-120	
Molybdenum	ug/L	500	480	96	80-120	
Nickel	ug/L	500	497	99	80-120	
Selenium	ug/L	500	468	94	80-120	
Silver	ug/L	250	243	97	80-120	
Vanadium	ug/L	500	493	99	80-120	
Zinc	ug/L	500	478	96	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

MATRIX SPIKE & MATRIX	SPIKE DUPL	ICATE: 2784	760		2784761							
			MS	MSD								
		92460380001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	ug/L	ND	500	500	515	541	103	108	75-125	5	20	
Arsenic	ug/L	ND	500	500	501	525	99	104	75-125	5	20	
Barium	ug/L	52.7	500	500	551	574	100	104	75-125	4	20	
Beryllium	ug/L	ND	500	500	506	530	101	106	75-125	5	20	
Cadmium	ug/L	ND	500	500	509	537	102	107	75-125	5	20	
Calcium	ug/L	18400	5000	5000	22800	23900	88	109	75-125	4	20	
Chromium	ug/L	ND	500	500	507	531	101	106	75-125	5	20	
Cobalt	ug/L	ND	500	500	505	527	101	105	75-125	4	20	
Copper	ug/L	ND	500	500	516	539	102	107	75-125	5	20	
_ead	ug/L	ND	500	500	511	532	102	106	75-125	4	20	
Molybdenum	ug/L	ND	500	500	482	499	96	100	75-125	3	20	
Nickel	ug/L	ND	500	500	503	526	100	105	75-125	4	20	
Selenium	ug/L	ND	500	500	511	560	102	112	75-125	9	20	
Silver	ug/L	ND	250	250	252	266	101	106	75-125	5	20	
/anadium	ug/L	ND	500	500	506	531	101	106	75-125	5	20	
Zinc	ug/L	20.8	500	500	513	541	98	104	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

QC Batch: 520647 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET

Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 2785829 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	ND ND	25.0	01/28/20 16:30	
Lithium	ug/L	ND	2.5	01/28/20 16:30	
Thallium	ug/L	ND	0.10	01/28/20 16:30	

LABORATORY CONTROL SAMPLE:	2785830					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Boron	ug/L		52.8	106	80-120	
Lithium	ug/L	50	52.5	105	80-120	
Thallium	ug/L	10	10.7	107	80-120	

MATRIX SPIKE & MATRIX S	PIKE DUPLI	CATE: 2785	831		2785832							
			MS	MSD								
		92461124003	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	ND	50	50	65.1	65.0	85	85	75-125	0	20	E
Lithium	ug/L	6.5	50	50	51.5	51.5	90	90	75-125	0	20	E
Thallium	ug/L	ND	10	10	11.3	11.2	113	112	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461280

QC Batch: 520656 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 2785840 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

Blank Reporting
Parameter Units Result Limit Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 01/22/20 14:43

LABORATORY CONTROL SAMPLE: 2785841

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers **Total Dissolved Solids** mg/L 250 250 100 90-110

SAMPLE DUPLICATE: 2785842

Parameter Units Parameter Units Parameter Units Parameter Units Parameter Parameter Units Parameter Parame

SAMPLE DUPLICATE: 2785843

Date: 02/10/2020 04:33 PM

92460490079 Dup Max RPD RPD Parameter Units Result Result Qualifiers 1040 **Total Dissolved Solids** mg/L 930 11 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

QC Batch: 520369 Analysis Method: EPA 300.0 Rev 2.1 1993

QC Batch Method: EPA 300.0 Rev 2.1 1993 Analysis Description: 300.0 IC Anions

Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 2784682 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

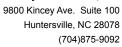
Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND ND	1.0	01/21/20 15:30	
Fluoride	mg/L	ND	0.10	01/21/20 15:30	
Sulfate	mg/L	ND	1.0	01/21/20 15:30	

LABORATORY CONTROL SAMPLE:	2784683					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Chloride	mg/L	50	50.9	102	90-110	
Fluoride	mg/L	2.5	2.4	97	90-110	
Sulfate	ma/L	50	52.8	106	90-110	

MATRIX SPIKE & MATRIX SP	IKE DUPLIC	CATE: 2784	684	2784685								
			MS	MSD								
	9	2460490077	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	24.9	50	50	79.5	79.8	109	110	90-110	0	10	
Fluoride	mg/L	0.052J	2.5	2.5	2.5	2.6	98	100	90-110	2	10	
Sulfate	mg/L	10.9	50	50	67.3	67.7	113	114	90-110	1	10	M1

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2784686 2784687												
			MS	MSD								
		92461278007	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	297	50	50	338	338	83	82	90-110	0	10	M6
Fluoride	mg/L	0.11	2.5	2.5	2.6	2.6	100	101	90-110	1	10	
Sulfate	mg/L	16.5	50	50	71.6	71.8	110	111	90-110	0	10	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461280

Sample: SW-1 PWS:	Lab ID: 92461 Site ID:	280001 Collected: 01/16/20 09:30 Sample Type:	Received:	01/17/20 13:52	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	-0.0634 ± 0.412 (0.894) C:NA T:85%	pCi/L	01/31/20 11:47	7 13982-63-3	
Radium-228	EPA 904.0	0.257 ± 0.434 (0.945) C:78% T:71%	pCi/L	01/31/20 11:36	5 15262-20-1	
Total Radium	Total Radium Calculation	0.257 ± 0.846 (1.84)	pCi/L	02/03/20 10:38	3 7440-14-4	

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### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92461280

Sample: SW-2 PWS:	<b>Lab ID: 924612</b> Site ID:	80002 Collected: 01/16/20 10:20 Sample Type:	Received:	01/17/20 13:52	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	0.0617 ± 0.320 (0.664) C:NA T:91%	pCi/L	01/31/20 11:47	7 13982-63-3	
Radium-228	EPA 904.0	-0.991 ± 0.743 (1.93) C:75% T:32%	pCi/L	01/31/20 11:36	5 15262-20-1	
Total Radium	Total Radium Calculation	0.0617 ± 1.06 (2.59)	pCi/L	02/03/20 10:38	8 7440-14-4	



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### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH Pace Project No.:

92461280

QC Batch: 380403 Analysis Method:

EPA 903.1

Analysis Description:

903.1 Radium-226

EPA 903.1 Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 1844245

Matrix: Water

Associated Lab Samples:

QC Batch Method:

92461280001, 92461280002

Parameter

Act ± Unc (MDC) Carr Trac

Units pCi/L Analyzed

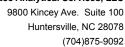
Qualifiers

Radium-226

 $0.0521 \pm 0.339$  (0.684) C:NA T:77%

01/31/20 11:47

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





EPA 904.0

Project: CHARAH
Pace Project No.: 92461280

QC Batch: 380404 Analysis Method:

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Associated Lab Samples: 92461280001, 92461280002

METHOD BLANK: 1844246 Matrix: Water

Associated Lab Samples: 92461280001, 92461280002

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 0.0516 ± 0.306 (0.701) C:83% T:82%
 pCi/L
 01/31/20 11:36

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALIFIERS**

Project: CHARAH
Pace Project No.: 92461280

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **LABORATORIES**

PASI-A Pace Analytical Services - Asheville
PASI-PA Pace Analytical Services - Greensburg

### **ANALYTE QUALIFIERS**

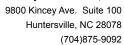
Date: 02/10/2020 04:33 PM

D3 Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.

E Analyte concentration exceeded the calibration range. The reported result is estimated.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.





Project: CHARAH
Pace Project No.: 92461280

Date: 02/10/2020 04:33 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch			
92461280001	<b>SW-1</b> EPA 3010A		520386	EPA 6010D	520404			
92461280002	SW-2	EPA 3010A	520386	EPA 6010D	520404			
92461280001	SW-1	EPA 3010A	520647	EPA 6020B	520664			
92461280002	SW-2	EPA 3010A	520647	EPA 6020B	520664			
92461280001	SW-1	EPA 7470A	520252	EPA 7470A	520294			
92461280002	SW-2	EPA 7470A	520252	EPA 7470A	520294			
92461280001	SW-1	EPA 903.1	380403					
92461280002	SW-2	EPA 903.1	380403					
92461280001	SW-1	EPA 904.0	380404					
92461280002	SW-2	EPA 904.0	380404					
92461280001	SW-1	Total Radium Calculation	382104					
92461280002	SW-2	Total Radium Calculation	382104					
92461280001	SW-1	SM 2540C-2011	520656					
92461280002	SW-2	SM 2540C-2011	520656					
92461280001	SW-1	EPA 300.0 Rev 2.1 1993	520369					
92461280002	SW-2	EPA 300.0 Rev 2.1 1993	520369					

	Relinquished by/Company: (Signature)  Relinquished by/Company: (Signature)	To sevent feront	6000: 6,7:	Customer Remarks / Special Conditions / Possible Hazards:		2m-C W1	-	Customer Sample ID Matrix *	* Matrix Codes (Insert in Matrix box below): Drinkir Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Ai	appropriate [ ] Return [ ] 2 Day	Collected By (signature):  Turnaround Date Required:	101	Phone: 701-46-0851 Site/Facility ID #:	ha	Customer Project Name/Number:	obert	Address: Huc > Color of to 18700	HDR	ace Analytical	CHAIN-
incurred by company, (biginatile)	Date/Time: Received by/kompany: (Signature)	Radchem sample(s) screened (<500 cpm): Y N	Packing Material Used:	zards: Type of Ice Used: Web Blue Dry None		S //020 020	1/10/10 0930	Comp / Collected (or Composite End Cl Ctns Grab Composite Start) Composite End Cl Ctns	Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)	Next Day   Next Day	Immediately	#: DW PWS ID #: DW Location Code:	#: Compliance Monitoring?	Juste: County/City: Ime_Lone Collected:	Grant (G):	Cita Collegaio 1.6. 7.7.1		Billing Information:	Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevent fields	
Template: Prelogin:	Date/Time: MTJL LA  (-1/1-30   352   Table #:  Acctnum:	Samples received via:	0	SHORT HOLDS PRESENT (<72 hours): Y N3)N/A		×××××××××××××××××××××××××××××××××××××××	×		T D Vad	F. 504	<i>h</i>	47.	0		(C) ammonium hydroxide, (D) TSP, (U) Unpreserved, (O) Other  Analyses  Analyses	** Preservative Types: (1) nitric acid, (2) sulfuric acid, (3) hydrochloric acid, (4) sodium hydroxide, (5) zinc acetate, (6) methanol, (7) sodium bisulfate, (8) sodium thiosulfate, (9) hexane, (A) ascorbic acid (B) anmonium sulfate	Container Preservative Type ** 9246126	ALL SHADED AF	LAB USE ONLY- Affix Workorder/L MTJ MO	
Trip Blank Received: Y (V) NA HCL MeOH TSP Other		Cooler 1 Temp Upon Receipt: Cooler 1 Therm Corr. Factor: O	Temp Blank Reggived: N NA Therm ID#:	Lab Sample Temperature Info:				LAB USE ONLX: Lab Sample # / Comments:		Nobe Regulated Soils Y Nobe Samples in Holding Time Confine Residual Chlorine Present Y N Nobe Sample pH Acceptable CYN NA PH Strips:	es Received on Ice Headspace Acceptable	Bottles Intact Correct Bottles Sufficient Volume YN NA	Custody Seals Present/Intact Y MNA Custody Signatures Present Y N NA Collector Signature Present Y N NA	Lab Sample Receipt Checklist:	lah Profile / ino:	cid, (4) sodium hydroxide, (5) zinc acetate,  A) ascorbic acid. (B) ammonium sulfate	80	Pag	WO#: 92461280	



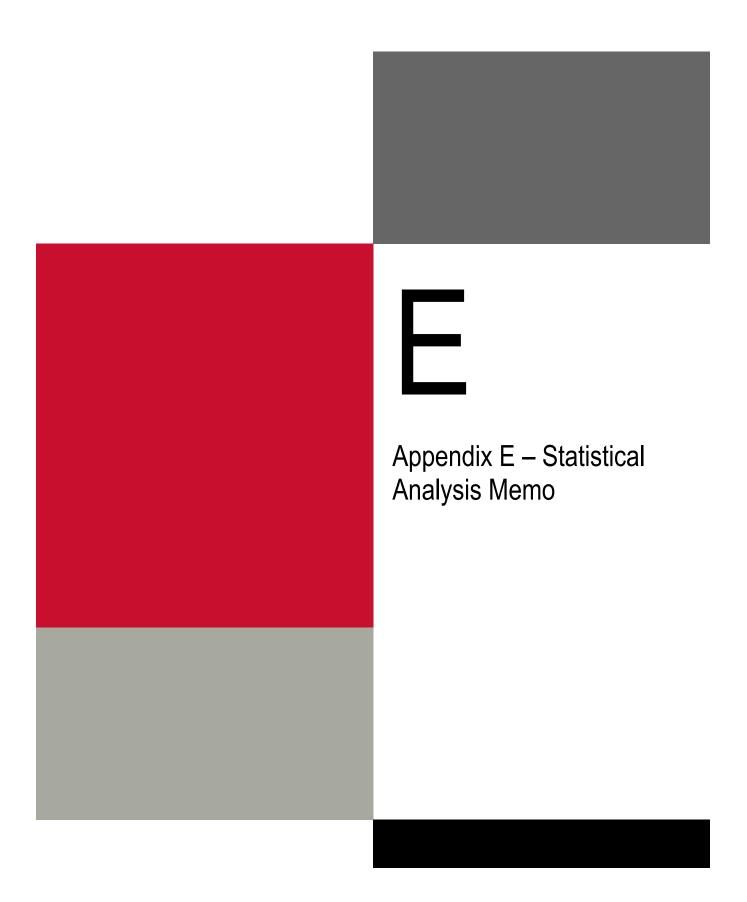


Appendix D – Electronic Data Deliverables (CD-ROM only)



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# Summary of Statistical Analysis and Evaluation for SSIs

Background and Downgradient Wells Charah, LLC

Moncure, Chatham County, North Carolina April 24, 2020



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## 1 Introduction

This report summarizes the statistical analysis of background and downgradient groundwater quality for the Charah, LLC Brickhaven No. Mine Tract 'A' Site (Brickhaven Mine) and operating under the Facility Permit #1910-STRUC-2015 as a municipal solid waste land fill (MSWLF). Background groundwater quality was evaluated such that statistically-derived background concentrations could be established for the site. Groundwater quality in downgradient wells was then compared to background concentrations to determine if a statistically significant increase (SSI) over background has occurred, as required by Section .1600 rules of the North Carolina Solid Waste Management Rules 15A NCAC 13B .1600. Sampling results used to establish background threshold values (BTVs) were obtained during twenty monitoring events performed between October 2015 and January 2020. Downgradient sampling results from the detection monitoring round in January 2020 were used to evaluate for SSIs. The current Brickhaven Mine groundwater monitoring network is presented in **Table 1**.

Software packages ProUCL [1], NCSS [2], R [3], and SPSS [4] were used in the production of the statistics. ProUCL is offered by the USEPA, R is a free software environment, NCSS and SPSS are licensed software packages.

**Table 1: Brickhaven Mine Monitoring Well Network** 

Background	Downgradient
BG-1	MW-1
BG-2	MW-2
	MW-3
	MW-4
	MW-5
	MW-6
	MW-7R
	MW-8

Groundwater samples collected as part of the 15A NCAC 13B .1600 monitoring program were analyzed for EPA Appendix III and Appendix IV constituents, and Appendix I metals. Only non-filtered sample results were utilized for the statistical analysis of monitored constituents. A summary of constituents included in the data analysis is provided in **Table 2**.



**Table 2: Brickhaven Mine Monitored Constituents** 

Appendix I Metals	Appendix III Constituents	Appendix IV Constituents
Copper	Boron	Antimony
Nickel	Calcium	Arsenic
Silver	Chloride	Barium
Vanadium	Fluoride	Beryllium
Zinc	pH (Field)	Cadmium
	Sulfate	Chromium
	Total Dissolved Solids	Cobalt
		Fluoride
		Lead
		Lithium
		Mercury
		Molybdenum
		Radium-226
		Radium-228
		Selenium
		Thallium
		Total Radium



## 2 Statistical Analysis

The background sample size (i.e., quantity of qualifying samples) was evaluated per constituent. Descriptive statistics were calculated for the background data set including non-detect (ND) values and excluding ND values. When NDs were included in the data set, the method detection limit (MDL) was substituted as the ND value for simple descriptive statistics. The analysis was performed with NDs removed to better understand the central tendency and range of the detected values. A summary of the descriptive statistics for the background data set is provided in **Table 3**. Note that for the trend analyses in Section 2.3 and for the establishment of statistically-derived background concentration levels in Section 4, imputation methods using the maximum likelihood method (MLE) for NDs, regression on order statistics (ROS) or Kaplan-Meier (KM) methods, where appropriate, were used.

Following the calculation of descriptive statistics, the statistical analysis for the background data set was performed to evaluate for outliers, data distributions, trends, and spatial variability between the background wells for Appendix I metals, Appendix III and IV constituents, where data quantity and quality permit. Spatial variability between the background wells was evaluated for each consistent to assess whether the data can be pooled for establishing background concentrations. A total of twenty-five samples (twenty monitoring events from well BG-1 and five monitoring events from well BG-2) were included for the descriptive analysis of the background monitoring well results for the monitored constituents. The first monitoring round sampled in August 2015 was not included in the analysis as it was deemed not representative of the other monitoring events as the samples were tested at a different lab. The January 2020 samples for boron were removed from the analysis as they were diluted and could not be properly detected.

For downgradient monitoring results, the data analysis included the calculation of descriptive statistics for Appendix I metals, Appendix III and IV constituents (for the data sets including and excluding ND values), followed by an evaluation of outliers and trends. A total of nineteen monitoring events performed between November 2015 and January 2020 were included for the descriptive analysis of the downgradient monitoring well results for the monitored constituents. A summary of the descriptive statistics for each downgradient well is provided in **Appendix E.A**.



Table 3: Summary of Background Data Set Descriptive Statistics (BG-1 and BG-2)

0	1114	Sample	No. of	With NDs=MDLs Included				With NDs Re	emoved		
Constituent	Unit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				ı	Appendix I M	letals					
Copper	ug/L	25	24	2.10	11.4	2.78	2.50	11.4	11.4	11.4	11.4
Nickel	ug/L	25	25	0.900	2.50	2.12	2.50			-	
Silver	ug/L	25	25	2.50	2.50	2.50	2.50				
Vanadium	ug/L	25	17	1.30	8.30	3.41	2.50	5.10	8.30	5.80	5.40
Zinc	ug/L	25	22	3.90	34.2	6.51	5.00	10.0	34.2	19.4	14.0
				Арр	endix III Con	stituents					
Boron	ug/L	24	15	0.570	7.50	3.74	2.60	5.50	7.50	6.46	6.10
Calcium	ug/L	25	0	20,700	119,000	44,632	29,500	20,700	119,000	44,632	29,500
Chloride	mg/L	25	0	187	311	256	251	187	311	256	251
Fluoride	mg/L	25	0	0.100	0.210	0.146	0.140	0.100	0.210	0.146	0.140
pH (Field)	S.U.	23	0	6.10	7.01	6.56	6.52	6.10	7.01	6.56	6.52
Sulfate	mg/L	25	0	15.1	135	34.8	19.6	15.1	135	34.8	19.6
Total Dissolved Solids	mg/L	24	0	546	1,120	690	647	546	1,120	690	647
				Арр	endix IV Cor	stituents					
Antimony	ug/L	25	25	3.00	3.90	3.66	3.80			-	
Arsenic	ug/L	25	25	2.50	5.00	4.23	4.70				
Barium	ug/L	25	0	93.1	443	291	327	93.1	443	291	327
Beryllium	ug/L	25	25	0.200	0.500	0.428	0.500				
Cadmium	ug/L	25	25	0.400	0.500	0.476	0.500				
Chromium	ug/L	25	25	1.00	2.50	2.14	2.50				
Cobalt	ug/L	25	25	1.10	2.50	2.16	2.50				
Fluoride	mg/L	25	0	0.100	0.210	0.146	0.140	0.100	0.210	0.146	0.140
Lead	ug/L	25	24	1.60	14.1	2.78	2.50	14.1	14.1	14.1	14.1
Lithium	ug/L	25	2	0.420	36.8	17.8	17.1	11.9	36.8	19.2	17.8
Mercury	ug/L	25	25	0.100	0.100	0.100	0.100		-	-	
Molybdenum	ug/L	25	20	0.900	13.6	3.97	2.50	6.80	13.6	10.5	10.8
Radium-226	pCi/L	22	0	-0.206	1.22	0.341	0.340				
Radium-228	pCi/L	22	0	0.0108	1.29	0.596	0.554		-	-	-
Selenium	ug/L	25	25	4.70	5.00	4.93	5.00				
Thallium	ug/L	25	24	0.0200	13.7	1.78	0.0600	13.7	13.7	13.7	13.7
Total Radium	pCi/L	22	0	0.271	2.09	0.950	0.915		-	-	

- 1. ND = not detected above the laboratory method detection limit.
- 2. MDL = method detection limit.
- "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



## 2.1 Outliers

Outliers are values that are not representative of the population from which they are sampled. The background and downgradient data sets were screened for outliers using Dixon's and Rosner's outlier tests. Dixon's outlier test is suitable for data sets containing less than twenty-five samples, while Rosner's test is suitable for data sets with twenty-five or more samples. The outlier test was conducted using a significance of one percent. For constituents that had NDs, the NDs were removed prior to testing for outliers.

## 2.1.1 Background

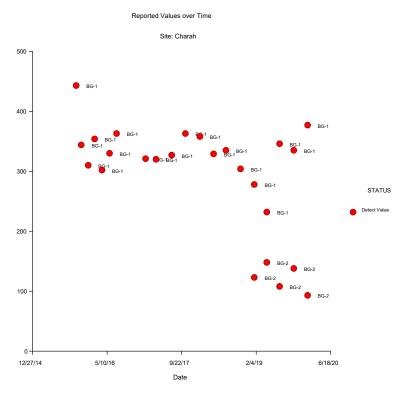
Statistical outliers were identified in the background data set evaluated for three Appendix III constituents (calcium, sulfate, and total dissolved solids) and one Appendix IV constituent (barium). The constituent concentrations identified as statistical outliers were sampled from the newly installed background well BG-2, except for total dissolved solids, and are listed in **Table 4**.

Table 4: Dixon's Outlier Test Results - Background

Well	Constituent	Constituent Type	Potential Outlier Value	Units	Sampling Event	Sample Date
BG-1	Total Dissolved Solids	Appendix III	2,630	mg/L	R10	4/3/2017
			89600	ug/L	R17	1/22/2019
			119,000	ug/L	R18	4/16/2019
	Calcium	Appendix III	111000.0	ug/L	R19	7/11/2019
			109000.0	ug/L	R20	10/14/2019
			106000.0	ug/L	R21	1/15/2020
	BG-2 Sulfate	Appendix III	65	mg/L	R17	1/22/2019
			79.8	mg/L	R18	4/16/2019
BG-2			102	mg/L	R19	7/11/2019
			135	mg/L	R20	10/14/2019
			102.000	mg/L	R21	1/15/2020
			123	ug/L	R17	1/22/2019
			148	ug/L	R18	4/16/2019
	Barium	Appendix IV	108.0	ug/L	R19	7/11/2019
			138.00	ug/L	R20	10/14/2019
			93.10	ug/L	R21	1/15/2020

A visual inspection of concentration vs. time scatter plots for total dissolved solids (**Figure 1**), calcium (**Figure 2**), sulfate (**Figure 3**), and barium (**Figure 4**: Barium Concentrations (ug/L) vs.





Time presence of the potential outliers. The statistical outliers were investigated as possible data entry or measurement errors. The value for total dissolved solids was considered an outlier and removed from the analysis. The remaining values were all within one order of magnitude of other observations and deemed correct. Although the elevated values appears as a statistical outliers, it is within a reasonable range of the remaining concentrations throughout the monitoring period and should not be removed from the data set at this time for purposes of determining background concentrations. Given the variable nature of groundwater samples, the small sample sizes and that it is common for groundwater quality samples to have very low or very high concentrations over time, statistical outliers are expected but do not necessarily signify that the outliers are from different distributions. As additional background samples are collected over time, the variability in concentrations will be better understood. Outlier test results may change and earlier observations thought to be outliers may no longer be outliers.



Figure 1: Total Dissolved Solids Concentrations (mg/L) vs. Time

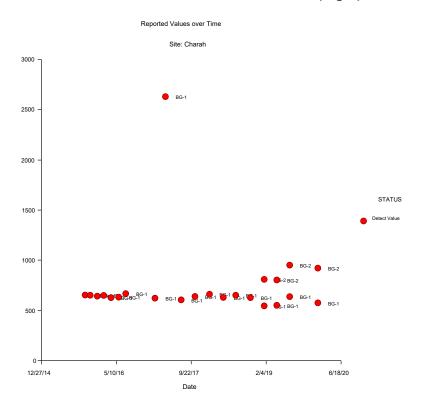


Figure 2: Calcium Concentrations (ug/L) vs. Time

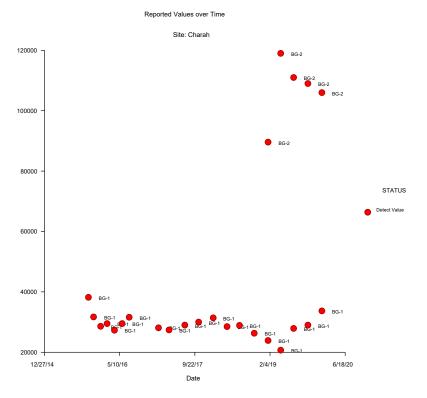




Figure 3: Sulfate Concentrations (mg/L) vs. Time

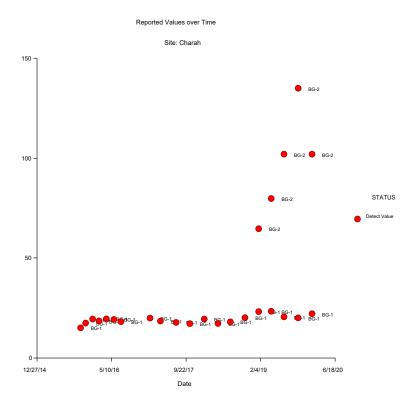
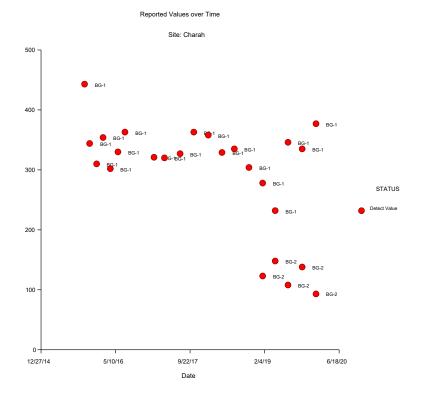


Figure 4: Barium Concentrations (ug/L) vs. Time





## 2.1.2 Downgradient

Statistical outliers were identified for Appendix I metals, Appendix III and Appendix IV constituents in the data sets evaluated for downgradient monitoring wells throughout the monitoring period, and are listed in **Table 5**.

Table 5: Dixon's Outlier Test Results - Downgradient

Well	Constituent	Constituent Type	Potential Outlier Value	Units	Sampling Event	Sample Date
	Total Dissolved Solids	Appendix III	257	mg/L	R03	11/19/2015
	Total Dissolved Solids	Appendix III	1,170	mg/L	R21	1/17/2020
MW-2	Calcium	Appendix III	1,300	ug/L	R07	5/27/2016
	Lithium	Appendix IV	356	ug/L	R08	7/12/2016
	Molybdenum	Appendix IV	41.0	ug/L	R21	1/17/2020
MW-3	Lithium	Appendix IV	236	ug/L	R12	10/18/2017
IVIVV-3	Molybdenum	Appendix IV	35.7	ug/L	R21	1/16/2020
MW-4	Boron	Appendix III	165	ug/L	R12	10/17/2017
IVIVV-4	Nickel	Appendix I Metals	11.1	ug/L	R21	1/16/2020
	Boron	Appendix III	39.3	ug/L	R09	1/23/2017
MW-5	Total Dissolved Solids	Appendix III	1,160	mg/L	R12	10/17/2017
	pH (Field)	Appendix III	5.62	S.U.	R21	1/16/2020
MW-6	Chloride	Appendix III	15.3	mg/L	R06	4/5/2016
	Fluoride	Appendix III/IV	0.320	mg/L	R11	7/20/2017
	pH (Field)	Appendix III	9.60	S.U.	R11	7/20/2017
MM 7D	Sulfate	Appendix III	51.2	mg/L	R11	7/20/2017
MW-7R	Nickel	Appendix I Metals	880	ug/L	R19	7/10/2019
	Chromium	Appendix IV	1,940	ug/L	R19	7/10/2019
	Total Dissolved Solids	Appendix III	990	mg/L	R20	10/14/2019
MW-8	Nickel	Appendix I Metals	42.1	ug/L	R09	1/24/2017

A visual inspection of concentration vs. time scatter plots for constituents included in the outliers listed in **Table 5** reveal the presence of the potential outliers. Following review of the sampling protocols and field sampling records, there were no obvious reasons for the outliers noted on the sampling dates. The value for each statistical outlier listed above is within a reasonable range of the remaining concentrations for each constituent throughout the monitoring period. The variability in concentrations will be better understood as additional samples are obtained.

## 2.2 Data Distribution

Groundwater data was fitted to known distribution models using Goodness-of-Fit (GOF) tests incorporated into ProUCL. For data sets comprised of 50 or fewer samples, ProUCL's GOF

<sup>&</sup>lt;sup>1</sup> See Appendix E.B for scatter plots of constituents with downgradient statistically-derived outliers.



module incorporates the Shapiro-Wilk GOF test to determine normal or lognormal distribution and Anderson-Darling to determine gamma distribution. Normal, lognormal and gamma distributions are parametric distributions. If a data set could not be fit with any of these three parametric distributions, it was considered to follow a nonparametric distribution. Note that ProUCL does not provide GOF results for data sets with less than three detected values due to insufficient data. For purposes of estimating background concentrations, these data sets were treated under non-parametric distribution assumptions with the maximum detected value chosen to represent the background concentrations. In addition, the data for total radium is set to nonparametric as the MDL values were not provided by the laboratory. Data distributions are listed in **Table 6**.

Table 6: Data Distributions - Background

Constituent	Sample Size	No. of NDs	Distribution Fit <sup>1</sup>
	Appendix I I	Metals	
Copper	25	24	Nonparametric
Nickel	25	25	Nonparametric
Silver	25	25	Nonparametric
Vanadium	25	17	Nonparametric
Zinc	25	22	Nonparametric
	Appendix III Co	nstituents	
Boron	24	15	Nonparametric
Calcium	25	0	Nonparametric
Chloride	25	0	Parametric
Fluoride	25	0	Parametric
pH (Field)	23	0	Parametric
Sulfate	25	0	Nonparametric
Total Dissolved Solids	24	0	Nonparametric
	Appendix IV Co	nstituents	
Antimony	25	25	Nonparametric
Arsenic	25	25	Nonparametric
Barium	25	0	Nonparametric
Beryllium	25	25	Nonparametric
Cadmium	25	25	Nonparametric
Chromium	25	25	Nonparametric
Cobalt	25	25	Nonparametric
Fluoride	25	0	Parametric
Lead	25	24	Nonparametric
Lithium	25	2	Parametric
Mercury	25	25	Nonparametric



Constituent	Sample Size	No. of NDs	Distribution Fit <sup>1</sup>
Molybdenum	25	20	Nonparametric
Radium-226	22	0	Nonparametric
Radium-228	22	0	Nonparametric
Selenium	25	25	Nonparametric
Thallium	25	24	Nonparametric
Total Radium	22	0	Nonparametric

<sup>&</sup>lt;sup>1</sup>Best fit is based on detected data.

## 2.3 Trends

## 2.3.1 Background

Background constituent concentrations in groundwater should demonstrate stationary conditions through time, free of trends. Constituents were analyzed for trends within the data set using a maximum likelihood estimate (MLE) regression for constituents which followed parametric distributions and Mann-Kendall tests for those that were treated under nonparametric distributional assumptions. The MLE regression can be applied to data sets that can be fitted to a specific distribution model and that contain NDs with multiple MDLs. The Mann-Kendall test is suitable for data series with no discernable distributions and only one MDL value for NDs.

Constituents treated under nonparametric data assumptions (either tested as nonparametric or having more than 50 percent NDs) and with multiple MDLs or with less than three detected values were not assessed for trends. A summary of the trend analysis results for constituents with sufficient detected values in the background data set is provided in **Table 7**.

The background well regression analysis showed a potential increasing trend for fluoride (an Appendix III and Appendix IV constituent) and a potential decreasing trend for two Appendix III constituents (chloride and sulfate) and three Appendix IV constituents (barium, lithium, and radium-226). There were no increasing or decreasing trends identified for other monitoring constituents with sufficient data quantity and quality for testing with the MLE analysis or Mann-Kendall test. Although statistical trends were identified for barium, chloride, fluoride, lithium, sulfate, and radium-226-, the results can be misleading due to the short duration of the sampling program.

Table 7: Summary of Trend Analysis Results - Background

Constituent	Trend		
Appendix III Constituents			
Chloride	<b>↓</b>		
Fluoride	1		



Constituent	Trend
Sulfate	$\downarrow$
Appendix IV	Constituents
Fluoride	<b>↑</b>
Lithium	$\downarrow$
Barium	$\downarrow$
Radium-226	↓

## 2.3.2 Downgradient

Trends were also evaluated for constituents in each downgradient well using the same methods as described above for the background data set. Trends were identified for select constituents at select monitoring well locations, and should be monitored as additional downgradient groundwater data are collected at the site. A summary of the statistical trends identified within the downgradient data set is provided in **Table 8**.

Table 8: Summary of Trend Analysis Results - Downgradient

0 111 1			Downgradien	Well with Inc	reasing or De	creasing Tren	d	
Constituent	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7R	MW-8
			Appendix	I Metals				
Copper			1					
			Appendix III	Constituents				
Boron			$\downarrow$					
Calcium	1			1				$\downarrow$
Chloride	1		$\downarrow$		1	↓		$\downarrow$
Fluoride			1	$\downarrow$				
pH (Field)								1
Sulfate	<b>↓</b>	<b>↓</b>	1	1		<b>↓</b>	<b>↓</b>	1
Total Dissolved Solids	1			1				
			Appendix IV	Constituents				
Barium				1	1	$\downarrow$	1	$\downarrow$
Fluoride			1	$\downarrow$				
Lithium	1			1		<b>↓</b>	1	<b>↓</b>
Molybdenum	1	<b>↓</b>		1				
Radium-226				1				
Radium-228	1							
Total Radium				1				



## 2.4 Spatial Variability

Spatial variability refers to identifying whether or not there are statistically identifiable differences in mean concentrations or variance levels across the well field (i.e., the pooled background data). Parametric and nonparametric analysis of variance (ANOVA) tests and visual aids (i.e., side-by-side box plots and scatter plots), as needed, were used to evaluate for spatial variability within the background data set to confirm that results from background wells BG-1 and BG-2 were appropriate for pooling and calculating background concentrations for constituents.

Statistical tests indicated that five Appendix III constituents (calcium, fluoride, pH, sulfate, and total dissolved solids) exhibited spatial variability. Statistical spatial variability was also identified for one Appendix IV constituent (barium). Review of side-by-side box plots for the constituents listed above indicated that the statistically-identified variability in concentrations are reasonable and the mean concentrations calculated for the monitoring wells are generally within one order of magnitude of the other. Therefore, the concentration distribution across the background wells should be considered reflective of the hydrogeological regime at the site and the background results are appropriate for pooling and calculating background concentrations at this time.



## 3 Summary of Statistical Analysis

A summary of the statistical analysis results is provided in **Table 9** and discussed below.

- The statistical outlier for total dissolved solids was removed from the dataset. The statistical outliers identified for barium, calcium, and sulfate should not be removed from the data set to be used for developing background concentrations for the site at this time.
- For the background data set, all of the five Appendix I metals exhibited high percentages
  of NDs and will be treated under nonparametric distribution assumptions with the
  maximum detected value chosen to represent background, until additional results can be
  included in the data sets.
- For the background data set, there are currently sufficient data to fit the Appendix III
  constituents to known parametric distribution models (e.g., gamma, lognormal, or
  normal) using GOF tests, except for boron, calcium, sulfate, and total dissolved solids,
  which are nonparametric. Statistical tests conducted under parametric distribution
  assumptions have more power to detect a SSI when compared to tests conducted under
  nonparametric distribution assumptions.
- For the background data set, eleven of the seventeen Appendix IV constituents exhibited high percentages of NDs and will be treated under nonparametric distribution assumptions with the maximum detected value chosen to represent background, until additional results can be included in the data sets. The data for radium-226, radium-228 and total radium is set to a nonparametric distribution as the MDL values were not provided by the laboratory. Currently, the background data sets for fluoride and lithium can be fitted to known parametric distribution models using GOF tests.
- Based on the small data set and short duration of the monitoring program, results from the outlier, trend, and spatial variability analyses should be considered preliminary until additional sample results are included in the data set and re-evaluated.
- The January 2020 monitoring event for boron was not included in the calculation of the background threshold value for boron as the sample was diluted and not representative of the other background sampling events.
- At this time, for the purpose of calculating background concentrations and testing for SSIs over background for Appendix I metals, Appendix III and Appendix IV constituents, results from twenty-five samples (twenty monitoring events taken during October 2015 to January 2020 from BG-1 and five monitoring events taken January 2019 to January 2020 from BG-2) were used. The statistically-derived background concentrations and the evaluation for SSIs over background for Appendix I metals, Appendix III and Appendix IV constituents are included in **Section 4**.



**Table 9: Summary of Background Preliminary Data Analysis** 

Constituent	Statistical Outlier	Nonparametric Data Distribution	Trend
	Appendix I Me	etals	
Copper		✓	
Nickel		✓	
Silver		✓	
Vanadium		✓	
Zinc		✓	
Арр	endix III Cons	stituents	
Boron		✓	
Calcium	✓	✓	
Chloride			✓
Fluoride			✓
Sulfate	✓	✓	✓
Total Dissolved Solids	✓	✓	
Арр	endix IV Cons	stituents	
Antimony		✓	
Arsenic		✓	
Barium	✓	✓	✓
Beryllium		✓	
Cadmium		✓	
Chromium		✓	
Cobalt		✓	
Fluoride			✓
Lead		✓	
Lithium			✓
Mercury		✓	
Molybdenum		✓	
Radium-226		✓	✓
Radium-228		✓	
Selenium		✓	
Thallium		✓	
Total Radium		✓	

<sup>✓</sup> Constituent was flagged during the statistical analysis



## 4 Evaluation for SSIs over Background

Based on the statistical evaluations performed, background threshold values (BTVs) were determined for the detection monitoring program at the site for Appendix I metals, Appendix III and Appendix IV constituents. For constituents that have all ND background values, the maximum MDL is chosen to represent background and the double quantification rule (DQR) is used to evaluate whether or not there is an SSI. The BTV provided for detection monitoring constituents is the statistically-derived background concentration (i.e., upper prediction limit [UPL]), the maximum detected value or the maximum MDL depending on the level of censorship in each of the background samples. For pH (field), both the UPL and the lower prediction limit (LPL) were computed as pH values above or below the prediction limits at the downgradient wells can be considered statistically significant. The test significance level per constituent has been estimated such that the cumulative false positive rate over all constituent/well pair comparisons is approximately ten percent. The number of verification samples per constituent has been selected to provide sufficient statistical power to detect an SSI when an SSI has occurred conditional to the background sample size, its distributional properties, and the total number of statistical test comparisons. The calculated background concentrations, or BTVs, for each detection monitoring constituent is provided below in Table

**Table 10: Background Concentrations for Detection Monitoring Constituents** 

Constituent	Unit	No. of Verification Samples.	BTV (UPL)
	Appendix I	Metals	
Copper	ug/L	2	11.4
Nickel	ug/L	na	2.50
Silver	ug/L	na	2.50
Vanadium	ug/L	2	8.30
Zinc	ug/L	2	34.2
А	ppendix III Co	onstituents	
Boron	ug/L	2	7.50
Calcium	ug/L	2	119,000
Chloride	mg/L	1	340
Fluoride	mg/L	1	0.230
pH (Field)	S.U.	1	5.90* - 7.27
Sulfate	mg/L	2	135
Total Dissolved Solids	mg/L	2	1,120
A	ppendix IV Co	onstituents	
Antimony	ug/L	na	3.90
Arsenic	ug/L	na	5.00
Barium	ug/L	2	443



Constituent	Unit	No. of Verification Samples.	BTV (UPL)
Beryllium	ug/L	na	0.500
Cadmium	ug/L	na	0.500
Chromium	ug/L	na	2.50
Cobalt	ug/L	na	2.50
Fluoride	mg/L	1	0.230
Lead	ug/L	2	14.1
Lithium	ug/L	1	52.0
Mercury	ug/L	na	0.100
Molybdenum	ug/L	2	13.6
Radium-226	pCi/L	3	1.20
Radium-228	pCi/L	3	1.28
Selenium	ug/L	na	5.00
Thallium	ug/L	2	13.7
Total Radium	pCi/L	3	2.07

#### Note:

Downgradient sampling results from the first detection monitoring round in January 2020 were used to test for SSIs. The boron sample results for each downgradient well could not be tested for SSIs due to dilution in the samples. For constituents that have all ND background values, the DQR is applied; that is, an SSI is registered for the well-constituent pair if the downgradient concentrations exhibit detects in two consecutive sampling events. Downgradient sampling results from the October 2019 and January 2020 sampling events were used to test for SSIs for constituents that have all ND background values. Downgradient concentrations were compared to the BTVs and are summarized below in **Table 11** through **Table 13**. Eight monitoring wells (MW-1 through MW-8) were installed and sampled (October 2015) prior to ash placement, thus representing pre-ash conditions at the site. The range of the concentrations of the pre-ash conditions are included in the tables below as a relative comparison to the current downgradient conditions.

Table 11: Summary of Evaluation for SSIs over Background for Appendix I Metals (Detection Monitoring)

	Appendix I Metals										
	Copper	Nickel	Silver	Vanadium	Zinc						
Unit	ug/L	ug/L	ug/L	ug/L	ug/L						
BTV (UPL)	11.4	2.50	2.50	8.30	34.2						
Pre-Ash Range	2.50 - 16.4	2.50 - 18.2	2.50 - 2.50	2.50 - 9.90	5.00 - 106						
Well		First Detection	n Monitoring R	ound Results							
MW-1	2.10	0.900	2.50	1.30	3.90						

<sup>\*</sup> indicates the lower bound of the pH range is the lower prediction limit (LPL). The upper bound is the UPL. *Italic* concentration indicates a non-detect value and that the DQR is recommended for statistical evaluation.



		Appendix I	Metals		
	Copper	Nickel	Silver	Vanadium	Zinc
MW-2	2.10	0.900	2.50	1.30	13.4
MW-3	9.20	0.900	2.50	1.30	3.90
MW-4	2.10	<u>11.1</u>	2.50	1.30	14.5
MW-5	2.10	0.900	2.50	1.30	3.90
MW-6	2.10	0.900	2.50	1.30	3.90
MW-7R	2.10	0.900	2.50	1.30	3.90
MW-8	2.10	0.900	2.50	1.30	3.90

#### Notes:

<u>Underlined</u> concentration indicates a detect value for constituents with 100 percent background non-detects.

 $\underline{\textbf{Bold and underlined}} \ \text{concentration indicates an SSI over background}.$ 

Italic concentration indicates a non-detect value and that the DQR is recommended for statistical evaluation.

Table 12: Summary of Evaluation for SSIs over Background for Appendix III Constituents (Detection Monitoring)

			Appen	dix III Constituen	ts		
	Boron	Calcium	Chloride	Fluoride	pH (Field)	Sulfate	TDS
Unit	ug/L	ug/L	mg/L	mg/L	S.U.	mg/L	mg/L
BTV (UPL)	7.50	119,000	340	0.230	5.90* - 7.27	135	1,120
Pre-Ash Range	6.20 - 53.1	16,900 - 185,000	22.2 - 1,160	0.0200 - 0.590	6.17 - 7.70	3.70 - 199	296 - 2,770
Well			First	Detection Moniton	ing Round Results		
MW-1	NA	<u>176,000</u>	<u>675</u>	0.120	6.79	6.60	<u>1,570</u>
MW-2	NA	<u>199,000</u>	<u>1,190</u>	0.200	<u>7.58</u>	102	<u>11,700</u>
MW-3	NA	<u>179,000</u>	<u>1,110</u>	<u>0.370</u>	<u>7.69</u>	57.8	<u>2,700</u>
MW-4	NA	56,400	<u>508</u>	<u>0.240</u>	6.32	10.8	<u>1,580</u>
MW-5	NA	13,900	22.2	<u>0.610</u>	<u>5.62</u>	3.10	255
MW-6	NA	37,700	218	<u>0.310</u>	6.48	26.8	624
MW-7R	NA	84,100	297	0.110	<u>7.46</u>	16.5	810
MW-8	NA	108,000	<u>362</u>	0.0500	7.24	7.50	1,060

#### Notes

<u>Underlined</u> concentration indicates a detect value for constituents with 100 percent background non-detects.

 $\underline{\textbf{Bold and underlined}} \ \text{concentration indicates an SSI over background}.$ 

Italic concentration indicates a non-detect value and that the DQR is recommended for statistical evaluation.

The boron samples could not be tested due to dilution.

<sup>\*</sup> indicates the lower bound of the pH range is the LPL. The upper bound is the UPL.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 13: Summary of Evaluation for SSIs over Background for Appendix IV Constituents (Detection Monitoring)



							P	Appendix IV	Constitue	ents							
	Antimony	Arsenic	Barium	Bery- Ilium	Cadmium	Chromium	Cobalt	Fluoride	Lead	Lithium	Mercury	Moly- bdenum	Radium- 226	Radium- 228	Selenium	Thallium	Total Radium
Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	pCi/L	pCi/L	ug/L	ug/L	pCi/L
BTV	3.90	5.00	443	0.500	0.500	2.50	2.50	0.230	14.1	52.0	0.100	13.6	1.20	1.28	5.00	13.7	2.07
Pre- Ash	3.80 - 12.0	2.50 - 2.50	117 - 1,240	0.500 - 0.500	0.500 - 0.500	2.50 - 33.9	2.50 - 7.00	0.0200 - 0.590	2.50 - 6.30	7.50 - 70.4	0.100 - 0.100	2.50 - 20.6	0.0774 - 0.820	0.0230 - 1.56	5.00 - 5.00	5.00 - 5.00	0.304 - 2.93
Well							Firs	t Detection N	<i>lonitoring</i>	Round Resu	ults						
MW-	3.00	4.70	214	0.200	0.400	1.00	1.10	0.120	1.60	35.6	0.100	9.00	0.0553	0.581	4.70	0.600	0.636
MW- 2	3.00	4.70	332	0.200	0.400	1.00	1.10	0.200	1.60	<u>132</u>	0.100	<u>41.0</u>	0.727	<u>1.97</u>	4.70	0.600	<u>2.70</u>
MW-	3.00	4.70	<u>628</u>	0.200	0.400	1.00	1.10	<u>0.370</u>	1.60	<u>89.0</u>	0.100	<u>35.7</u>	0.784	<u>2.86</u>	4.70	0.600	<u>3.64</u>
MW- 4	3.00	4.70	346	0.200	0.400	1.00	<u>9.30</u>	0.240	1.60	31.7	0.100	<u>20.9</u>	0.730	0.961	4.70	0.600	1.69
MW- 5	3.00	4.70	117	0.200	0.400	1.00	1.10	<u>0.610</u>	1.60	4.20	0.100	0.900	0.243	-0.0922	4.70	0.600	0.243
MW- 6	3.00	4.70	53.7	0.200	0.400	1.00	1.10	<u>0.310</u>	1.60	26.4	0.100	5.80	-0.225	0.265	4.70	0.0600	0.265
MW- 7R	3.00	4.70	264	0.200	0.400	1.00	1.10	0.110	1.60	27.6	0.100	0.900	-0.194	0.728	4.70	0.0600	0.728
MW- 8	3.00	4.70	<u>1,020</u>	0.200	0.400	<u>7.40</u>	1.10	0.0500	1.60	4.20	0.100	0.900	0.798	0.466	4.70	0.0600	1.26

<u>Underlined</u> concentration indicates a detect value for constituents with 100 percent background non-detects.

**Bold and underlined** concentration indicates an SSI over background.

Italic concentration indicates a non-detect value and that the DQR is recommended for statistical evaluation.



SSIs were found for five Appendix III constituents (calcium, chloride, fluoride, pH (field), and total dissolved solids) and six Appendix IV constituents (barium, fluoride, lithium, molybdenum, radium-228, and total radium). When the January 2020 sampling event results are compared to the pre-ash sampling results from those eight wells, current downgradient groundwater constituent concentrations are generally similar to concentrations reported prior to ash placement. Of the ten constituents with observed SSIs, barium and pH are within the range of pre-ash conditions. Depending on the data distribution of the constituent, the BTVs have been computed to allow for one to three verification samples. With verification sampling, the validity of the SSIs can be confirmed.



## 5 Appendix E.A: Downgradient Well Descriptive Statistics

Table 14: Summary of Well MW-1 Data Set Descriptive Statistics

				V	Vith NDs=MD	Ls Included			With NDs R	Removed	
Constituent	Unit	Sample Size	No. of NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				Appe	ndix   Metals	;					
Copper	ug/L	19	18	2.10	7.20	2.68	2.50	7.20	7.20	7.20	7.20
Nickel	ug/L	19	16	0.900	13.3	3.26	2.50	5.60	13.3	8.93	7.90
Silver	ug/L	19	19	2.50	2.50	2.50	2.50	-			
Vanadium	ug/L	19	15	1.30	7.80	3.08	2.50	5.00	7.80	6.15	5.90
Zinc	ug/L	19	12	3.90	28.0	9.17	5.00	10.2	28.0	16.8	14.7
	Appendix I Metals           ug/L         19         18         2.10         7.20         2.68         2.50         7.20         7.20         7.2           ug/L         19         16         0.900         13.3         3.26         2.50         5.60         13.3         8.93         7.9           ug/L         19         19         2.50         2.50         2.50         2.50         - <th></th>										
Boron	ug/L	18	10	0.570	14.5	5.18	2.75	6.20	14.5	9.63	9.65
Calcium	ug/L	19	0	43,100	233,000	129,432	126,000	43,100	233,000	129,432	126,000
Chloride	mg/L	19	0	167	914	512	531	167	914	512	531
Fluoride	mg/L	19	1	0.0200	0.170	0.133	0.130	0.110	0.170	0.139	0.135
pH (Field)	S.U.	17	0	6.41	7.30	6.72	6.70	6.41	7.30	6.72	6.70
Sulfate	mg/L	19	0	6.20	11.2	8.07	7.20	6.20	11.2	8.07	7.20
Total Dissolved Solids	mg/L	19	0	569	2,220	1,127	1,060	569	2,220	1,127	1,060
				Appendix	( IV Constitu	ents					
Antimony	ug/L	19	18	3.00	6.10	3.85	3.90	6.10	6.10	6.10	6.10
Arsenic	ug/L	19	19	2.50	5.00	4.16	5.00	-	-		
Barium	ug/L		0	61.9	363	175	171	61.9	363	175	171
Beryllium	ug/L	19	19	0.200	0.500	0.453	0.500				
Cadmium	ug/L	19	19	0.400	0.500	0.484	0.500				
Chromium	ug/L	19	14	1.00	18.4	4.24	2.50	6.60	18.4	10.0	7.40
Cobalt	ug/L	19	19	1.10	2.50	2.28	2.50				
Fluoride	mg/L	19	1	0.0200	0.170	0.133	0.130	0.110	0.170	0.139	0.135
Lead	ug/L	19	19	1.60	2.50	2.36	2.50				
Lithium	ug/L	19	0	19.2	38.3	30.9	31.4	19.2	38.3	30.9	31.4
Mercury	ug/L	19	19	0.100	0.100	0.100	0.100				
Molybdenum	ug/L	19	16	2.50	15.1	4.14	2.50	9.00	15.1	12.9	14.5
Radium-226	pCi/L	17	0	-0.188	1.03	0.367	0.276				
Radium-228	pCi/L	17	0	-0.0467	1.45	0.559	0.508				
Selenium	ug/L	19	19	4.70	5.00	4.95	5.00				
Thallium	ug/L	19	19	0.0200	5.00	1.63	0.0600				
Total Radium	pCi/L	17	0	0.237	2.48	0.950	0.762				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



Table 15: Summary of Well MW-2 Data Set Descriptive Statistics

0 111 1		0 10	N. CND	V	Vith NDs=MD	Ls Included			With NDs F	Removed	
Constituent	Unit	Sample Size	No. of NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				Appe	ndix   Metals	;					
Copper	ug/L	16	11	2.10	17.2	4.38	2.50	5.00	17.2	8.58	6.60
Nickel	ug/L	16	9	0.900	54.4	11.2	2.50	8.70	54.4	22.6	15.2
Silver	ug/L	16	16	2.50	2.50	2.50	2.50	-			
Vanadium	ug/L	16	15	1.30	7.60	2.74	2.50	7.60	7.60	7.60	7.60
Zinc	ug/L	16	8	5.00	113	21.2	7.85	10.7	113	37.5	29.2
				Appendi	x III Constitu	ents					
Boron	ug/L	15	0	37.4	63.9	45.4	44.9	37.4	63.9	45.4	44.9
Calcium	ug/L	16	0	130,000	217,000	193,750	197,000	130,000	217,000	193,750	197,000
Chloride	mg/L	16	0	910	1,360	1,170	1,190	910	1,360	1,170	1,190
Fluoride	mg/L	16	1	0.0200	0.400	0.216	0.220	0.130	0.400	0.229	0.220
pH (Field)	S.U.	13	0	7.50	8.50	7.75	7.60	7.50	8.50	7.75	7.60
Sulfate	mg/L	16	0	73.3	338	186	186	73.3	338	186	186
Total Dissolved Solids	mg/L	16	0	257	11,700	2,948	2,475	257	11,700	2,948	2,475
				Appendix	k IV Constitu	ents					
Antimony	ug/L	16	8	3.00	12.3	6.46	4.75	5.60	12.3	9.13	9.10
Arsenic	ug/L	16	16	2.50	5.00	4.04	5.00	-			
Barium	ug/L	16	0	177	360	262	263	177	360	262	263
Beryllium	ug/L	16	16	0.200	0.500	0.481	0.500				
Cadmium	ug/L	16	16	0.400	0.500	0.494	0.500	-			
Chromium	ug/L	16	4	1.00	84.0	19.5	7.45	5.10	84.0	25.3	14.9
Cobalt	ug/L	16	16	1.10	2.50	2.41	2.50				
Fluoride	mg/L	16	1	0.0200	0.400	0.216	0.220	0.130	0.400	0.229	0.220
Lead	ug/L	16	16	1.60	2.50	2.44	2.50				
Lithium	ug/L	16	0	53.1	356	150	126	53.1	356	150	126
Mercury	ug/L	16	16	0.100	0.100	0.100	0.100			-	
Molybdenum	ug/L	16	0	6.70	41.0	13.2	9.65	6.70	41.0	13.2	9.65
Radium-226	pCi/L	15	0	0.580	1.94	0.958	0.945				
Radium-228	pCi/L	15	0	0.433	1.97	1.28	1.37	-		-	-
Selenium	ug/L	16	16	4.70	5.00	4.98	5.00				
Thallium	ug/L	16	15	0.0200	10.3	2.26	0.0600	10.3	10.3	10.3	10.3
Total Radium	pCi/L	15	0	1.12	3.02	2.24	2.37				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDI
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs



## Table 16: Summary of Well MW-3 Data Set Descriptive Statistics

Constituent	Unit	Cample Cire	No. of NDs	V	Vith NDs=MD	Ls Included			With NDs F	Removed	
Constituent	Unit	Sample Size	NO. OI NDS	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				Appe	ndix I Metals	;					
Copper	ug/L	17	12	2.50	36.0	6.11	2.50	5.30	36.0	14.8	9.20
Nickel	ug/L	17	13	0.900	86.0	10.6	2.50	5.50	86.0	37.2	28.7
Silver	ug/L	17	17	2.50	2.50	2.50	2.50	-			
Vanadium	ug/L	17	15	1.30	13.9	3.45	2.50	8.40	13.9	11.2	11.2
Zinc	ug/L	17	14	3.90	42.7	8.78	5.00	12.5	42.7	26.8	25.2
				Appendi	x III Constitu	ents					
Boron	ug/L	16	7	0.570	49.4	21.0	13.2	9.70	49.4	36.3	41.9
Calcium	ug/L	17	0	117,000	201,000	164,471	162,000	117,000	201,000	164,471	162,000
Chloride	mg/L	17	0	893	1,280	1,095	1,110	893	1,280	1,095	1,110
Fluoride	mg/L	17	1	0.0200	0.610	0.372	0.420	0.210	0.610	0.394	0.425
pH (Field)	S.U.	14	0	7.10	7.69	7.30	7.30	7.10	7.69	7.30	7.30
Sulfate	mg/L	17	0	9.10	174	77.9	80.9	9.10	174	77.9	80.9
Total Dissolved Solids	mg/L	17	0	256	3,180	1,983	2,170	256	3,180	1,983	2,170
				Appendi	x IV Constitu	ents					
Antimony	ug/L	17	10	3.00	11.4	6.16	3.90	5.80	11.4	9.53	10.1
Arsenic	ug/L	17	17	2.50	5.00	4.10	5.00				
Barium	ug/L	17	0	353	855	612	578	353	855	612	578
Beryllium	ug/L	17	17	0.200	0.500	0.482	0.500	-			
Cadmium	ug/L	17	17	0.400	0.500	0.494	0.500				
Chromium	ug/L	17	9	1.00	179	19.6	2.50	5.30	179	39.0	9.85
Cobalt	ug/L	17	16	1.10	6.20	2.64	2.50	6.20	6.20	6.20	6.20
Fluoride	mg/L	17	1	0.0200	0.610	0.372	0.420	0.210	0.610	0.394	0.425
Lead	ug/L	17	16	1.60	7.30	2.73	2.50	7.30	7.30	7.30	7.30
Lithium	ug/L	17	0	36.7	236	104	89.0	36.7	236	104	89.0
Mercury	ug/L	17	17	0.100	0.100	0.100	0.100	-			
Molybdenum	ug/L	17	0	5.10	35.7	10.3	8.10	5.10	35.7	10.3	8.10
Radium-226	pCi/L	16	0	0.213	1.92	0.917	0.953	-		-	
Radium-228	pCi/L	16	0	0.387	2.86	1.55	1.73	-		-	
Selenium	ug/L	17	17	4.70	5.00	4.98	5.00	-		-	
Thallium	ug/L	17	17	0.0200	5.00	1.82	0.0600	-		-	
Total Radium	pCi/L	16	0	0.857	3.92	2.46	2.53	-		-	

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 17: Summary of Well MW-4 Data Set Descriptive Statistics



Constituent	Unit	Sample Size	No. of NDs	W	ith NDs=MDL	s Included			With NDs Re	emoved	
Constituent	Offic	Sample Size	NO. OI NDS	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				Appen	dix I Metals						
Copper	ug/L	18	18	2.10	2.50	2.43	2.50				
Nickel	ug/L	18	11	0.900	11.1	3.96	2.50	5.10	11.1	6.47	5.60
Silver	ug/L	18	18	2.50	2.50	2.50	2.50		-	-	
Vanadium	ug/L	18	18	1.30	2.50	2.30	2.50				
Zinc	ug/L	18	16	3.90	29.4	6.76	5.00	14.5	29.4	22.0	22.0
				Appendix I	II Constituer	nts					
Boron	ug/L	17	9	0.570	165	13.2	2.90	5.70	165	26.3	6.60
Calcium	ug/L	18	0	17,900	71,600	54,044	62,800	17,900	71,600	54,044	62,800
Chloride	mg/L	18	0	144	567	421	489	144	567	421	489
Fluoride	mg/L	18	0	0.210	0.420	0.316	0.310	0.210	0.420	0.316	0.310
pH (Field)	S.U.	16	0	6.10	6.56	6.34	6.33	6.10	6.56	6.34	6.33
Sulfate	mg/L	18	0	3.40	12.3	9.22	10.4	3.40	12.3	9.22	10.4
Total Dissolved Solids	mg/L	18	0	395	1,580	1,037	1,150	395	1,580	1,037	1,150
				Appendix I	V Constituer	nts					
Antimony	ug/L	18	17	3.00	5.00	3.78	3.90	5.00	5.00	5.00	5.00
Arsenic	ug/L	18	18	2.50	5.00	4.12	4.85				
Barium	ug/L	18	0	85.9	346	260	297	85.9	346	260	297
Beryllium	ug/L	18	18	0.200	0.500	0.450	0.500			-	
Cadmium	ug/L	18	18	0.400	0.500	0.483	0.500				
Chromium	ug/L	18	17	1.00	5.70	2.43	2.50	5.70	5.70	5.70	5.70
Cobalt	ug/L	18	13	1.10	9.30	3.61	2.50	5.30	9.30	7.06	6.60
Fluoride	mg/L	18	0	0.210	0.420	0.316	0.310	0.210	0.420	0.316	0.310
Lead	ug/L	18	18	1.60	2.50	2.35	2.50				
Lithium	ug/L	18	0	15.8	31.7	25.5	26.8	15.8	31.7	25.5	26.8
Mercury	ug/L	18	18	0.100	0.100	0.100	0.100				
Molybdenum	ug/L	18	14	2.50	20.9	5.73	2.50	8.90	20.9	17.1	19.2
Radium-226	pCi/L	16	0	-0.120	0.913	0.437	0.434				
Radium-228	pCi/L	16	0	0.0190	1.35	0.538	0.519				
Selenium	ug/L	18	18	4.70	5.00	4.95	5.00				
Thallium	ug/L	18	18	0.0200	5.00	1.72	0.0600				
Total Radium	pCi/L	16	0	0.240	2.26	0.982	0.793				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 18: Summary of Well MW-5 Data Set Descriptive Statistics



Constituent	Unit Sa	Sample Size	No. of NDs	With NDs=MDLs Included				With NDs Removed			
				Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Appendix I Metals											
Copper	ug/L	19	17	2.10	6.90	2.85	2.50	5.60	6.90	6.25	6.25
Nickel	ug/L	19	17	0.900	9.00	2.88	2.50	8.10	9.00	8.55	8.55
Silver	ug/L	19	19	2.50	2.50	2.50	2.50				
Vanadium	ug/L	19	19	1.30	2.50	2.31	2.50				
Zinc	ug/L	19	14	3.90	36.1	8.77	5.00	11.4	36.1	19.8	16.6
Appendix III Constituents											
Boron	ug/L	18	8	0.570	39.3	8.93	10.1	9.80	39.3	13.8	11.0
Calcium	ug/L	19	0	9,140	16,900	12,328	12,400	9,140	16,900	12,328	12,400
Chloride	mg/L	19	0	17.6	22.3	20.2	19.9	17.6	22.3	20.2	19.9
Fluoride	mg/L	19	0	0.410	0.680	0.533	0.540	0.410	0.680	0.533	0.540
pH (Field)	S.U.	17	0	5.62	7.30	6.91	7.00	5.62	7.30	6.91	7.00
Sulfate	mg/L	19	0	2.60	5.60	3.69	3.50	2.60	5.60	3.69	3.50
Total Dissolved Solids	mg/L	19	0	194	1,160	286	242	194	1,160	286	242
Appendix IV Constituents											
Antimony	ug/L	19	19	3.00	3.90	3.73	3.90				
Arsenic	ug/L	19	19	2.50	5.00	4.16	5.00				
Barium	ug/L	19	0	90.7	153	110	103	90.7	153	110	103
Beryllium	ug/L	19	19	0.200	0.500	0.453	0.500				
Cadmium	ug/L	19	19	0.400	0.500	0.484	0.500		-		
Chromium	ug/L	19	15	1.00	16.8	3.97	2.50	5.10	16.8	10.6	10.3
Cobalt	ug/L	19	19	1.10	2.50	2.28	2.50		-		
Fluoride	mg/L	19	0	0.410	0.680	0.533	0.540	0.410	0.680	0.533	0.540
Lead	ug/L	19	19	1.60	2.50	2.36	2.50		-		
Lithium	ug/L	19	1	4.20	11.6	8.38	8.60	6.30	11.6	8.62	8.75
Mercury	ug/L	19	19	0.100	0.100	0.100	0.100		-		
Molybdenum	ug/L	19	19	0.900	2.50	2.25	2.50				
Radium-226	pCi/L	17	0	-0.142	0.778	0.134	0.0766				
Radium-228	pCi/L	17	0	-0.0922	1.08	0.381	0.359				
Selenium	ug/L	19	19	4.70	5.00	4.95	5.00				
Thallium	ug/L	19	18	0.0200	14.8	2.15	0.0600	14.8	14.8	14.8	14.8
Total Radium	pCi/L	17	0	0.0766	1.15	0.552	0.489				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 19: Summary of Well MW-6 Data Set Descriptive Statistics



Constituent	Unit	Sample Size	No. of NDs	With NDs=MDLs Included				With NDs Removed			
				Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Appendix I Metals											
Copper	ug/L	19	18	2.10	5.50	2.62	2.50	5.50	5.50	5.50	5.50
Nickel	ug/L	19	19	0.900	2.50	2.25	2.50				
Silver	ug/L	19	19	2.50	2.50	2.50	2.50				
Vanadium	ug/L	19	19	1.30	2.50	2.31	2.50				
Zinc	ug/L	19	15	3.90	17.7	6.58	5.00	11.3	17.7	13.4	12.2
Appendix III Constituents											
Boron	ug/L	18	10	0.570	10.8	4.49	2.75	6.10	10.8	8.08	8.15
Calcium	ug/L	19	0	31,300	40,200	35,216	35,400	31,300	40,200	35,216	35,400
Chloride	mg/L	19	0	15.3	279	228	239	15.3	279	228	239
Fluoride	mg/L	19	0	0.180	0.520	0.387	0.400	0.180	0.520	0.387	0.400
pH (Field)	S.U.	17	0	6.15	7.00	6.50	6.48	6.15	7.00	6.50	6.48
Sulfate	mg/L	19	0	25.8	214	92.2	86.9	25.8	214	92.2	86.9
Total Dissolved Solids	mg/L	19	0	371	946	676	688	371	946	676	688
Appendix IV Constituents											
Antimony	ug/L	19	19	3.00	3.90	3.73	3.90				
Arsenic	ug/L	19	19	2.50	5.00	4.16	5.00				
Barium	ug/L	19	0	46.9	142	99.9	102	46.9	142	99.9	102
Beryllium	ug/L	19	19	0.200	0.500	0.453	0.500				
Cadmium	ug/L	19	19	0.400	0.500	0.484	0.500				
Chromium	ug/L	19	17	1.00	6.00	2.59	2.50	5.30	6.00	5.65	5.65
Cobalt	ug/L	19	19	1.10	2.50	2.28	2.50				
Fluoride	mg/L	19	0	0.180	0.520	0.387	0.400	0.180	0.520	0.387	0.400
Lead	ug/L	19	19	1.60	2.50	2.36	2.50		-		
Lithium	ug/L	19	0	22.7	60.5	40.2	40.0	22.7	60.5	40.2	40.0
Mercury	ug/L	19	18	0.100	0.320	0.112	0.100	0.320	0.320	0.320	0.320
Molybdenum	ug/L	19	15	2.50	8.30	3.41	2.50	5.40	8.30	6.83	6.80
Radium-226	pCi/L	17	0	-0.225	0.910	0.249	0.227				
Radium-228	pCi/L	17	0	0.148	1.07	0.619	0.628				
Selenium	ug/L	19	19	4.70	5.00	4.95	5.00				
Thallium	ug/L	19	18	0.0200	6.20	1.67	0.0600	6.20	6.20	6.20	6.20
Total Radium	pCi/L	17	0	0.148	1.47	0.889	0.912				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

## Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 20: Summary of Well MW-7R Data Set Descriptive Statistics



Constituent	Unit Samp	Sample Size	No. of NDs	With NDs=MDLs Included				With NDs Removed			
		Sample Size	NO. OI NDS	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Appendix I Metals											
Copper	ug/L	9	6	2.10	79.3	13.2	2.50	7.10	79.3	34.6	17.4
Nickel	ug/L	9	5	0.900	880	106	2.50	17.4	880	235	21.8
Silver	ug/L	9	9	2.50	2.50	2.50	2.50				
Vanadium	ug/L	9	6	1.30	18.8	7.37	2.50	16.1	18.8	17.5	17.6
Zinc	ug/L	9	6	3.90	53.4	16.2	5.00	10.7	53.4	39.0	52.8
Appendix III Constituents											
Boron	ug/L	8	4	2.60	25.3	11.6	13.3	13.8	25.3	18.1	16.7
Calcium	ug/L	9	0	74,000	104,000	89,278	89,100	74,000	104,000	89,278	89,100
Chloride	mg/L	9	0	275	312	289	285	275	312	289	285
Fluoride	mg/L	9	1	0.0500	0.320	0.137	0.120	0.110	0.320	0.148	0.120
pH (Field)	S.U.	9	0	7.22	9.60	7.71	7.60	7.22	9.60	7.71	7.60
Sulfate	mg/L	9	0	16.5	51.2	22.2	18.3	16.5	51.2	22.2	18.3
Total Dissolved Solids	mg/L	9	0	740	990	826	810	740	990	826	810
Appendix IV Constituents											
Antimony	ug/L	9	8	3.00	13.6	4.78	3.90	13.6	13.6	13.6	13.6
Arsenic	ug/L	9	9	4.70	5.00	4.90	5.00		-		
Barium	ug/L	9	0	50.1	423	260	255	50.1	423	260	255
Beryllium	ug/L	9	9	0.200	0.500	0.400	0.500				
Cadmium	ug/L	9	9	0.400	0.500	0.467	0.500				
Chromium	ug/L	9	2	1.00	1,940	232	9.60	6.50	1,940	297	33.0
Cobalt	ug/L	9	7	1.10	20.4	4.80	2.50	6.70	20.4	13.6	13.6
Fluoride	mg/L	9	1	0.0500	0.320	0.137	0.120	0.110	0.320	0.148	0.120
Lead	ug/L	9	7	1.60	6.80	3.34	2.50	6.70	6.80	6.75	6.75
Lithium	ug/L	9	0	5.60	32.3	24.2	25.4	5.60	32.3	24.2	25.4
Mercury	ug/L	9	9	0.100	0.100	0.100	0.100				
Molybdenum	ug/L	9	6	0.900	49.5	10.3	2.50	10.7	49.5	26.6	19.5
Radium-226	pCi/L	7	0	-0.194	0.987	0.233	0.0741				
Radium-228	pCi/L	7	0	-0.454	1.01	0.537	0.686			-	
Selenium	ug/L	9	9	4.70	5.00	4.90	5.00				
Thallium	ug/L	9	6	0.0280	0.480	0.109	0.0600	0.110	0.480	0.237	0.120
Total Radium	pCi/L	7	0	0.0741	2.00	0.870	0.728				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 21: Summary of Well MW-8 Data Set Descriptive Statistics



Compliture	Hei4	Campula Cina	No. of NDs	V	Vith NDs=MD	Ls Included		With NDs Removed			
Constituent	Unit	Sample Size		Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Appendix I Metals											
Copper	ug/L	19	18	2.10	10.2	2.84	2.50	10.2	10.2	10.2	10.2
Nickel	ug/L	19	15	0.900	42.1	5.88	2.50	10.8	42.1	19.8	13.1
Silver	ug/L	19	19	2.50	2.50	2.50	2.50				
Vanadium	ug/L	19	19	1.30	2.50	2.31	2.50				
Zinc	ug/L	19	11	3.90	50.7	14.0	5.00	13.6	50.7	26.8	20.4
Appendix III Constituents											
Boron	ug/L	18	9	0.570	12.8	6.18	8.80	8.70	12.3	9.74	9.30
Calcium	ug/L	19	0	91,900	194,000	122,958	110,000	91,900	194,000	122,958	110,000
Chloride	mg/L	19	0	271	939	477	394	271	939	477	394
Fluoride	mg/L	19	19	0.0200	0.0500	0.0374	0.0500				
pH (Field)	S.U.	17	0	6.70	7.29	6.99	7.00	6.70	7.29	6.99	7.00
Sulfate	mg/L	19	0	4.40	8.00	6.67	6.70	4.40	8.00	6.67	6.70
Total Dissolved Solids	mg/L	19	0	224	1,530	974	934	224	1,530	974	934
Appendix IV Constituents											
Antimony	ug/L	19	13	3.00	10.1	5.00	3.90	6.50	10.1	7.83	7.55
Arsenic	ug/L	19	19	2.50	5.00	4.16	5.00				
Barium	ug/L	19	0	976	1,550	1,183	1,170	976	1,550	1,183	1,170
Beryllium	ug/L	19	19	0.200	0.500	0.453	0.500				
Cadmium	ug/L	19	19	0.400	0.500	0.484	0.500				
Chromium	ug/L	19	14	1.00	82.0	10.1	2.50	7.40	82.0	32.0	25.3
Cobalt	ug/L	19	19	1.10	2.50	2.28	2.50				
Fluoride	mg/L	19	19	0.0200	0.0500	0.0374	0.0500				
Lead	ug/L	19	19	1.60	2.50	2.36	2.50				
Lithium	ug/L	19	1	4.20	50.1	27.8	27.3	18.7	50.1	29.1	27.4
Mercury	ug/L	19	18	0.100	0.370	0.114	0.100	0.370	0.370	0.370	0.370
Molybdenum	ug/L	19	17	0.900	5.60	2.64	2.50	5.20	5.60	5.40	5.40
Radium-226	pCi/L	17	0	0.00	1.16	0.552	0.528				
Radium-228	pCi/L	17	0	0.239	1.20	0.735	0.594				
Selenium	ug/L	19	19	4.70	5.00	4.95	5.00				
Thallium	ug/L	19	18	0.0200	8.80	1.80	0.0600	8.80	8.80	8.80	8.80
Total Radium	pCi/L	17	0	0.454	1.94	1.29	1.26				

#### Notes:

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



# 6 Appendix E.B: Scatter Plots for Constituents with Downgradient Statistical Outliers

Figure 5: Total Dissolved Solids Concentrations (mg/L) vs. Time (MW-2)

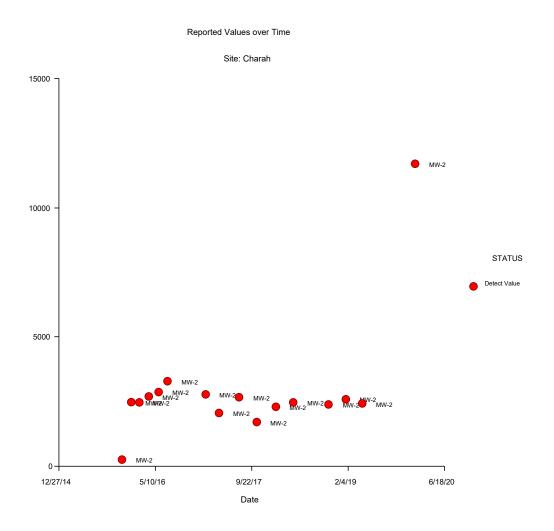




Figure 6: Calcium Concentrations (ug/L) vs. Time (MW-2)

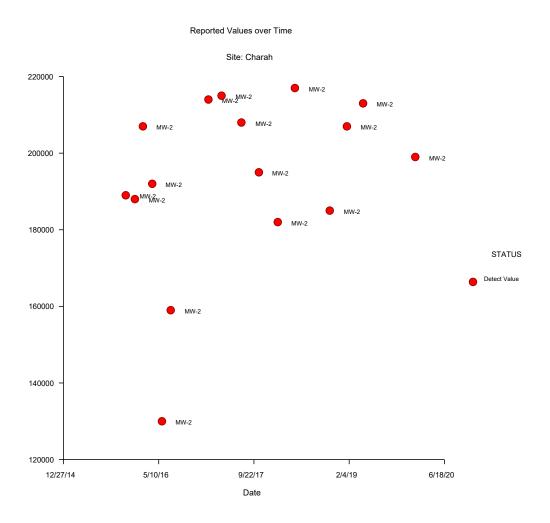




Figure 7: Lithium Concentrations (ug/L) vs. Time (MW-2)

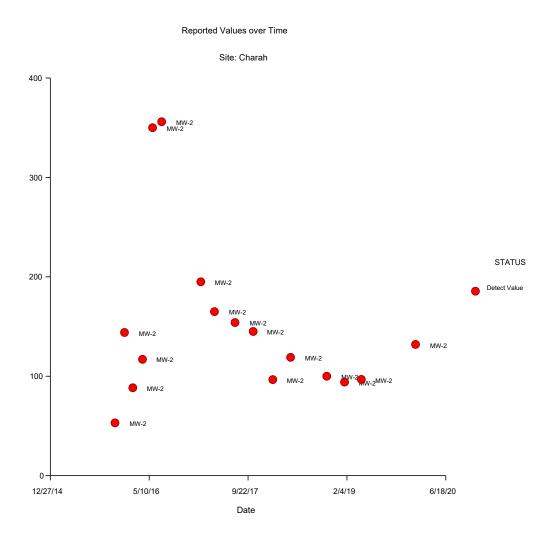




Figure 8: Molybdenum Concentrations (ug/L) vs. Time (MW-2)

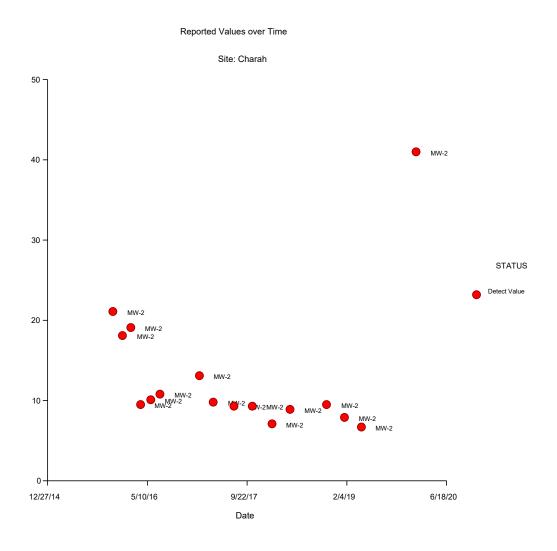




Figure 9: Lithium Concentrations (ug/L) vs. Time (MW-3)

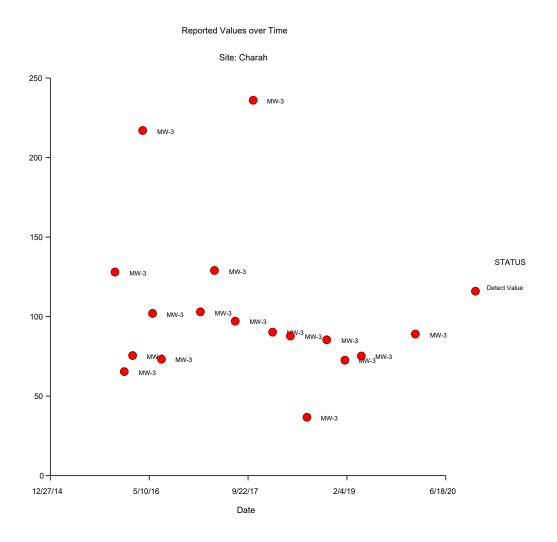




Figure 10: Molybdenum Concentrations (ug/L) vs. Time (MW-3)

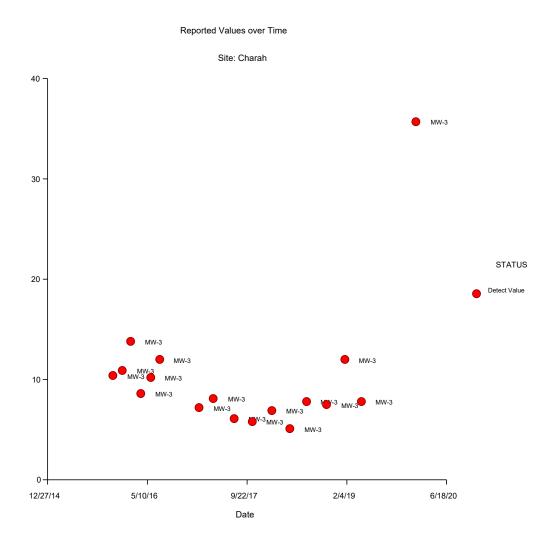




Figure 11: Boron Concentrations (ug/L) vs. Time (MW-4)

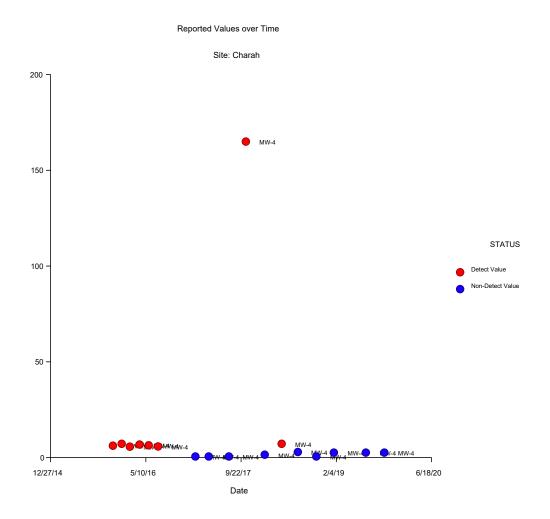




Figure 12: Nickel Concentrations (ug/L) vs. Time (MW-4)

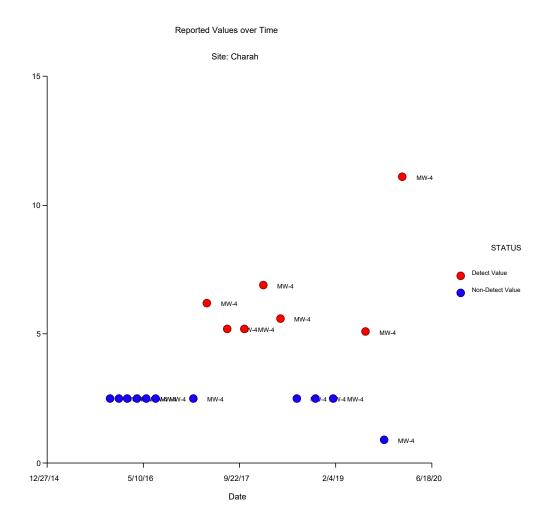




Figure 13: Boron Concentrations (ug/L) vs. Time (MW-5)

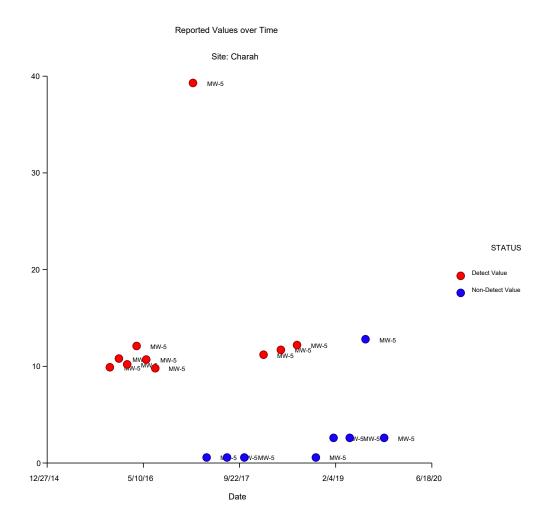




Figure 14: Total Dissolved Solids Concentrations (mg/L) vs. Time (MW-5)

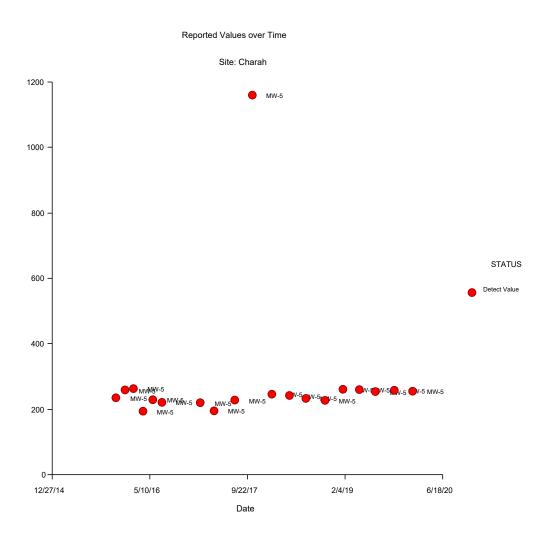




Figure 15: pH (Field) Concentrations (S.U.) vs. Time (MW-5)

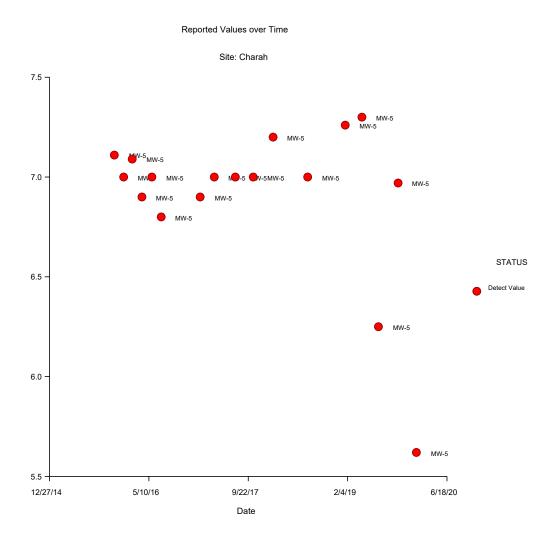




Figure 16: Chloride Concentrations (mg/L) vs. Time (MW-6)

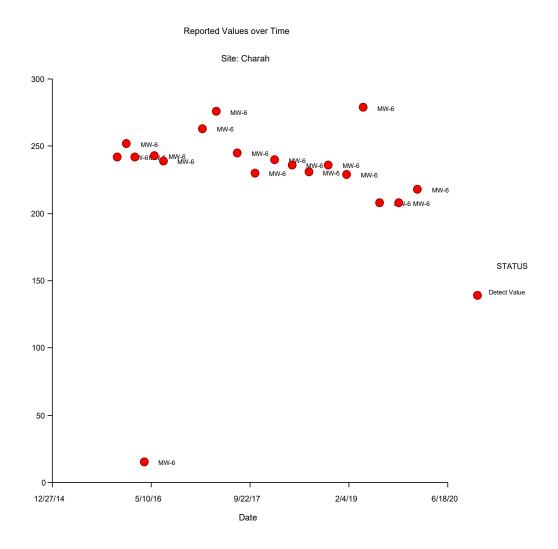




Figure 17: Fluoride Concentrations (mg/L) vs. Time (MW-7R)

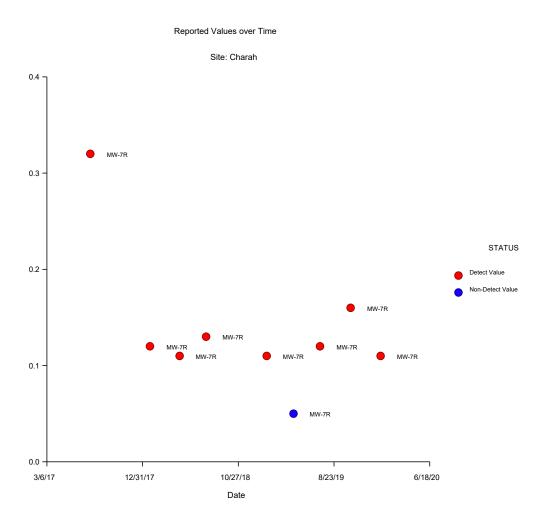




Figure 18: pH (Field) Concentrations (S.U.) vs. Time (MW-7R)

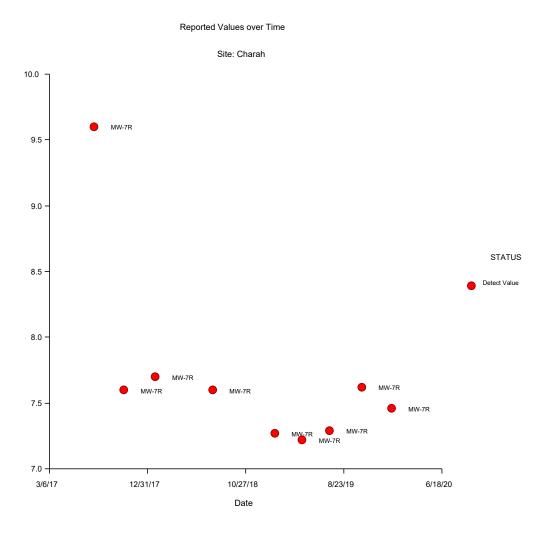




Figure 19: Sulfate Concentrations (mg/L) vs. Time (MW-7R)

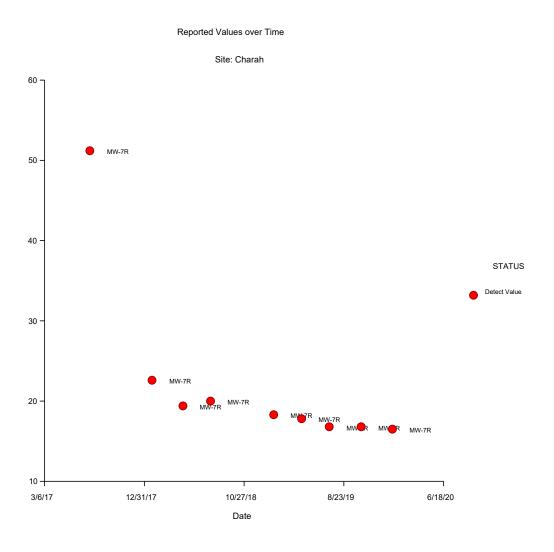




Figure 20: Nickel Concentrations (ug/L) vs. Time (MW-7R)

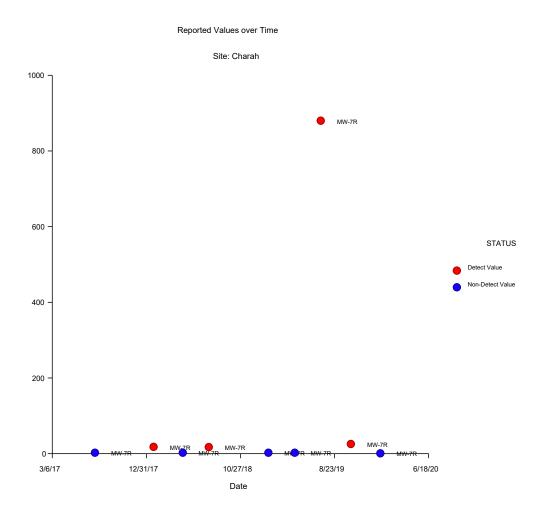




Figure 21: Chromium Concentrations (ug/L) vs. Time (MW-7R)

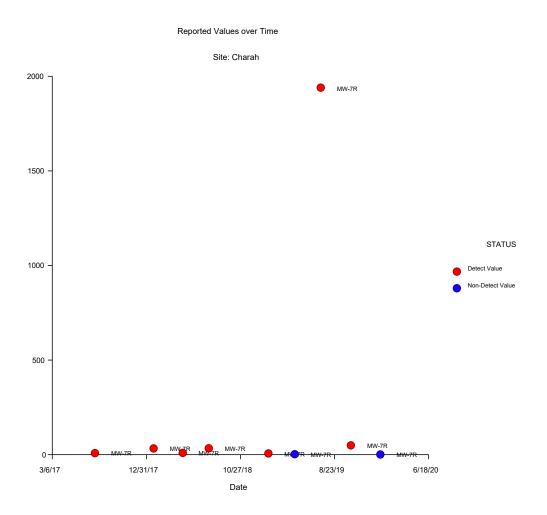




Figure 22: Total Dissolved Solids Concentrations (mg/L) vs. Time (MW-7R)

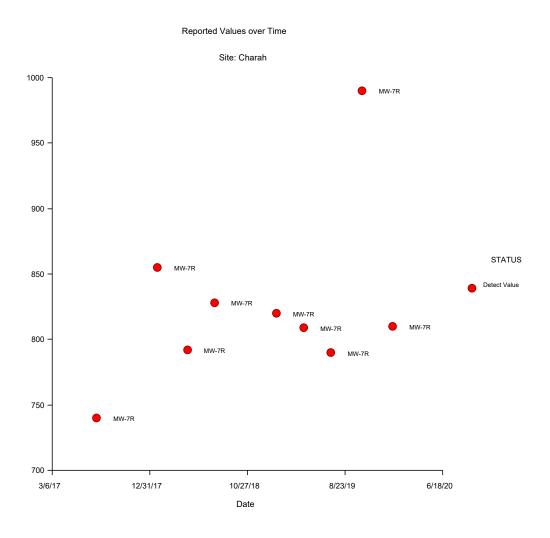
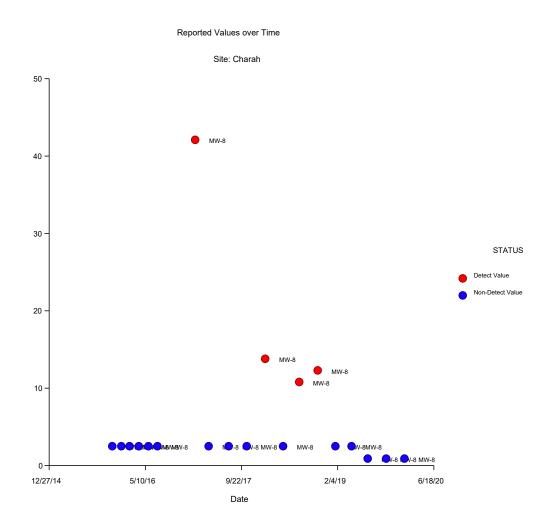




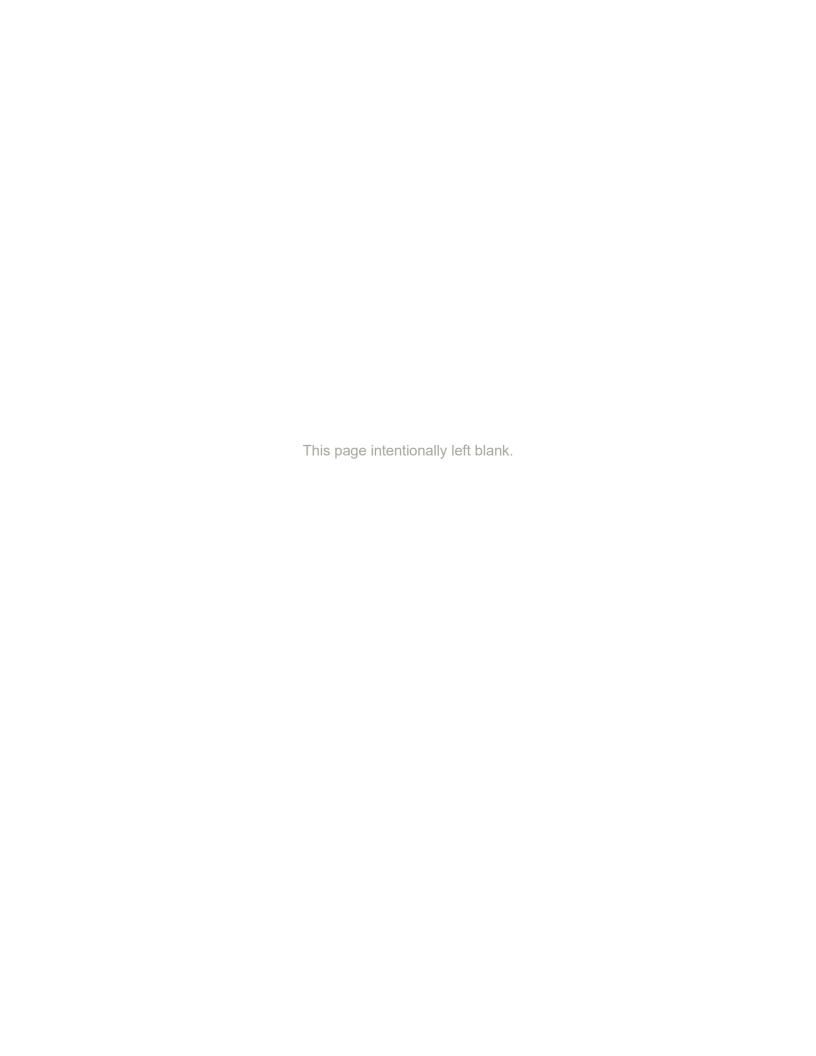
Figure 23: Nickel Concentrations (ug/L) vs. Time (MW-8)





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- [4] IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.



# **FD3**

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Attachment B – 2020 Second Semi-Annual Detection Monitoring Report

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# 2020 Second Semi-Annual Detection Monitoring Report

Brickhaven No.2 Mine Tract "A" Structural Fill

Charah Solutions, Inc.

Moncure, Chatham County, North Carolina November 5, 2020

HDR Engineering, Inc. of the Carolinas 440 S Church Street, Suite 1000, Charlotte, NC 28202-2075 704.338.6700 NC License F0116



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Appendix D – Electronic Data Deliverables (electronic only)

Appendix E - Statistical Analysis Memo



# Select Acronyms

μg/L micrograms per liter

CAMA North Carolina Coal Ash Management Act of 2014

CCP Coal Combustion Products
DEC Duke Energy Carolinas
DEP Duke Energy Progress
DO Dissolved Oxygen

EPA United States Environmental Protection Agency

KM Kaplan-Meier Method MDL Method Detection Limit

MLE Maximum Likelihood Estimate

MRL Method Reporting Limit

msl mean sea level

NCDENR North Carolina Department of Environment and Natural Resources

NCDEQ North Carolina Department of Environmental Quality

N Standard Penetration Resistance

ND Non-detects

NTU Nephelometric turbidity units
ORP Oxidation-Reduction Potential
ROS Regression on Order Statistics
SSI Statistically Significant Increase

UPL Upper Prediction Limit

USCS Unified Soil Classification System



## 1 Introduction

## 1.1 Purpose

The purpose of this 2020 Second Semi-Annual Detection Monitoring Report is to summarize semi-annual detection monitoring activities conducted at the Brickhaven No.2 Mine Tract "A" Structural Fill site in Moncure, Chatham County, North Carolina between July 6 and 8, 2020.

The next semi-annual monitoring event will occur in the first quarter of 2021.

## 1.2 Regulatory Compliance

Operating under Facility Permit #1910-STRUT-2015, Charah is required to monitor groundwater and surface water quality at designated locations. Per the Water Quality Monitoring Plan (Buxton, 2015a), groundwater samples are collected from 10 monitoring wells (MW-1 through MW-6, MW-7R, MW-8, BG-1, and BG-2) and two surface water locations (SW-1 and SW-2). Samples are analyzed for constituents listed in North Carolina Department of Environmental Quality (NCDEQ) Solid Waste Appendix I (except VOCs) and II, 40 CFR 257 Appendix III, and 40 CFR 257 Appendix IV. On January 8, 2020, NCDEQ approved the discontinuation of Appendix I VOC analysis based on the historic non-detection of VOC constituents. Per the WQMP, if sampling results indicate impacts to groundwater or surface water, Charah must notify NCDEQ within 14 days. If no impacts are observed, Charah must submit a report of the sampling results to NCDEQ with 120 days of the sampling event.

Groundwater monitoring and sampling at the site is governed by the following:

- North Carolina Coal Ash Management Act (CAMA) of 2014 (Senate Bill 729).
- Water Quality Monitoring Plan, Brickhaven No.2 Mine Tract "A" Structural Fill, approved March 2015 (Buxton, 2015a).
- North Carolina Department of Environment and Natural Resources (NCDENR)<sup>1</sup> Permit No. 1910-STRUC-2015, issued June 5, 2015.
- NCDENR Solid Waste Section Guidelines for Groundwater, Soil, and Surface Water Sampling, April 2008 including Groundwater Rules .1600.
- NCDENR Division of Water Management memorandum concerning electronic document submittal for routine groundwater and surface water monitoring, November 5, 2014.
- U.S. Environmental Protection Agency (EPA) Region I, Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples from Monitoring Wells, January 19, 2010.

Groundwater monitoring and sampling at the site is also conducted in general accordance with the U.S. EPA's "Disposal of Coal Combustion Residuals from Electric Utilities" rule (CCR Rule).

On June 21, 2019, Charah received correspondence from the North Carolina Department of Environmental Quality (NCDEQ) Solid Waste Section requesting that Charah submit an

<sup>1</sup> On September 18, 2015, the North Carolina Department of Environment and Natural Resources (NCDENR) became the North Carolina Department of Environmental Quality (NCDEQ). Both naming conventions are used in this report, as appropriate.

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Assessment Work Plan (Plan) in accordance with 15A NCAC 02L .0106 and 15A NCAC 02B .0211 and .0216. NCDEQ cited exceedances of 2L Standards for barium, chloride, chromium, cobalt, total dissolved solids (TDS), and vanadium, and exceedances of 2B Standards for arsenic, cobalt, copper, lead, TDS, and zinc as cause for the Plan. On behalf of Charah, HDR submitted a *Groundwater and Surface Water Assessment Monitoring Plan* (Plan) to NCDEQ on August 16, 2019 (HDR 2019). The plan was approved by NCDEQ in correspondence dated September 16, 2019 and amended on October 4, 2019. Between November 2019 and July 2020, Charah implemented the Plan, which was documented in an *Assessment Monitoring Report* dated July 24, 2020. To date, Charah has not received comments on the *Assessment Monitoring Report* from NCDEQ.

## 1.3 Site Location and Operation

The site is located in Chatham County, approximately four miles southeast of Moncure, North Carolina (**Figure 1**). The owner of the site is Green Meadow, LLC (Green Meadow) and Charah Solutions, Inc. (Charah) is responsible for the operation and maintenance of the site. The mine property is approximately 301 acres in total; of which 145 acres is permitted for structural fill placement of coal combustion products (CCP).

The property located within the structural fill area was previously owned by General Shale Brick, Inc., which operated the site and an adjacent property as a mine beginning in 1985 for their off-site brick manufacturing facility. Mined material was stockpiled and then transported approximately 3.5 miles south to Brickhaven, North Carolina for brick manufacturing.

The area immediately surrounding the site primarily consists of rural residential (approximately 2,500 feet east, 1,000 feet southeast, and 1,000 feet southwest), commercial, industrial, wooded and agricultural property. According to information obtained from the Chatham County GIS website (October 2015), municipal water is available to the surrounding area.

Charah began CCP placement in the first composite liner containment system (Cell 1, Sub Cell 1A) on October 23, 2015. CCP placement has occurred in Cell 1, Cell 2, Cell 6A and Cell 6B. Charah has placed just over 7.3 million tons of CCP material in the structural fill. CCP materials (including fly ash, bottom ash, boiler slag, and/or flue gas desulfurization materials) were initially brought to the site by truck through October 2015 until transportation was changed to rail in January 2016. The CCP originated at the Duke Energy Carolinas (DEC) Riverbend Steam Station and Duke Energy Progress (DEP) L.V. Sutton Energy Complex (Sutton Plant) sites.

Leachate (i.e., product generated from the liquids present in the fill at the time of placement and/or stormwater that infiltrates the fill) is managed on-site through the collection, storage, and disposal of the resultant liquid. Green Meadow has approved pump and haul permits to dispose of leachate at the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant and the Town of Spring Lake's South Harnett Regional Wastewater Treatment Plant.

## 1.4 Groundwater Monitoring System

The groundwater monitoring system was designed to provide background groundwater quality data prior to the placement of CCP in the structural fill and early detection of potential CCP



constituents subsequent to CCP placement to be protective of human health and the environment. The groundwater monitoring system is comprised of ten (10) wells: eight wells are located downgradient/cross-gradient (MW-1, MW-2, MW-3, MW-4, MW-5, MW-6, MW-7R and MW-8) and two wells are considered to represent background groundwater quality (BG-1 and BG-2). Well construction details are presented in **Table 1**.

Background monitoring well BG-1 was installed in July of 2015 near the entrance of the site along Moncure-Flatwood Road. This location was selected to provide groundwater quality data in an area of the site presumed to not be affected by historic or current usage. Upon statistical analysis of groundwater quality data collected pre- and post-CCP placement, concentrations of target constituents in well BG-1 appear to be anomalously low when compared to pre-CCP conditions elsewhere on-site. With approval from NCDEQ, Charah installed a second background well (BG-2) southwest of the structural fill in December 2018 to evaluate spatial variability of inorganic concentrations across the site.

Well MW-7R was installed in April of 2017 as a replacement for monitoring well MW-7, as documented and approved in the May 25, 2017 memorandum to the NCDEQ Solid Waste Section. Well MW-7 has temporarily remained onsite for water level gauging purposes only.

Well MW-11 was installed on March 3, 2020 during assessment monitoring and is not currently part of the detection monitoring program.



Table 1: Well Construction, Survey, and Groundwater Elevations

Well ID	Northing <sup>1</sup>	Easting	Pad Elev. (ft.)	TOC Elev. (ft.)	TD <sup>2</sup> (ft. BGS)	TD (ft. BTOC)	Screen Length (ft.)	Screened Interval (ft. BGS)	DTW (ft. BTOC) <sup>3</sup>	GW Elevation (ft. MSL)	Lithologic Unit <sup>4</sup>
BG-1	670898.50	1996348.25	225.64	228.19	40.50	43.05	15	26-41	9.03	219.16	Layered Rock/PWR*
BG-2	669278.99	1990476.10	191.41	194.23	23.29	26.11	10	13-23	11.80	182.43	Layered Rock/PWR*
MW-1	674737.98	1993417.69	277.28	280.08	72.50	75.30	15	57-72	57.34	222.74	Layered Rock/PWR*
MW-2	673677.07	1994537.54	229.27	231.76	47.66	50.15	15	30-45	31.95	199.81	Layered Rock/PWR*
MW-3	672474.63	1994834.76	220.00	222.56	40.80	43.36	15	25-40	16.33	206.23	PWR
MW-4	671326.48	1994974.40	214.49	217.13	22.70	25.34	10	13-23	11.75	205.38	Residuum/PWR
MW-5	671081.19	1993779.03	242.72	244.86	44.00	46.14	10	34-44	21.39	223.47	PWR
MW-6	671267.60	1992793.34	228.63	231.10	27.00	29.47	15	12-27	6.50	224.45	Residuum/PWR
MW-7	672306.28	1992642.35	229.53	231.71	15.00	17.18	10	5-15	16.14	215.57	Residuum/PWR
MW-7R	672221.96	1992702.98	239.99	242.22	36.00	39.94	10	26-36	20.40	219.54	Residuum/PWR
MW-8	673304.83	1992200.37	233.41	236.47	46.00	49.06	15	31-46	35.87	200.60	PWR

#### Notes:

<sup>1.</sup> Wells MW-4 (PZM-1), MW-5 (PZM-22) and MW-7 (PZM-27) surveyed by Lawrence Surveying of Monroe, NC. Wells BG-1, BG-2, MW-1, MW-2, MW-3, MW-6, MW-8 and MW-7R surveyed by McAdams of Durham, NC. Well locations and elevations based on NAD 83 horizontal datum and NGVD88 vertical datum.

<sup>2.</sup> TD=total depth; BGS=below ground surface; TOC=top of casing; DTW = Depth-to-Water; BTOC = below top-of-casing; GW = groundwater; MSL = mean sea level.

<sup>3.</sup> Depth to water measurements obtained on July 6, 2020, to the nearest 0.01 foot with a water level meter.

<sup>4. \* =</sup> interpreted lithologic unit based on relative drilling hardness and geologic judgment during well installation.



## 1.5 Site Topography and Geographical Setting

Based on review of the 1993 USGS topographic quadrangle (**Figure 2**) and GIS mapping, the topography of the site and immediately surrounding area can be characterized by moderately rolling hills, which are dissected by dendritic creeks. Prior to mining by General Shale, a topographic ridge was present within the site, extending from the northwestern corner of the present-day structural fill toward the southeast. Thus, historic drainage was assumed to be to the north/northwest/west and to the northeast/east/southeast away from the ridge.

## 1.6 Geologic and Hydrogeologic Setting

## 1.6.1 Regional Geology

The site is located within the Piedmont physiographical province of North Carolina, which is a northeast-southwest trending region extending from New York to Alabama.

According to the 1985 North Carolina Geologic Map prepared by the North Carolina Geological Survey, the site is located in the Triassic Basin Belt of the Piedmont physiographic province. The basement rocks of the Triassic Basin Belt include conglomerate, sandstone, mudstone, limestone, coal, and shale. The majority of the site is located within the Sanford Formation which contains conglomerate, fanglomerate, sandstone, and mudstone. The far western portion of the site is located in the Cummock Formation which contains sandstone, mudstone, gray and black coal, and carbonaceous shale. The Triassic Basin is bounded by felsic metavolcanic rock within the Carolina Slate Belt approximately 6.5 miles to the northwest; and is contacted by metamorphosed granite and biotite gneiss and schist of the Raleigh Belt along a normal fault approximately 2.5 miles to the southeast. The Triassic Basin formations have been intruded by north northwest-south southeast trending igneous diabase dikes during the Jurassic Period (~144 to 208 Ma), and contain northeast-southwest trending normal faults. However, none of these faults were indicated to exist at the subject site on the 1985 geologic map (NCDENR, 1985).

In the Piedmont, the bedrock is typically overlain by a mantle of weathered rock (residuum/saprolite), which has an average thickness of approximately 25 feet. The residuum/saprolite consists of varying amounts of unconsolidated clays, silts, and sands, with lesser amounts of rock fragments. Due to the range of the parent rock composition and the variable susceptibility to weathering of each rock type, the residuum/saprolite range widely in color, texture, and thickness. Generally, the residuum/saprolite is thickest near inter-stream divides (ridges) and thins toward stream beds. In profile, the residuum/saprolite normally grades from clayey soils near the land surface to sandier, partially weathered rock above competent bedrock (Buxton, 2015a).

#### 1.6.2 Site Geology

The geology of the site can be subdivided into six units which include fill, flood plain, soil horizon, residuum, partially weathered rock, and layered rock. These units generally grade downward from a soil horizon, to residuum, to partially weathered rock and finally layered rock. Fill materials were limited to the road bed and berm located around the east and west sides of MW-4. Flood plain sediments were only identified at MW-4 on the southeast corner of the site.



The following summary of site-specific units is based on boring logs originally included in the *Design Hydrogeologic Report* (Buxton, 2016).

#### FILL

Fill materials were primarily identified in the road bed and berm located around the east and west sides near MW-4 and generally consisted of mottled reddish yellow, orange, brown, and light gray sandy silty clay with quartz gravel.

#### **FLOOD PLAIN**

Flood plain sediments were only located adjacent to MW-4 on the southeast corner of the site. Sediments were associated with a former adjacent intermittent tributary creek and can be generally characterized as mottled light gray fine sandy silty clay. The flood plain sediments were approximately 5 feet thick in this area and had been deposited above residuum. Based on geotechnical laboratory data, the flood plain sediments were identified as lean clay (CL) under the Unified Soil Classification System (USCS).

#### **RESIDUUM**

Residuum is characterized as mottled yellowish, brown, orange, and red silty clay and clayey silt. Root structures were common. Residuum was formed from the continued weathering and biologic reworking of saprolite, and ranges from 2 to 15 feet in thickness, when present. Based on geotechnical laboratory data, the residuum consisted of clayey sand (SC), elastic silt (MH), and lean clay (CL) and had a hydraulic conductivity of 2.86 x 10<sup>-7</sup> cm/sec.

#### **SAPROLITE**

Saprolite is characterized as mottled (black and gray) red and reddish brown sandy silty clay with infrequent quartz gravel and cobbles. Saprolite is characteristically fissile, often breaking in horizontal sheets. Saprolite generally retains the remnant texture, structure, and mineral content of the rock from which it was formed, and ranged from 5 to 15 feet in thickness. Saprolite had a Standard Penetration Resistance (N) of less than 100 blows per foot. Based on geotechnical laboratory data, the saprolite consisted of lean clay (CL) with hydraulic conductivities ranging from 7.69 x 10-8 cm/sec to 3.69 x 10-9 cm/sec.

#### PARTIALLY WEATHERED ROCK

Partially weathered rock is characterized as mottled (light green and purple) brown, reddish gray, and weak red silty clay and weathered mudstone, which are often fissile. Partially weathered rock generally retains the remnant texture, structure, and mineral content of the rock from which it was formed, and ranges from 5 to 40 feet in thickness. Partially weathered rock has an N-value of 100 blows per foot or greater and can generally be drilled with standard hollow-stem auger drilling technology. Based on geotechnical laboratory data, partially weathered rock consisted of lean clay (CL). Hydraulic conductivity ranged from 2.433 x 10<sup>-4</sup> cm/sec to 7.154 x 10<sup>-8</sup> cm/sec, according to slug or recovery test data (for wells screened solely in partially weathered rock).

#### **BEDROCK**

Based on rock coring activities conducted near MW-7/MW-7R and visual inspection of the rock exposed on the north side of the MW-4 area, bedrock at the site is primarily composed of reddish to light tan gray mudstone, cross-bedded muddy sandstone, and muddy sandy



conglomerate (rounded quartz gravel and cobbles). Bedrock generally occurs as horizontally oriented and relatively thin intermittent layers (especially within the upper 15 feet of contacting layered rock) across the site. Bedrock contained horizontal to near vertical fracturing. Large fractures, oriented approximately N 40° to 60° E at 70° northwest, were observed in weathered mudstone immediately northeast of well MW-8. The occurrence of layered rock at the site was generally defined by auger refusal.

### 1.6.3 Regional Hydrogeology

The occurrence and movement of groundwater in the Piedmont physiographic province are within two separate but interconnected water-bearing zones that typically comprise one aquifer. A shallow water-bearing zone typically occurs within the residuum/saprolite and a deeper zone within the underlying bedrock.

Groundwater in the residuum/saprolite zone occurs in the interstitial pore spaces between the individual sediment grains. Groundwater in this zone generally flows from topographic highs to topographic lows. The occurrence and movement of groundwater in the underlying bedrock zone are controlled by joints and fractures within the bedrock. Groundwater within this deeper zone may occur under confined or semi-confined conditions, depending on the extent of fracturing at the saprolite/bedrock interface. Deeper groundwater movement is typically controlled by the distribution of openings in the bedrock and can be variable.

#### 1.6.4 Site Hydrogeology

On July 6, 2020, groundwater depth was measured in each well and ranged from 6.50 feet (MW-6) to 57.34 feet (MW-1) below top of casing. Groundwater elevations ranged from 182.43 feet at BG-2 to 224.60 feet at MW-6 (**Table 1**). Historic and current groundwater elevations are shown in **Table 2**. Monitoring well locations are shown on **Figure 3**.

A groundwater model was developed using the groundwater modeling pre- and post-processing software Groundwater Modeling System (GMS) 10.3.4 (Aquaveo;

https://www.aquaveo.com/software/gms-groundwater-modeling-system-introduction) as well as ArcMap 10.4.1 (ESRI; https://www.esri.com/en-us/arcgis/products/index). For the groundwater flow model, MODFLOW-2005 (Harbaugh 2005; https://pubs.usgs.gov/tm/2005/tm6A16/) was used to solve the groundwater-flow equations that quantify the flow of groundwater in three dimensions.

Groundwater measurements recorded on July 6, 2020 were used as targets for the calibrated MODFLOW model (HDR 2020), where recharge was adjusted slightly from the calibrated model to match the target water levels and generate a groundwater potentiometric surface map. Regional groundwater flow near the site generally flows northeast to southwest. On-site, the model indicated a groundwater high near MW-6 and a groundwater low at the mine pond near MW-3 and MW-4. Throughout the active life of the structural fill, water was regularly pumped from the mine pond to a downstream sediment basin prior to discharge through a NPDES-permitted outfall. Thus, water pumped from the mine pond likely represented groundwater discharge and surface water runoff. During the July 2020 gauging event, the mine pond was dewatered and actively being filled and graded. These activities may have affected static water levels in unconsolidated material in the vicinity of the mine pond, which are likely rebounding



levels in unconsolidated material in the vicinity of the mine pond, which are likely rebounding after pumping stopped. Note that the groundwater elevation calculated in well MW-2 appeared anomalous during the current event and thus was not used to contour groundwater flow. Modeled groundwater contours using groundwater elevations derived from the July 6, 2020 gauging event are shown on **Figure 4**.

**Table 2: Groundwater Elevations** 

	тос			G	roundwate	er Elevatio	n		
Well ID	Elev. <sup>1</sup>	Oct-15	Nov-15	Jan-16	Feb-16	Apr-16	Jun-16	Jul-16	Jan-17
BG-1	228.19	215.70	216.83	218.14	218.94	218.46	218.46	218.74	217.08
BG-2	194.23	$NG^2$	NG	NG	NG	NG	NG	NG	NG
MW-1	280.08	220.18	220.55	222.03	222.76	221.83	221.83	221.51	220.58
MW-2	229.97	190.20	192.90	197.19	198.82	201.17	201.17	204.62	205.42
MW-3	222.56	208.46	210.29	210.64	212.31	212.36	212.36	204.81	202.35
MW-4	217.13	206.37	206.83	206.98	211.36	208.34	208.34	205.66	203.67
MW-5	244.86	229.66	230.11	230.16	228.69	220.06	220.06	222.96	203.32
MW-6	231.10	223.99	223.97	224.53	224.75	224.13	224.13	224.07	224.54
MW-7	231.71	222.36	222.53	216.11	215.31	215.66	215.65	216.21	215.42
MW-7R	242.22	NG	NG	NG	NG	NG	NG	NG	NG
MW-8	236.47	200.58	201.35	200.60	200.55	199.49	199.49	199.82	199.31

	тос		Groundwater Elevation									
Well ID	Elev.	Apr-17	Jul-17	Jan-18	Jul-18	Jan-19	Jul-19	Jan-20	Jul-20			
BG-1	228.19	216.61	216.76	211.96	215.37	218.50	218.63	217.54	219.16			
BG-2	194.23	NG	NG	NG	NG	183.28	181.32	182.88	182.43			
MW-1	280.08	219.72	219.19	217.61	218.03	220.52	222.44	221.73	222.74			
MW-2	229.97	201.63	201.58	186.33	195.65	195.61	194.45	188.46	199.81			
MW-3	222.56	202.36	203.91	199.53	194.38	199.03	196.86	199.55	206.23			
MW-4	217.13	203.30	204.10	202.16	203.43	204.16	205.00	203.88	205.38			
MW-5	244.86	221.53	222.60	218.86	221.93	223.86	224.11	221.83	223.47			
MW-6	231.10	223.31	223.58	222.14	222.21	224.89	223.95	224.50	224.60			
MW-7	231.71	215.59	216.09	215.03	215.97	215.40	215.82	215.41	215.57			
MW-7R	242.22	NG	220.92	217.54	220.30	219.82	219.46	217.99	219.54			
MW-8	236.47	199.11	198.98	198.75	198.45	201.85	198.91	202.50	200.60			

Notes:

- 1. TOC –Top of Casing (feet);
- 2. Elev. Elevation
- 3. NG Not Gauged; MW-7R installed April 2017 and BG-2 installed December 2018

#### 1.6.5 Horizontal Hydraulic Gradients

Horizontal hydraulic gradient is calculated by taking the difference in hydraulic head over the length of the flow path between two wells of similar construction and (generally) perpendicular to flow. Since groundwater flow direction can vary slightly between gauging events, it is difficult to install permanent monitoring wells in locations consistently perpendicular to groundwater flow. Horizontal hydraulic gradient was calculated between well pairs MW-1/MW-8 and MW-6/BG-2, recognizing that these well pairs are not truly perpendicular to flow, as shown on **Figure 4**. Hydraulic gradients at the site during this sampling event are presented in **Table 3**.

**Table 3: Horizontal Hydraulic Gradients** 

Upgradient Well	Downgradient Well	Upgradient Groundwater Elevation (ft)	Downgradient Groundwater Elevation (ft)	Linear Flow Distance (ft)	Hydraulic Gradient
MW-1	MW-8	222.74	200.60	1,880	0.012
MW-6	BG-2	224.45	182.43	3,054	0.014

#### Notes:

- 1. Horizontal hydraulic gradients calculated by dividing the difference in hydraulic head between a well pair by the length of the flow path between the well pair. (*i*= dh/dl)
- 2. All well pairs assumed to be screened in same surficial aquifer unit
- 3. Groundwater elevations calculated using measurements obtained on July 6, 2020

#### 1.6.6 Groundwater Flow Velocity

The average linear velocity, or seepage velocity, of groundwater between wells at the site was calculated using Darcy's Law, as follows:

$$V_S = \frac{Ki}{P_e}$$

Where:

V<sub>s</sub> = seepage velocity K = horizontal hydraulic conductivity i = horizontal hydraulic gradient P<sub>e</sub> = effective porosity

Seepage velocities for groundwater were calculated using horizontal hydraulic gradients, as referenced above, average horizontal hydraulic conductivity and average effective porosity values. Average horizontal hydraulic conductivity (9.79x10-5 cm/sec) was calculated during geotechnical testing from on-site wells, except BG-2, MW-7R, and MW-11. Average effective porosity (0.093) values were calculated from geotechnical testing and from the literature where geotechnical data was not available (Buxton, 2014; Sinhal and Gupta, 2010).

Seepage velocity varies on a well-by-well basis and was calculated between the MW-1/MW-8 and MW-6/BG-2 well pairs, representing the two well pairs that are roughly perpendicular to the direction of groundwater flow. Seepage velocity was calculated at 12.8 feet per year (between MW-1 and MW-8) and 14.9 feet per year (between MW-6 and BG-2) for this sampling event. Flow rate values listed above are estimations; actual rates will vary across the site with local hydrogeologic conditions. Seepage velocities are shown in **Table 4**.



Table 4: Seepage Velocity

		Seepage Velocity (ft/yr)									
Well Pair	Dec-15	May-16	Jan-17	Jul-17	Jan-18	Jul-18	Jan-19	Jul-19	Jan- 20	Jul-20	
MW-1/MW-2	62.8	6.78	6.1	7.1	12.5	9.0	10.0	11.2	13.3		
MW-4/MW-5	15.6	4.59	0.1	4.9	4.4	4.9	5.2	5.1	4.8		
MW-1/MW-8										12.8	
MW-6/BG-2										14.9	



## 2 Sampling Procedures

#### 2.1 Groundwater Sampling Procedures

HDR collected groundwater samples from the monitoring well network between July 6 and 8, 2020. Purging was conducted via low-flow methods and was considered complete when the water table and field parameters had stabilized in accordance with the targets specified below.

- Turbidity (10% for values greater than 5 NTU (if three turbidity values are less than 5 NTU, the values are considered stabilized)
- DO (10% for values greater than 0.5 mg/L, if three DO values are less than 0.5 mg/L, the values are considered stabilized)
- Specific conductance (5%)
- Temperature (3%)
- pH (± 0.1 unit)
- ORP (± 20 millivolts)

In cases where water level in the well would not stabilize, the well was pumped dry and groundwater samples were collected with disposable bailers upon recovery of adequate volume for sampling. Field data sheets are provided in **Appendix A**.

All non-disposable equipment was decontaminated after each use by washing in a Liqunox® detergent solution followed by a tap-water rinse. Purge water was discharged to the ground surface adjacent to each well.

Samples were shipped under Chain of Custody (COC) procedures to Pace Analytical Services, LLC (Pace) for analysis. Sample handling and custody were performed in accordance with the USEPA Guidance for Field Samplers.

#### 2.2 Surface Water Sampling Procedures

Surface water samples were collected from two locations outside of the structural fill boundary to evaluate potential groundwater to surface water interaction. Surface water sample SW-1 was collected approximately 500 feet south of MW-4, outside of the property boundary, from an unnamed tributary of Gulf Creek. Surface water sample SW-2 was collected south and adjacent to the rail spur west of the structural fill from an unnamed tributary of Shaddox Creek. Prior to sample collection, field parameters (temperature, specific conductance, DO, pH, turbidity, and ORP) were measured with a water quality meter and recorded on field data sheets (**Appendix A**). Surface water sampling locations are shown on **Figure 3**.

### 2.3 Leachate Sampling Procedures

One leachate grab sample (Leachate) was collected from the on-site holding tanks (Figure 3).



## 3 Water Quality

Groundwater samples were collected from 9 of 10 monitoring wells (MW-1, MW-3 through MW-6, MW-7R, MW-8, BG-1, and BG-2) in the active sampling network and two surface water locations (SW-1 and SW-2). Note that well MW-2 was purged dry before groundwater parameter stabilization and did not recharge during the event. A sample was not collected from MW-2. Groundwater samples were analyzed for constituents listed in NCDEQ Solid Waste Appendix I (except VOCs) and II, 40 CFR 257 Appendix III, and 40 CFR 257 Appendix IV.

#### 3.1 Background Site Conditions

Two groundwater sampling events were conducted prior to CCP placement (August and October 2015). The background sampling events consisted of sample collection and analysis from nine monitoring wells (MW-1 through MW-8 and BG-1) and two surface water sample locations (SW-1 and SW-2).

During these initial background monitoring events, chloride, pH, TDS, and vanadium were detected at concentrations that exceeded their North Carolina 2L Groundwater Protection Standards (2L Standard) or Interim Maximum Allowable Concentration (IMAC) in groundwater samples collected from background monitoring well BG-1. Antimony, barium, chloride, chromium, cobalt, pH, TDS, and vanadium were detected at concentrations that exceeded their respective 2L Standards or IMACs in other monitoring wells prior to ash placement. Additional target constituents were detected in the samples from well BG-1 and other wells; however, these concentrations did not exceed applicable standards.

Copper and cobalt concentrations that exceeded their respective NC Surface Water & Wetland Standards (2B Standards) were reported in surface water samples collected during the initial background monitoring events, prior to CCP placement. Additionally, all EPA Appendix III constituents were detected in the surface water samples collected prior to CCP material placement, but at concentrations below their respective 2B Standards (if applicable).

During the first monitoring event (August 2015), bromodichloromethane and dibromochloromethane were detected at concentrations above their respective 2L Standards in groundwater samples collected from MW-2, MW-3, and MW-7. Volatile organic compounds (VOCs), including trihalomethanes, are not present naturally at the site. These detections are attributed to the use of municipal water during previous well development activities. VOCs were not detected above laboratory method detection limits (MDLs) in any subsequent (2<sup>nd</sup> through 8<sup>th</sup>) background sampling events.

A detailed discussion of background groundwater conditions can be found in the *2016 Background Sampling Report* (HDR, 2016b). Additional discussion of the statistical results can be found in **Section 5** of this report for a better understanding of predictive limits for the background well locations (BG-1 and BG-2), as well as interwell interactions.



#### 3.2 Groundwater Analytical Results

Concentrations of the following constituents exceeded 2L Standards or IMACs in one or more wells during the current sampling event: chloride, pH, TDS, barium, chromium, cobalt, and vanadium. Three constituents were reported with method reporting limits (MRL) that exceeded the IMAC (antimony, cobalt, and vanadium). The antimony MRL was 5.0  $\mu$ g/L, and the IMAC is 1.0  $\mu$ g/L. The cobalt MRL is 5.0  $\mu$ g/L, and the IMAC is 1  $\mu$ g/L. The vanadium MRL is 5.0  $\mu$ g/L and the IMAC is 0.3  $\mu$ g/L.

- Antimony, arsenic, beryllium, boron, cadmium, copper, lead, selenium, silver, thallium, and zinc were not detected above the MRL.
- Chloride exceeded the 2L Standard of 250 mg/L in the following wells: BG-2, MW-1, MW-3, MW-4, MW-7R, and MW-8. Concentrations were consistent with the prior sampling event, except that the concentration in MW-1 (1,010 mg/L) was higher than previously recorded.
- The pH values did not fall within 2L Standard range of 6.5-8.5 SU in samples collected from the following wells: BG-1, MW-1, MW-3, MW-4, MW-5, and MW-6.
- TDS exceeded the 2L Standard of 500 mg/L in all wells sampled except MW-5.
   Concentrations increased in BG-2, MW-1, and MW-7R, as compared to the prior sampling event.
- Barium exceeded the 2L Standard of 700 μg/L in well MW-8.
- Chromium exceeded the 2L Standard of 10 µg/L in wells MW-6 and MW-8.
- Cobalt exceeded the IMAC of 1 μg/L in well MW-4.
- Vanadium exceeded the IMAC in well BG-1.

Analytical results are presented in **Table 5**. Concentration versus time plots generated for three constituents (barium, chloride, and TDS) with the most frequent detections and/or exceedances are included in **Appendix B**.

The presence of naturally occurring inorganic constituents above regulatory criteria is common in North Carolina due to various geologic conditions. The presence of naturally occurring metals is discussed in more detail in the *Initial Background Groundwater & Surface Water Monitoring Event* (Buxton, 2015c). The laboratory report for the current sampling event is provided in **Appendix C**. Electronic data deliverables (EDDs) are provided in **Appendix D**.

Table 5: Analytical Results July 2020

		2L Standard /	вту					Ground	water Analy	/sis				Quality		Surfa	ce Water A	Analysis	Leachate Analysis
Analyte	CAS Number	IMAC	(1Q2019)	BG-1	BG-2	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7R	MW-8	EQBL	DUP-1 (MW-6)	SW-1	SW-2	2B Standard	LEACHATE
EPA APPENDI)	K III														(10100-0)				
Boron (µg/l)	7440-42-8	700	9.26	6.3J	17.6J	<25.0	Dry	24.8J	<25.0	10.1J	7.7J	11.4J	10.4J	7.1J	7.4J	10.9J	14.0J	NE	3,470
Calcium (µg/l)	7440-70-2	NE	89,600	21,700	117,000	<b>254,000</b>	Dry	<u>190,000</u>	63,200	12,700	34,500	<u>91,100</u>	<u>95,600</u>	<100	34,900	9,390	2,830	NE	11,600
Chloride (mg/l)	16887-00-6	250	355	192	256	<u>1,010</u>	Dry	<u>1,100</u>	<u>485</u>	23.1	216	289	318	<1.0	217	4.9	17.4	250	19.0
Fluoride (mg/l)	16984-48-8	2	0.189	0.16	0.15	0.12	Dry	0.33	<u>0.25</u>	<u>0.56</u>	<u>0.32</u>	0.12	0.073J	<0.1	<u>0.33</u>	0.34	0.069J	1.8	0.22
pH (standard units)	pН	6.5-8.5	6.05 - 7.07	6.27	6.74	6.46	Dry	6.18	6.13	<u>5.50</u>	6.15	<u>7.35</u>	7.00	NT	6.15	7.44	8.24	6.0-9.0	7.62
Sulfate (mg/l)	14808-79-8	250	64.7	23.5	<u>135</u>	7.0	Dry	40.1	11.4	2.9	26.2	17.3	7.8	<1.0	26.2	1.8	2.5	250	573
Total Dissolved Solids (mg/l)	TDS	500	2,630	548	1,080	2,360	Dry	2,680	1,140	264	614	884	900	<25	624	1,290	62.0	500	1,400
EPA APPENDIX	( IV																		
Antimony (µg/I)	7440-36-0	1	3.90	<5.0	<5.0	<5.0	Dry	<5.0	3.4J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5.6	<5.0
Arsenic (μg/I)	7440-38-2	10	5.00	4.8J	<10.0	<10.0	Dry	5.1J	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	9.6J	5.1J	10	14.6
Barium (μg/l)	7440-39-3	700	433	265	98.4	328	Dry	<u>610</u>	341	110	59.7	292	<u>1,020</u>	<5.0	60.0	1,140	29.1	1,000	64.0
Beryllium (μg/l)	7440-41-7	4	0.500	<1.0	<1.0	<1.0	Dry	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.7	<1.0	6.5	<1.0
Cadmium (μg/I)	7440-43-9	2	0.500	<1.0	<1.0	0.57J	Dry	<1.0	0.47J	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.90J	<1.0	2	0.42J
Chromium (µg/I)	7440-47-3	10	2.50	<5.0	<5.0	<5.0	Dry	<5.0	<5.0	<5.0	<u>14.0</u>	<u>5.9</u>	<u>43.5</u>	<5.0	<u>10.4</u>	22.4	<5.0	50	<5.0
Cobalt (µg/l)	7440-48-4	1	2.50	<5.0	<5.0	<5.0	Dry	<5.0	<u>8.1</u>	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	17.5	<5.0	3	3.8J
Fluoride (mg/l)	16984-48-8	2	0.189	0.16	0.15	0.12	Dry	<u>0.33</u>	<u>0.25</u>	<u>0.56</u>	<u>0.32</u>	0.12	0.073J	<0.1	<u>0.33</u>	0.34	0.069J	1.8	0.22
Lead (µg/l)	7439-92-1	15	2.50	<5.0	<5.0	<5.0	Dry	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	70.6	<5.0	25	<5.0
Lithium (μg/l)	7439-93-2	NE	42.7	15.0	14.0	31.9	Dry	<u>70.1</u>	25.5	8.5	23.4	23.3	19.6	<2.5	22.8	9.5	<2.5	NE	39.1
Mercury (µg/l)	7439-97-6	1	0.100	<0.20	0.20	<0.20	Dry	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.012	<5.0
Molybdenum (μg/l)	7439-98-7	NE	6.80	<5.0	<5.0	<5.0	Dry	<u>8.5</u>	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	160	249
Selenium (µg/I)	7782-49-2	20	5.00	<10.0	<10.0	<10.0	Dry	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	5	<10.0
Thallium (µg/l)	7440-28-0	0.2	13.7	<0.10	<0.10	<0.10	Dry	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.26	<0.10	0.24	0.32
Radium 226 (pCi/l)	13982-63-3	NE	0.800	0.137	0.417	0.391	Dry	<u>0.804</u>	0.135	0.000	0.233	0.127	0.260	0.000	-0.135	1.76	0.000	NE	0.295
Radium 228 (pCi/l)	15262-20-1	NE	1.29	0.861	0.749	0.627	Dry	<u>1.61</u>	0.625	0.0262	0.770	0.343	0.474	0.679	0.737	2.16	0.847	NE	0.128
Combined Radium (pCi/I)	7440-14-4	NE*	2.09	0.998	1.17	1.02	Dry	<u>2.41</u>	0.760	0.0262	1.00	0.470	0.734	0.679	0.737	3.92	0.847	NE	0.423
EPA APPENDIX I M	IETALS																		
Copper (mg/l)	7440-50-8	1	0.0025	<0.005	<0.005	<0.005	Dry	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.0258	<0.005	0.007	<0.005
Nickel (µg/I)	7440-02-0	100	2.50	<5.0	<5.0	<5.0	Dry	4.8J	<u>8.8</u>	<5.0	<u>8.2</u>	4.7J	<u>22.1</u>	<5.0	<u>6.8</u>	18.5	<5.0	88	8.6
Silver (μg/I)	7440-22-4	20	2.50	<5.0	<5.0	<5.0	Dry	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	0.06	<5.0
Vanadium (µg/l)	7440-62-2	0.3	5.50	<u>6.8</u>	<5.0	4.9J	Dry	4.1J	<5.0	<5.0	<5.0	4.5J	<5.0	<5.0	<5.0	103	<5.0	NE	<5.0
Zinc (mg/l)	7440-66-6	1	0.01	<0.01	<0.01	<0.01	Dry	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.115	<0.01	0.05	<0.01

J = Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit

Shaded = concentration reported above (or below for pH) established 2L Standard, IMAC, or 2B Standard

**Bold/Underlined** = concentration exceeded BTV

IMAC = Interim Allowable Maximum Concentration

<sup>\* =</sup> no established 2L Standard. 5 pCi/l is the Federal Standard

BTV = background threshold value calculated for January 2020

NE = not established

NT = not tested

μg/l = micrograms per liter

pCi/I = picocuries per liter

EQBL = Equipment Blank

mg/l = miligrams per liter

<sup>2</sup>L Standard = North Carolina Groundwater Protection Standard (T15A NCAC 02L .0202)

<sup>2</sup>B Standard = North Carolina Surface Water and Wetland Standards (15A NCAC 02B) for Gulf Creek (SW-1) and Shaddox Creek (SW-2) which are both Class WS-IV Waters or are National Criteria per EPA pH was field tested

Groundwater, surface water, and leachate samples collected from July 6-8, 2020 and analyzed for above parameters by Pace Analytical Services, LLC



#### 3.3 Surface Water Analytical Results

Surface water sample results were compared to the North Carolina Water Quality Standards for Surface Waters established under T15A NCAC 02B (2B Standards) or the EPA National Criteria Standard (utilized by the North Carolina Division of Water Quality as default standards for parameters not listed in 15A NCAC 02B). Four constituents (cobalt, mercury, selenium, and silver) were reported with MRLs that exceeded the 2B Standards. The cobalt MRL was  $5.0~\mu g/L$ , and the 2B Standard is  $3~\mu g/L$ . The mercury MRL was  $0.20~\mu g/L$ , and the 2B Standard is  $0.012~\mu g/L$ . The selenium MRL was  $0.06~\mu g/L$ . and the 2B Standard is  $0.06~\mu g/L$ .

- TDS, barium, cobalt, lead, thallium, copper, and zinc exceeded 2B Standards in the sample collected at SW-1.
- No exceedances of 2B Standards were reported in the sample collected from SW-2.

Standards have not been established under T15A NCAC 02B for the following constituents detected: calcium, lithium, radium-226, radium-228, and vanadium. Laboratory results are presented in **Table 5**.

#### 3.4 Leachate Analytical Results

One sample (LEACHATE) of leachate generated on-site was collected and analyzed during the current monitoring event. Increases in concentrations of boron, chloride, fluoride, sulfate, TDS, arsenic, lithium, molybdenum, radium-226, and nickel were observed when compared to the prior sampling event; however, results were generally within range of historical concentrations. Leachate sampling is required by the Permit to Operate and is disposed of in compliance with the Clean Water Act at either the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant or the Town of Spring Lake's South Harnett Regional Wastewater Treatment Plant.



## 4 Statistics

#### 4.1 Methodology

Background groundwater quality was evaluated to establish statistically-derived background concentrations for the site. Groundwater quality in downgradient wells was then compared to background concentrations to determine if a statistically significant increase (SSI) over background has occurred, as required by Section .1600 rules of the North Carolina Solid Waste Management Rules 15A NCAC 13B.

Sampling results used to establish background threshold values (BTVs) were obtained during twenty monitoring events performed between October 2015 and January 2020. Downgradient sampling results from the detection monitoring event in July 2020 were used to evaluate the potential for SSIs. Software packages ProUCL, NCSS, R and SPSS were used in the production of the statistics (ProUCL is offered by the USEPA; R is a free software environment; NCSS and SPSS are licensed software packages).

Groundwater samples collected as part of the monitoring program were analyzed for NCDEQ Solid Waste Appendix I (except VOCs), 40 CFR 257 Appendix III, and 40 CFR 257 Appendix IV constituents. Only non-filtered sample results were utilized for the statistical analysis of monitored constituents.

#### 4.1.1 Statistical Analysis

The background sample size (i.e., quantity of qualifying samples) was evaluated per constituent. Descriptive statistics were calculated for the background data set including and excluding non-detect (ND) values. When NDs were included in the data set, the method detection limit (MDL) was substituted as the ND value for simple descriptive statistics. The analysis was performed with NDs removed to better understand the central tendency and range of the detected values. Note that for the trend analyses in **Section 4.1.4** and for the establishment of statistically-derived background concentration levels in **Section 4.2**, imputation methods using the maximum likelihood method (MLE) for NDs, regression on order statistics (ROS) or Kaplan-Meier (KM) methods were used, where appropriate.

Following the calculation of descriptive statistics, statistical analyses for the background data set were performed to evaluate for outliers, data distributions, trends, and spatial variability between the background wells for Appendix I Metals, Appendix III and Appendix IV constituents, where data quantity and quality permit. A total of 25 samples (twenty monitoring events from BG-1 and five monitoring events from BG-2) were included for the descriptive analysis of the background monitoring well results for the monitored constituents. The first sampling event conducted in August 2015 was not included in the analysis as data obtained during this event were not consistent with data from subsequent rounds; sample analyses for the August 2015 event were performed by a different laboratory, possibly accounting for the disparity in results. January 2020 samples for boron were removed from the analysis as they were diluted and could not be properly detected.



For downgradient monitoring results, the analysis included the calculation of descriptive statistics for Appendix I Metals, Appendix III and Appendix IV constituents, (for the data sets including and excluding ND values), followed by an evaluation of outliers and trends. A total of twenty-one monitoring events performed between November 2015 and July 2020 were included for the descriptive analysis of the downgradient monitoring well results for the monitored constituents.

#### 4.1.2 Outliers

Outliers are values that are not representative of the population from which they are sampled. The background and downgradient data sets were screened for outliers using the Dixon's and Rosner's outlier tests. Dixon's outlier test is suitable for data sets containing less than 25 samples, while Rosner's test is suitable for data sets with 25 or more samples. The outlier test was conducted using a significance of one percent. For constituents that had NDs, the NDs were removed prior to testing for outliers.

Statistical outliers were identified in the background data set evaluated for three Appendix III constituents (calcium, sulfate, and total dissolved solids) and one Appendix IV constituent (barium). The constituent concentrations identified as statistical outliers were reported in samples collected from background well BG-2, except for total dissolved solids.

Statistical outliers were identified intermittently for numerous Appendix III and Appendix IV constituents and Appendix I Metals, in the data sets evaluated for downgradient monitoring wells throughout the monitoring period.

The statistical outliers were investigated as possible data entry or measurement errors. The value for total dissolved solids was considered an outlier and removed from the analysis. The remaining values were all within one order of magnitude of other observations and deemed correct. Given the variable nature of groundwater samples, the small sample sizes and that it is common for groundwater quality samples to have very low or very high concentrations over time, statistical outliers are expected but do not necessarily signify that the outliers are from different distributions. As additional background samples are collected over time, outlier test results may change and earlier observations thought to be outliers may no longer be outliers.

#### 4.1.3 Data Distribution

Groundwater data was fitted to known distribution models using Goodness-of-Fit (GOF) tests incorporated into ProUCL. For data sets comprised of 50 or fewer samples, ProUCL's GOF module incorporates the Shapiro-Wilk GOF test to determine normal or lognormal distribution and Anderson-Darling to determine gamma distribution. Normal, lognormal and gamma distributions are parametric distributions. If a data set could not be fit with any of these three parametric distributions, it was considered to follow a nonparametric distribution.

Note that ProUCL does not provide GOF results for data sets with less than three detected values due to insufficient data. For purposes of estimating background concentrations, these data sets were treated under non-parametric distribution assumptions with the maximum detected value chosen to represent the background concentrations.



#### 4.1.4 Trends

Background constituent concentrations in groundwater should demonstrate stationary conditions through time, free of trends. Constituents were analyzed for trends within the data set using a maximum likelihood estimate (MLE) regression for constituents which followed parametric distributions and Mann-Kendall tests for those that were treated under nonparametric distributional assumptions. The MLE regression can be applied to data sets that can be fitted to a specific distribution model, and that contain NDs with multiple MDLs. The Mann-Kendall test is suitable for data series with no discernable distributions and only one MDL value for NDs.

Constituents treated under nonparametric data assumptions (either tested as nonparametric or having more than 50 percent NDs) and with multiple MDLs or with less than three detected values were not assessed for trends.

The background well regression analysis showed a potential increasing trend for fluoride (an Appendix III and Appendix IV constituent) and a potential decreasing trend for two Appendix III constituents (chloride and sulfate) and three Appendix IV constituents (barium, lithium, and radium-226). There were no increasing or decreasing trends identified for other constituents with sufficient data quantity and quality for testing with the MLE analysis or Mann-Kendall test. The statistical trends identified for barium, chloride, fluoride, lithium, sulfate, and radium-226 should be closely monitored as additional background samples are collected.

Trends were also evaluated for constituents in each downgradient well using the same methods as described above for the background data set. Trends were identified for select constituents at select monitoring well locations and should be monitored as additional downgradient groundwater data are collected at the site (**Section 4.2**).

#### 4.1.5 Spatial Variability

Spatial variability refers to identifying whether or not there are statistically identifiable differences in mean concentrations or variance levels across the well field (i.e., the pooled background data). To evaluate the potential for spatial variability between the background wells, parametric and nonparametric analysis of variance (ANOVA) tests were used to test differences in sample mean or median levels at the 5 percent level of significance. Side-by-side box plots for each constituent were also used to determine if variation is significant from a visual perspective.

Potential spatial variability between background wells BG-1 and BG-2 was identified for six Appendix III or Appendix IV constituents (barium calcium, fluoride, pH (field), sulfate and total dissolved solids). The observed spatial variability is indicative of the hydrogeological regime at the site and values between the two wells are within an order of magnitude of each other. Given the relatively small sample size of BG-2 (five events), the statistically-identified variability in concentrations for each constituent are preliminary and considered appropriate for the purpose of calculating background concentrations. The distributional patterns for constituents at the background wells will continue to be monitored for spatial variability and should be re-evaluated as the data set grows.



#### 4.2 Evaluation for SSIs over Background

Based on the statistical evaluations performed, BTVs were calculated for the detection monitoring program at the site for Appendix I metals, Appendix III and Appendix IV constituents. For constituents that have all ND background values, the maximum MDL is chosen to represent background and the double quantification rule (DQR) is used to evaluate whether there is an SSI. The BTV provided for detection monitoring constituents is the statistically-derived background concentration (i.e., upper prediction limit [UPL]), the maximum detected value or the maximum MDL depending on the level of censorship in each of the background samples.

Downgradient sampling results from the second detection monitoring event in July 2020 were used to test for SSIs. Downgradient concentrations were compared to BTVs. For constituents that have all ND background values, the DQR is applied; that is, an SSI is registered for the well-constituent pair if the downgradient concentrations exhibit detects in two consecutive sampling events. Downgradient sampling results from the April 2020 and July 2020 sampling events were used to test for SSIs for constituents that have all ND background values.

#### 4.3 Statistical Summary

BTVs were calculated using wells BG-1 and BG-2 as the background monitoring wells. However, eight monitoring wells (MW-1 through MW-8) were installed and sampled (October 2015) prior to ash placement, thus representing pre-ash conditions at the site.

SSIs were found for one Appendix I metal (nickel), six Appendix III constituents (boron, calcium, chloride, fluoride, pH (field), and total dissolved solids), and eight Appendix IV constituents (antimony, barium, chromium, cobalt, fluoride, lithium, radium-228, and total radium). Comparing the July 2020 sampling event results to pre-ash sampling results from those eight wells, current downgradient concentrations are generally similar to concentrations reported prior to ash placement. Of the fourteen constituents with observed SSIs, two (calcium and pH) were not within the range of pre-ash conditions. Depending on the data distribution of the constituent, the BTVs have been computed to allow for one to three verification samples. With verification sampling, the validity of the SSIs can be confirmed. Additional details regarding statistical methodology and results is provided in **Appendix E**.



## 5 Summary and Conclusions

The 2020 Second Semi-Annual Detection Monitoring Event was conducted at the Brickhaven No. 2 Mine Tract "A" Structural Fill site from July 6-8, 2020. A summary of the findings from this event is provided below.

#### 5.1 Groundwater

- Antimony, arsenic, beryllium, boron, cadmium, copper, lead, selenium, silver, thallium, and zinc were not detected above the MRL.
- Chloride exceeded the 2L Standard of 250 mg/L in the following wells: BG-2, MW-1, MW-3, MW-4, MW-7R, and MW-8. Chloride exceeded the BTV in wells MW-1, MW-3, and MW-4. Concentrations were consistent with the prior sampling event, except that the concentration in MW-1 (1,010 mg/L) was higher than previously recorded.
- The pH values did not fall within 2L Standard range of 6.5-8.5 SU in samples collected from the following wells: BG-1, MW-1, MW-3, MW-4, MW-5, and MW-6. pH was reported outside of the BTV range in wells MW-5 and MW-7R.
- TDS exceeded the 2L Standard of 500 mg/L in all wells sampled except MW-5. TDS exceeded the BTV in well MW-3. Concentrations increased in BG-2, MW-1, and MW-7R, as compared to the prior sampling event.
- Barium exceeded the 2L Standard of 700  $\mu$ g/L in well MW-8. Barium exceeded the BTV in wells MW-3 and MW-8.
- Calcium exceeded the BTV of 89,600 µg/L in wells BG-2, MW-1, MW-3, MW-7R, and MW-8.
- Chromium exceeded the 2L Standard of 10 μg/L in wells MW-6 and MW-8. Chromium exceeded the BTV in wells MW-6, MW-7R, and MW-8.
- Cobalt exceeded the IMAC of 1 μg/L and the BTV of 2.50 μg/L in well MW-4.
- Fluoride exceeded the BTV of 0.189 mg/L in wells MW-3 through MW-6, but did not exceed the 2L Standard of 2.0 mg/L in any wells.
- Lithium exceeded the BTV of 42.7 μg/L in well MW-3.
- Mercury exceeded the BTV of 0.100  $\mu$ g/L in well BG-2, but did not exceed the 2L Standard of 1  $\mu$ g/L in any wells.
- Molybdenum exceeded the BTV of 6.80 µg/L in well MW-3.
- Nickel did not exceed the 2L Standard of 100 μg/L, but did exceed the BTV of 2.50 μg/L in wells MW-4, MW-6, and MW-8.
- Radium 226, 228, and combined radium exceeded the BTVs in well MW-3.
- Sulfate exceeded the BTV of 64.7 mg/L in BG-2, but did not exceed the 2L Standard of 250 mg/L in any wells.
- Vanadium exceeded the IMAC of 0.3 μg/L and the BTV of 5.50 μg/L in well BG-1.

#### 5.2 Surface Water

- TDS, barium, cobalt, lead, thallium, copper, and zinc exceeded 2B Standards in the sample collected at SW-1.
- No exceedances of 2B Standards were reported in the sample collected from SW-2.



#### 5.3 Leachate

Increases in concentrations of boron, chloride, fluoride, sulfate, TDS, arsenic, lithium, molybdenum, radium-226, and nickel were observed when compared to the prior sampling event; however, results were generally within range of historical concentrations.

#### **5.4 Statistical Analysis**

- Statistical outliers were identified in the background data set evaluated for barium, calcium, sulfate, and TDS. Intermittent statistical outliers for Appendix III and Appendix IV constituents and Appendix I Metals, in the data sets evaluated for downgradient monitoring wells, were noted throughout the monitoring period.
- Groundwater quality in wells was compared to background concentrations to determine if a SSI over background has occurred:
  - Fourteen constituents were found to have SSIs: antimony, barium, boron, calcium, chloride, chromium, cobalt, fluoride, lithium, nickel, pH (field), radium-228, total dissolved solids, and total radium.
    - The BTV for antimony is a non-detect, represented by the maximum MDL, therefore the DQR is used for evaluating SSIs. An SSI is registered for antimony in MW-4 because the April 2020 (7.00 μg/L) and July 2020 (3.4 J μg/L) sampling events exhibited detect values.
    - Comparing the July 2020 sampling event results to the pre-ash sampling results, calcium and pH are not within the range of pre-ash conditions.
- HDR believes that the presence of SSIs is the result of low background concentrations
  that may not represent data collected prior to CCP placement (August and October 2015
  sampling events) and is influenced by natural and seasonal variations at the site. In
  general, the SSIs reported during this sampling event are either consistent with those
  evaluated in the Alternate Source Demonstration (ASD) dated March 29, 2019 or are
  potential SSIs to be verified during the next sampling event.



## 6 Recommendations

Based on the findings, and pending receipt of comments from NCDEQ regarding the Assessment Monitoring Report (HDR 2020) submitted on July 13, 2020, HDR makes the following recommendations:

- Continue semi-annual detection monitoring in accordance with permit requirements.
- Evaluate the validity of SSIs by further assessing sampling protocols/performance, spatial variability, and seasonality of constituent concentrations as additional sampling rounds are conducted.

## 7 References

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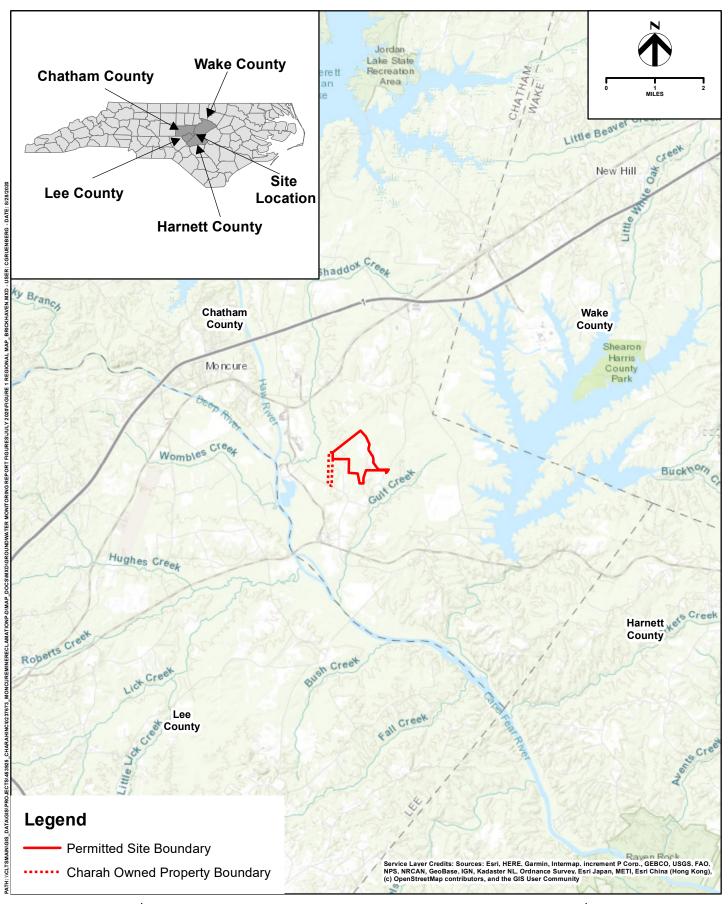
# Figures

Figure 1: Regional Site Location Map

Figure 2: Regional Topographic Map

Figure 3: Sample Location Map

Figure 4: Potentiometric Surface Map – July 2020





REGIONAL SITE LOCATION MAP CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA

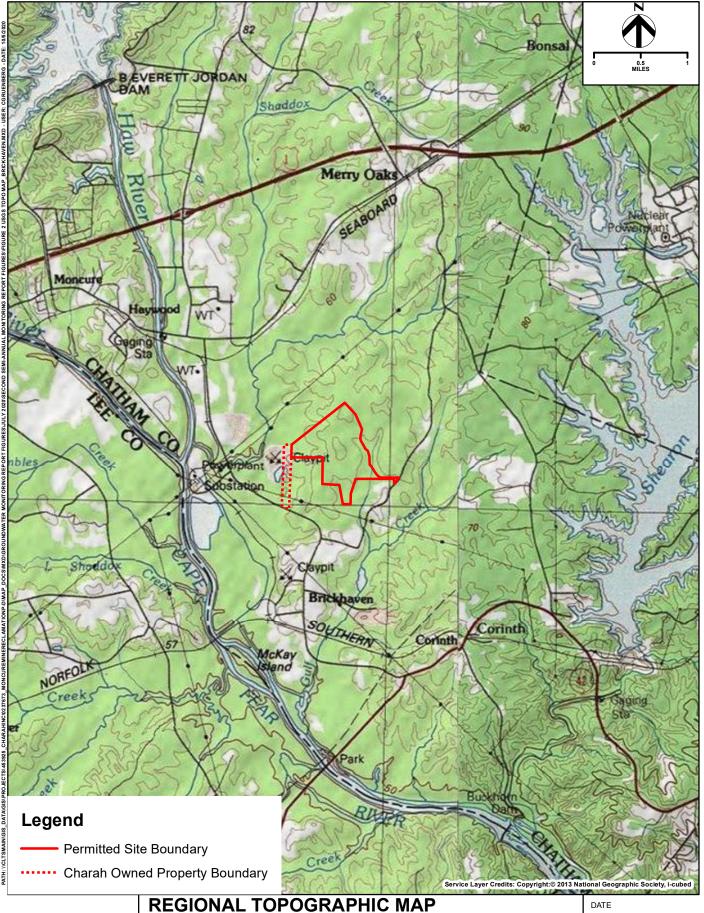
BRICKHAVEN NO. 2 MINE TRACT "A"

DATE

JULY 2020

FIGURE

1



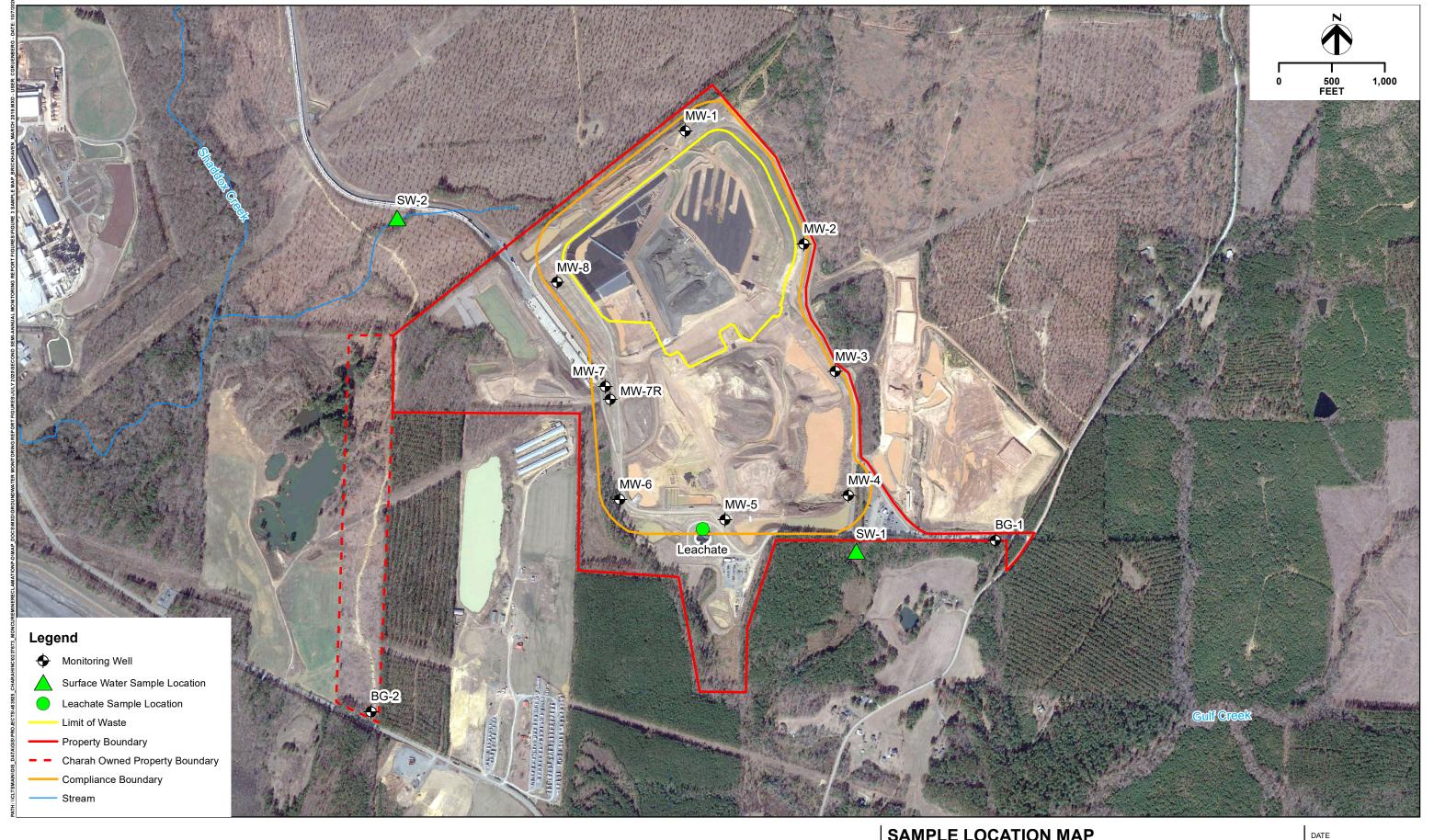


**CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA** 

FIGURE

2

**JULY 2020** 



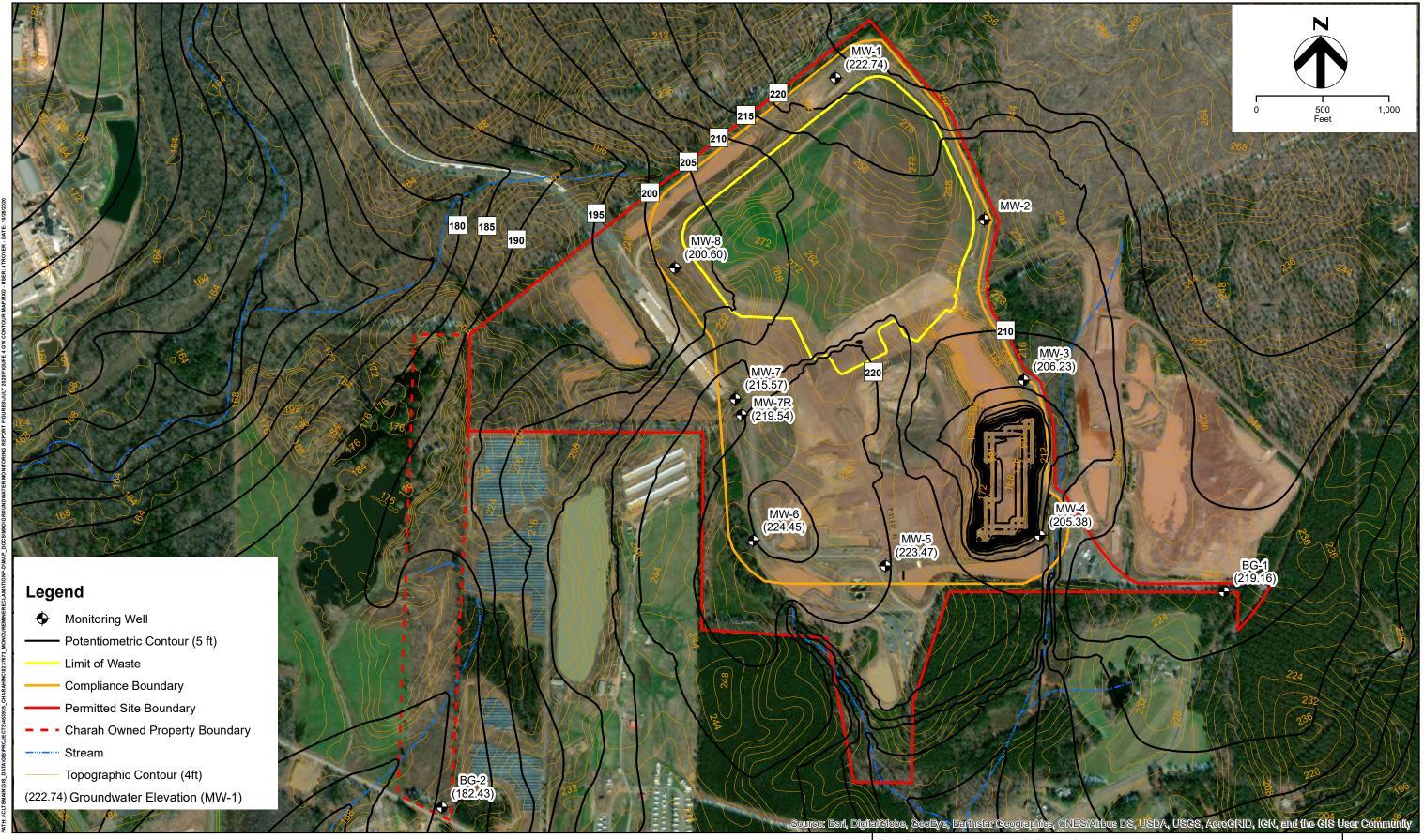


SAMPLE LOCATION MAP CHARAH SOLUTIONS, INC.
MONCURE, NORTH CAROLINA

FIGURE

BRICKHAVEN NO. 2 MINE TRACT "A"

JULY 2020



- 1. Groundwater elevations derived from depth to water measurements collected in July 2020.
- Groundwater elevations derived from ACDOT Geographic Information System (GIS) website (Dated 2007).
   Groundwater elevation in MW-2 was not used for contour as it may have been affected by filling of mine pond
- and may not be representative of static groundwater conditions.

  4. The pond near MW-4 was dewatered and actively being filled in and graded during the groundwater gauging.
- 5. Groundwater contours adapted from groundwater flow model constructed for Assessment Monitoring Report (July 2020) using groundwater elevations calculated from June 6, 2020 gaging event.



**GROUNDWATER CONTOUR MAP - JULY 2020** CHARAH SOLUTIONS, INC.
MONCURE, NORTH CAROLINA

**JULY 2020** 

FIGURE

BRICKHAVEN NO. 2 MINE TRACT "A"





Appendix A – Field Data Sheets

#### **HYDROLOGIC DATA SHEET - DEPTH**

Project Name: Charah GW	Date: 7/6/20
Project Address: Moncure, NC	Project No: 10021146
Time Started: 10 20	Time Finished: 1115
Personnel: Jacob Ruffing	Signature:

	Depth to	Total
Well ID	Water (btoc)	Depth
BG-1	9.03	43.78
B6-2	11.80	26.11
B6-35		
MW-1	57,34	75:55
MW - 2	31.95	50.6
MW-3	16.33	43.6
MW = 4	11.75	25 74
MW-5	21.39	46.96
MW-6	6.50	27,93
MW-7	16.14	17.64
MW-2R	20.40	39.94
NW -46	35.87	49.68

	Depth to Total											
Well ID	Depth to Water (btoc)	Depth										
	-											



Notes: Pumprate=

## **Groundwater Sampling Form**

Sample ID:_	110.	

Site Information								
Site Name: Charah	Project Number: 10021146							
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing							
Date: 7/4/20	Weather: Sonny							

Well Information								
Well Diameter (in): ~	Purge Equipment:							
Screened Interval (ft):	Pump Type:							
Well Depth (ft):	Pump Depth (ft-bTOC):							
Depth-to-Water (ft-bTOC): 第 57.33	Tubing Diameter (in):							
Water Column Thickness (ft):	Well Volume (ft^3):							
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity								
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47							

					Purging	Informa	tion					
Parame	arameter Instrument(s): Hanna, YSI											
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)	
1730	t		300	57.45	6.88	19.9	1592	0.31	-244	257	brown	
1250	6	7	300	57.45	6.60	21.0	2379	0.35	-29.6	119	clear	
1305	4.5	il.5	300	57.45	6.57	20.5	7604	0.38	-29.1	40.7	clear	
1315	3	14,5	300	57,45	6.57	21.4	27,24	0.39	-30.3	16.4	11	
1330	4.5	19	300	57.45	6.56	21.1	2852	0.40	-30.4	11.0	11	
1335	1.5	20.5	300	57.45	6.54	20.9	2967	0.38	-30.8	10.5	11	
1340	1.5	22	300	57.45	6.53	20.6	3068	0.42	- 30.8	7.00	11	
1345	1.5	23.5	300	57.45	6.51	21.2	3245	0.42	-30g	9.70	"	
1400	4.5	W1278	300	57.47	6.49	21.2	3505	0.46	~30.7	8.20	"	
1405	1.5	29	300	57.47	6.48	20.4	3602	0.44	-30,2	4,62		
Pu	irging Equipr	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify	

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
my				1.5
7				
Sampled By: Jaco		Sample Time: 14 48		
Date Sampled:	7/81	Sampler Signature:	2	



Sample ID: MW /

Purging Information (Page 2)											
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C) (3%)	COND. (μS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1410	1.5	30.5	300	57,47	6.47	20.(	3641	0.49	-29.7	377	elear
1430	3	33.5	300	57.47	6.46	20.9	3814	0.49	-29,6	4.44	clear
				1	hr	PUC					
					- Y ( 1						7.5
			l.								
								<u> </u>			
								<u> </u>			
								-			
										1	
	-									-	
	-		-								
			-						-		
								14			
	-										



Sample ID:	MW	-5
------------	----	----

Site Information							
Site Name: Galvan GW Charah	Project Number: 10026839						
Site Location: Harrisburg, NC	Sampling Personnel: Jacob Ruffing						
Date: 7/7/10	Weather:						

	Well Information (
Well Diameter (in):	Purge Equipment:
Screened Interval (ft):	Pump Type:
Well Depth (ft):	Pump Depth (ft-bTOC):
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):
Water Column Thickness (ft):	Well Volume (ft^3):
* 1 Well Volum	e = (Total Depth - Static Water Level) * Well Capacity
Well Capacity (gallons per feet): 0.75" = 0.0	2; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (μS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1020											
00	7/6	5 AUSO	100	1							
1020	)	7	]		5.50	14.3	448.0		_	25.1	į
Pu	irging Equipr	ment Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submers	sible Pump;	PP = Peristaltic	Pump; O = :	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
			-	
. /				
MW-S				
( ` ` `				
			51	
Sampled By: Jacob Ruffing		Sample Time: [O 2 O		
Date Sampled:	7/7/	<b>Sampler Signature:</b>		



Sample	ID:_	Sh	1-	Z

	Site Information	
	Site information	
Site Name: Charah	Project Number: 10021146	
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing	
Date: 7/6/20	Weather:	

	Well Information					
Well Diameter (in):	Purge Equipment:					
Screened Interval (ft):	Pump Type:					
Well Depth (ft):	Pump Depth (ft-bTOC):					
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):					
Water Column Thickness (ft):	Well Volume (ft^3):					
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity						
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; $1.25" = 0.06$ ; $2" = 0.16$ ; $3' = 0.37$ ; $4" = 0.65$ ; $5" = 1.02$ ; $6" = 1.47$					

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1145	9		{	)	8.24	27.4	105.1	0.91	0.5	45.1	)
Pu	ırging Equipr	Purging Equipment Codes (circle): B = Bailer; BP = Bladder Pump; ESP = Electric Submersible Pump; PP = Peristaltic Pump; O = Specify									

	Sample Information				
Collection Time	Parameter	Container	Preservative		
b Ruffing	Sample Time: 1/45				
7/6/2	Sampler Signature:	Sampler Signature:			
	Time b Ruffing	Collection Time Parameter  Barraneter  Barraneter	Collection Time Parameter Container  Barrameter Time Container  Container  Container  Container  Container  Container  Container		



_	_	C.1	/	,
Samp	le ID:	21	V	/

Site Information					
Site Name: Charah Project Number: 10021146					
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing				
Date: 7/6/20	Weather:				

	Well Information				
Well Diameter (in):			Purge Equipment:		
Screened Interval (ft):			Pump Type:		
Well Depth (ft):			Pump Depth (ft-bTOC):		
Depth-to-Water (ft-bTOC):			Tubing Diameter (in):		
Water Column Thickness (ft):	Water Column Thickness (ft): Well Volume (ft^3):				
1 Well Volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47					

					Purging	Informa	tion				
arame	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (μS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1200		/	1	1	7.44	24.9	55.7	7.18	3.2	>1000	
						2					
Pı	rging Equipr	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
/17				3
SW-2				
Sampled By: Jaco	b Ruffing	Sample Time: (200	н	
Date Sampled:	7/6	Sampler Signature:		



		M	r 1	_
Sample	ID:	1 (	<b>h</b> /-	.)

Site Information					
Site Name: Galvan GW Charlesh	Project Number: 10026839				
Site Location: Ḥarrisburg, N€	Sampling Personnel: Jacob Ruffing				
Date: 7/7/70	Weather:				

	r.	Well Information			
Well Diameter (in):		Purge Equipment:			
Screened Interval (ft):		Pump Type:			
Well Depth (ft):	\	Pump Depth (ft-bTOC):			
Depth-to-Water (ft-bTOC):		Tubing Diameter (in):			
Water Column Thickness (ft):		Well Volume (ft^3):			
1 Well volume = (Total Depth - Static Water Level) * Well Capacity					
Well Capacity (gallons per feet): 0.75" = 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47					

	Purging Information										
Paramet	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
00	7/	- Pc	1601	des							
0810	-	~	) (	~	618	28.6	560,0		_	42.5	-
 Pu	rging Equipr	nent Codes (circle	e): B = Baile	er; BP = B1	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify

		Sample Information					
Sample Number	Collection Time	Parameter	Container	Preservative			
			ie s				
Sampled By: Jaco		Sample Time: クマル					
Date Sampled: キ/ャ/てる			Sampler Signature:				



Sample	ID:	M	W-	7
Julipic				

, Site Information					
Site Name: Galvan GW Chara h	Project Number: 10026839				
Site Location: Harrisburg, NC	Sampling Personnel: Jacob Ruffing				
Date: 7/6	Weather:				

			Well Information \
Well Diameter (in):			Purge Equipment:
Screened Interval (ft):			Pump Type:
Well Depth (ft):	1		Pump Depth (ft-bTOC):
Depth-to-Water (ft-bTOC):	/		Tubing Diameter (in):
Water Column Thickness (ft):			Well Volume (ft^3):
	1 We	II Volume =	(Total Depth - Static Water Level) * Well Capacity
Well Capacity (gallons per	feet): 0.7	75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47

					Purging	Informa	tion				
Parame	ter Instru	ı <b>ment(s)</b> : Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
7/6-	Pula	ed dr	/								
7/7	- NO	-	a/Q	2,00	Sam	Ple					
<b>/</b> =			)								
Pı	urging Equipr	nent Codes (circl	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
Sampled By: Jaco	b Ruffing	Sample Time:		
Date Sampled:		Sampler Signature:		



Sample ID: BG

Site Information							
Site Name: Charah Project Number: 10021146							
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing						
Date: ユ/奴/ 20	Weather: cloude						

	Well Information
Well Diameter (in): て	Purge Equipment:
Screened Interval (ft):	Pump Type:
Well Depth (ft):	Pump Depth (ft-bTOC):
Depth-to-Water (ft-bTOC): 7.95	Tubing Diameter (in):
Water Column Thickness (ft):	Well Volume (ft^3):
1 Well Vol	ume = (Total Depth - Static Water Level) * Well Capacity
Well Capacity (gallons per feet): 0.75" =	0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47

					Purging	Informa	tion				
Parame	Parameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
0945	4	4	400	13.68	6.74	18.1	1061	2.17	-24.6	676	65-20
1005	8	(2	400	13,22	6.38	18:1	1067	0.23	-76.6	119	clear
1015	4	16	400	13.40	6.36	18.1	1050	0.18	-28,2	41.2	clear
1025	4	70	400	13.44	6.31	19.1	10:30	0.16	-270	39.0	eleni
1030	4	24	400	13,46	6.31	18.2	1023	0.15	~27.1	32.5	1/
1040	¥	28	400	13.50	6.28	18.7	1016	0.15	~24.9	28.4	11
1045	2	30	400	13 55	6.28	181	1007	0.13	- 25.0	23.5	"/
1050	7	32	400	13.62	6.28	18.0	1000	0.13	-25.4	16-0	11
1055	2	34	400	13.67	6.28	18,2	995	0.12	-25.8	14.8	11
1100	7	36	400	13.67	6.28	18.1	990	0:13	-25.4	17.1	11
Pu	rging Equipr	nent Codes (circle	e): B = Baile	er; BP = BI	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O =	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
261				
BG-1	-			
Block				
1,501				
Sampled By: Jaco	b Ruffing	Sample Time: 1150		
Date Sampled:	7/8/	Sampler Signature:		

**FDS** 

## **Groundwater Sampling Form**

Sheet 2 of 2 RG-1 Sample ID: 86-7

	Croundwater bumping room										
					Purging In	nformation	(Page 2)				
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP (°C) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1105	2	34	400	13.67	6.27	14.0	983	0.12	-25.4	11.1	clear
1110	2	40	400		6.26	181	982	0.11	-25.1	11.14	clear
1115	2	47	400		6.27	18.1	981	0.14	-25.1	155	11 ,
1120	2	44	400		6.27	18.1	979	0.13	-24.9	16.1	'/
1125	2	46	400	13.67	6.24	18.1	473		-25.9	11.2	pt
1130	2	446	400		6.28	18.3	470		-26.3	10.3	6
1135	2	50	400	13.67	6.27	14.0	963	0.12	-25.8	9.14	
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										1	



Sam	ple	ID:	BG-	2

	Site Information				
Site Name: Charah Project Number: 10021146					
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing				
Date: 7/4/10	Weather: Overcast				

	Well Information
Well Diameter (in):	Purge Equipment:
Screened Interval (ft):	Pump Type:
Well Depth (ft):	Pump Depth (ft-bTOC):
Depth-to-Water (ft-bTOC): 11-55	Tubing Diameter (in):
Water Column Thickness (ft):	Well Volume (ft^3):
1 Well V	olume = (Total Depth - Static Water Level) * Well Capacity
Well Capacity (gallons per feet): 0.75"	= 0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47

					Purging	Informa	tion				
Parame	ter Instru	ment(s): Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
0725	T	1	400	13.00	7.20	16.8	2636	1.00	-14.8	OR	clasely
0735	U	5	400	13.63	6.99	16,9	1444	0.25	-10.3	176	clour
079	444	4139	400	13.88	6.82	16.9	1806	0.18	-72.7	<4.0	cleac
2753	4	13	400	14-15	6.77	16.4	1798		-24.1	48.5	clear
0805	4	17	400	14.19	6.75	17.0	1790	0.12	-25,1	33.0	11808
0415	4	2021	400	14.38	6.45	17.1	1784	0.11	-25.5	29.5	clear
6425	2.5	23.5	250	14.12	6.74	17.6	1780	0.11	-26,4	25.0	1/10/
0435	2.5	26	250	14.12	6.74	17.7	1409	0.10	-28,9	26.2	clear
0446	1.25	27.25	250	14.16	6.44	17.6	1424	0.10	- 29.3	27.7	clear
manual states is beneficial some in		***************************************			THE PERSON NAMED IN ADDRESS OF THE OWNER, OF TAXABLE PARTY OF TAXABLE PARTY OF TAXABLE PARTY.	54	70/2				
Pι	ırging Equipn	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify

		Sample Information						
Sample Number	Collection Time	Parameter	Container	Preservative				
BG-2			7.					
1501		*						
Sampled By: Jaco		Sample Time: 0855						
Date Sampled:	7/8/20	Sampler Signature:	Sampler Signature:					



Sample ID:	MW-7R
• 99	

Site Information							
Site Name: Charah	Project Number: 10021146						
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing						
Date: 7/2/20	Weather: Overcast						

	Well Information				
Well Diameter (in):	Purge Equipment:				
Screened Interval (ft):	Pump Type:				
Well Depth (ft):	Pump Depth (ft-bTOC):				
Depth-to-Water (ft-bTOC): 「年.80	Tubing Diameter (in):				
Water Column Thickness (ft):	Well Volume (ft^3):				
1 Well Volu	ume = (Total Depth - Static Water Level) * Well Capacity				
Well Capacity (gallons per feet): 0.75" = (	0.02; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI								
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
1255	1	l	150	22.20	7.33	21.3	1564	6.49	-18.8	589	bown
1310	2.25	3.25	150	24.50	7.34	21.7	1563	7.34	-18.5	-	_
1345	d	19	150	32.30	7.33	21.0	1567	5.30	-20.5	51.5	clear
13.56	1.5	20,5	150	27.41	7.36	21.0	1563	4.40	-215	24.3	11
1335	1.5	22	150	22.50	7.36	21.0	1562	4.00	-7.3,4	17.0	11
131400	1.5	235	150	27.60	7.36	21.1	1562	3.68	-24.2	14,3	1/
1415	2.25	25,75	150	32.40	7.36	21.2	1565	3.88	-27.0	16.5	11
1420	8,75	26.50	150	32,98	7,35	21.1	1562	3,81	-27.4	12.0	11
1430	1.5	28	150	33.18	7.35	70.4	1557	3.75	-27.4	11.0	11
1440	1.5	24.5	150	33.40	7.35	21.2	1557	3.69	-27.6	8,94	1
Pι	ırging Equipr	ment Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O =	Specify

54-6L2

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
MW-7R				
C	1. D. (f)			
Sampled By: Jaco		Sample Time: 1450		
Date Sampled:	7/7/20	Sampler Signature: A		



Sample ID:	MW-4
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Site Information Site Name: Charab Project Number: 10021146			
•	Site Information		
Site Name: Chara <u>b</u>	Project Number: 10021146		
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing		
Date: 7/7/20	Weather: cloudy		

	Well Information				
Well Diameter (in):	Purge Equipment:				
Screened Interval (ft):	Pump Type:				
Well Depth (ft):	Pump Depth (ft-bTOC):				
Depth-to Water (ft-bTOC): 11.32	Tubing Diameter (in):				
Water Column Thickness (ft):	Well Volume (ft^3):				
1 Well Volume	e = (Total Depth - Static Water Level) * Well Capacity				
Well Capacity (gallons per feet): 0.75" = 0.0.	2; 1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47				

	Purging Information										
Parame	Parameter Instrument(s): Hanna, YSI										
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)
0910	1	1	200	13.48	6.20	16.4	1962	0.42	17.7	738	brown
0120	l l	2,	150	13.59	(ar05	19.7	2018	1.33	-17.0	OR	11
0440	3006	45	130	13.70	6.04	19.8	2172	0.56	-20.8	629.	11
1050	(-53)	1165	150	1359	6.10	19.9	2148	0.31	-20.8	111	cloar
1100	1.53	148	150	13.62	6.09	19.8	2191	0.24	-14.8	57.0	11
1110	1.53	1795	150	13,69	6.07	19.9	2185	0.39	-18.7	42.1	clear
1120	1-53	2011	150	13.57	6,11	20.0	2206	0.14	-14.4	35.5	11
1130	15\$ 1	1 23125	150	13.50	6.11	20.1	2204	0.14	-19.5	33,0	1/
1140	1,5	15	150	13.55	6,12	20.0	27.08	0.11	-19.7	25.8	11
1150	1.5	16.5	150	13.55	6.10	20.1	2193	0.10	-18.8	29.3	11
Р	urging Equipr	ment Codes (circl	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O =	Specify

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	1225			
MW-4				
		* *		(4)
Sampled By: Jac	ob Ruffing	Sample Time: 17 2	5	
Date Sampled:	7/7/20	Sampler Signature:	2	

**FDS** 

## **Groundwater Sampling Form**

Sheet <u>21</u> of <u>2</u>

Sample ID: <u>Mw-4</u>

					Purging I	nformation	(Page 2)				1
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C) (3%)	COND. (μS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	• COLOR/
620	3	14.5	150	13:45	6.13	20.4	2209	0.09	-19.5	29.30	clear
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FDS	Groundwater Sampling Form	Sample ID: MW-8				
	Site Information					
Site Name: Charah	Project Number: 10021146					
Site Location: Moncure, NC	Site Location: Moncure, NC Sampling Personnel: Jacob Ruffing					
Date: 7/7/20	Weather: Overcast					

Well Information								
Well Diameter (in):	Purge Equipment: Mrga monsoon							
Screened Interval (ft): 34-06-49.06								
Well Depth (ft): 49.06	Pump Depth (ft-bTOC): 44							
Depth-to-Water (ft-bTOC): ろくの	Tubing Diameter (in):							
Water Column Thickness (ft):	Well Volume (ft^3):							
1 Well Volume =	1 Well Volume = (Total Depth - Static Water Level) * Well Capacity							
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; 1.25" = 0.06; 2" = 0.16; 3' = 0.37; 4" = 0.65; 5" = 1.02; 6" = 1.47							

	Purging Information											
Parame <sup>*</sup>	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI									
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)	
0745	5	5	300	3752	7.10	19.5	1947	3.95	-21.5	104	clour	
0750	3	46	300	37.39	7.05	19.8	1732	1-54	-22.3	28.8	11	
0410	6	14	300	37.35	7.03	19.9	1563	0.98	~27.3	18.3	11	
0820	3	17	300	37.35	7.00	20.1	1497	0.78	-21.9	9.61	11	
0830	3	20	300	3735	7.00	70.1	148c	0.69	-22.3	8.87	11	
0835	3	23	300	37.35	7.00	28.2	1470	0.66	-22.3	7.54	11	
0440	3	26	300	37.35	7.00	20,3	1459	8.61	-27.7	6.22	11	
0445	3	24	300	37.35	7.00	20.2	1452	0.57	-23,1	6.24	11	
0450	3	32	300	37.35	7.00	20.3	1448	0.55	- 23,2	5.91	11	
~			}	<u></u>	5+961	e -						
Pu	ırging Equipr	nent Codes (circl	e): B = Baile	er; BP = BI	adder Pump;		ctric Submer	sible Pump;	PP = Peristaltic	Pump; O = :	Specify	

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
MW-4				
· ·				
Sampled By: Jaco		Sample Time: 0900 Sampler Signature: 900		
Date Sampled:	7/7/20	Sampler Signature: 9/0	2	

Notes: Pumprate=



Notes: Pumprate=

Version: 02/13/2020		Sheet 1 of 2
FDS	Groundwater Sampling Form	Sample ID: MM-C
	Site Information	
Site Name: Charah	Project Number: 10021146	
Site Location: Moncure, NC Sampling Personnel: Jacob Ruffi		
Date: 7/6/20	Weather: Suny	

Well Information								
Well Diameter (in): Z	Purge Equipment: Maga mon so on							
	Pump Type: impellar							
Well Depth (ft): 29.47	Pump Depth (ft-bTOC): てず							
Depth-to-Water (ft-bTOC):	Tubing Diameter (in): 3/4							
Water Column Thickness (ft):	Well Volume (ft^3):							
1 Well Volume =	(Total Depth - Static Water Level) * Well Capacity							
Well Capacity (gallons per feet): 0.75" = 0.02;	1" = 0.04; $1.25" = 0.06$ ; $2" = 0.16$ ; $3' = 0.37$ ; $4" = 0.65$ ; $5" = 1.02$ ; $6" = 1.47$							

	Purging Information												
Parame	arameter Instrument(s): Hanna, YSI												
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)		
1320	3	3	400	4.00	6.20	27.7	1057	3.61	-11.2	08	brown		
1330	4	7	150	<b>460</b>	6.23	229	1050	0.39	-13/2	379	clouds		
1340	1.5	4.5	45-6300	4.55	6.20	23.5	1053	0,22	~11.1	182	doude		
1350	-3	11.5	300	4.45	6.10	27.5	1055	0.15	-4.9	131	11		
1400	3	14-5	300	8.90	6-14	22.1	1057	0.13	~4.7	71.1	Clear		
1410	3	17.5	300	6.92	6-14	21.9	1057	0.11	. 3.6	60.5	11		
1420	3	20.5	300	4.44	6.15	22.1	1057	0.10	- 2.8	51.9	11		
14 40	6	26.5	300	4.02	6.15	21.9	10467	0.00	-3.4	400	11		
1450	3	29.5	300	4.08	6.17	220	1076	0.09	-4.1	3/.3	11		
1500	3	32.5	300	9.15	6.17	21,4	1081	0.03	-5.6	30,0	10		
Pι	ırging Equipn	nent Codes (circle	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O=	Specify		

		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
	1530			
M(.)-/.				
MW-6 Dopiuso	-			
Sampled By: Jaco		Cample Times 15.25	( ) ( ) ( ) ( )	
	4 7/6/20	Sample Time: 75 30 Sampler Signature:	7 24 10 (Dup	



## **Groundwater Sampling Form**

Sheet 2 of 2Sample ID: MW-6

	Groundwater Sampling Form Sumple 18.													
	Purging Information (Page 2)													
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (°C) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)			
1510	3	35.5	300	9,15	6.16	21.8	1076	0.07	-6.5	24.9	clear			
1520	_3	34.5	300	9.20	6.15	21.6	1088	0.07	-4.2	24.9	Clear			
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# Groundwater Sampling Form Sample ID: <u>Gadate</u>

	Site Information							
Site Name: Charah	te Name: Charah Project Number: 10021146							
Site Location: Moncure, NC	Sampling Personnel: Jacob Ruffing							
Date: 6 J_1 2020	Weather: Sunny							

Well Information									
Well Diameter (in):	Purge Equipment:								
Screened Interval (ft):	Pump Type:								
Well Depth (ft):	Pump Depth (ft-bTOC):								
Depth-to-Water (ft-bTOC):	Tubing Diameter (in):								
Water Column Thickness (ft):	Well Volume (ft^3):								
1 Well Volume =	(Total Depth - Static Water Level) * Well Capacity								
Well Capacity (gallons per feet): 0.75" = 0.02;	$1" = 0.04$ ; $1.25" \approx 0.06$ ; $2" = 0.16$ ; $3' = 0.37$ ; $4" = 0.65$ ; $5" = 1.02$ ; $6" = 1.47$								

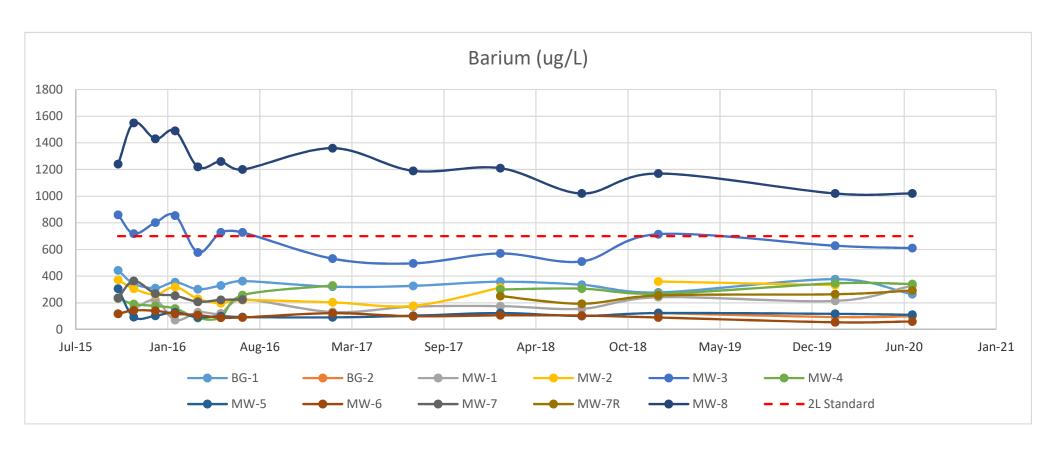
	Purging Information											
Parame	ter Instru	ı <b>ment(s):</b> Ha	nna, YSI									
TIME	VOLUME PURGED (Liters)	CUMULATIVE VOLUME PURGED (Liters)	PURGE RATE (mL/min)	DEPTH TO WATER (ft-bTOC)	pH (standard units) (±0.1)	TEMP. (C°) (3%)	COND. (µS/cm) (3%)	DISSOLVED OXYGEN (mg/L) (10%)	ORP (mV) (±10mV)	TURBIDITY (NTUs) (10%)	COLOR/ ODOR (describe)	
1/20	Some	1	Ţ		762	30.8	1919	4.85	~7.3	3.18	cleus	
	-											
	-											
P	l urging Equipr	nent Codes (circl	e): B = Baile	er; BP = Bl	adder Pump;	ESP = Ele	ctric Submer	sible Pump;	PP = Peristaltic	Pump; O =	Specify	

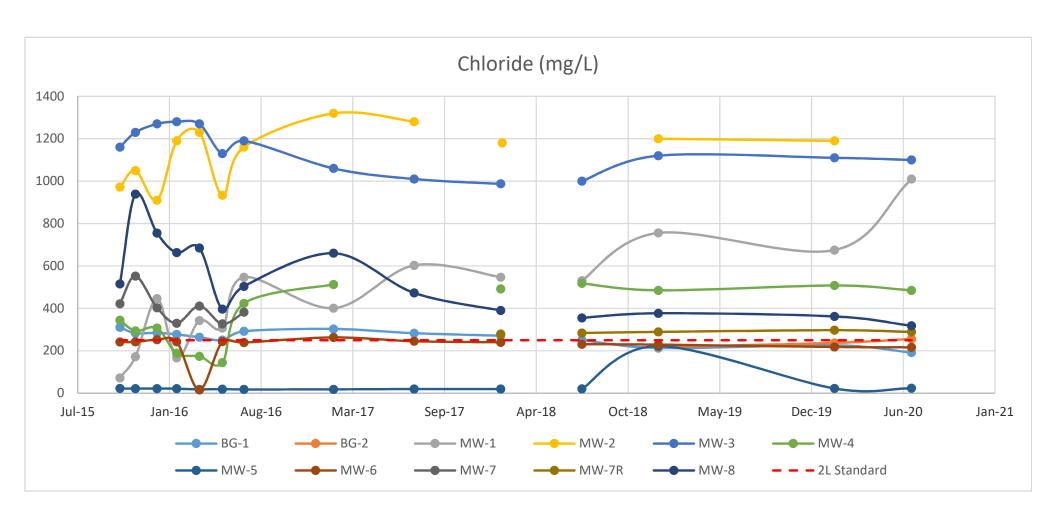
		Sample Information		
Sample Number	Collection Time	Parameter	Container	Preservative
, butc				
Leachate				
Sampled By: Jaco	ob Ruffing	Sample Time: 1(3,2	0	
Date Sampled:	7/6/20	Sampler Signature: 1	2	
Notes: Pumprat	:e= '	7		

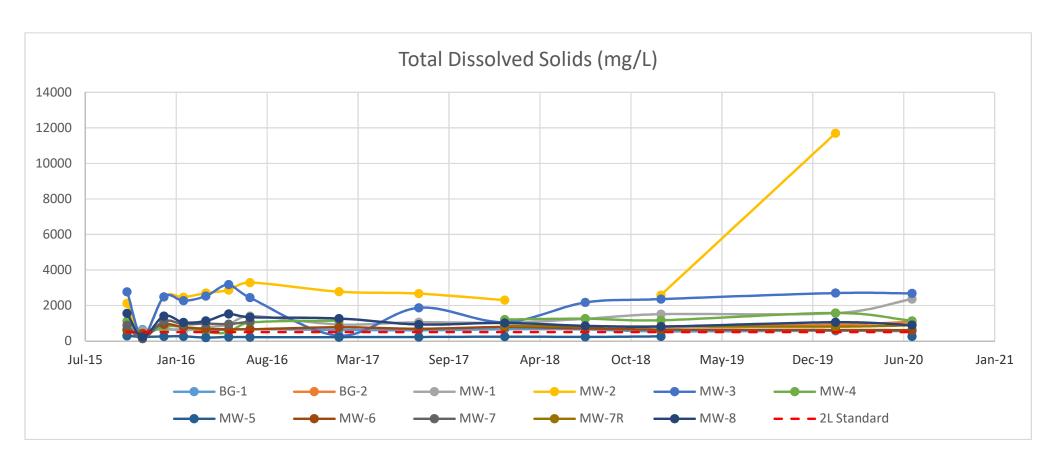


В

Appendix B – Concentration vs. Time Plots









C

Appendix C – Laboratory Reports, Chains of Custody, & Quality Control Data





9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

July 30, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH GW

Pace Project No.: 92485285

#### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on July 09, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- · Pace Analytical Services Asheville
- Pace Analytical Services Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kein Share

Kevin Herring

kevin.herring@pacelabs.com

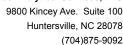
1(704)875-9092

**HORIZON** Database Administrator

**Enclosures** 

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing







#### **CERTIFICATIONS**

Project: CHARAH GW Pace Project No.: 92485285

#### Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

ANAB DOD-ELAP Rad Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

**Arkansas Certification** 

California Certification #: 04222CA Colorado Certification #: PA01547 Connecticut Certification #: PH-0694

Delaware Certification EPA Region 4 DW Rad

Florida/TNI Certification #: E87683 Georgia Certification #: C040 Florida: Cert E871149 SEKS WET

Guam Certification Hawaii Certification Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: KY90133 KY WW Permit #: KY0098221 KY WW Permit #: KY0000221

Louisiana DHH/TNI Certification #: LA180012 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: 2017020 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457 Michigan/PADEP Certification #: 9991 Montana Certification #: Cert0082 Nebraska Certification #: NE-OS-29-14 Nevada Certification #: PA014572018-1 New Hampshire/TNI Certification #: 297617 New Jersey/TNI Certification #: PA051

New Jersey/TNI Certification #: PA05 New Mexico Certification #: PA01457 New York/TNI Certification #: 10888 North Carolina Certification #: 42706 North Dakota Certification #: R-190 Ohio EPA Rad Approval: #41249

Missouri Certification #: 235

Oregon/TNI Certification #: PA200002-010 Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification
Tennessee Certification #: 02867

Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C

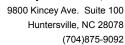
Wisconsin Approve List for Rad Wyoming Certification #: 8TMS-L

#### Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222

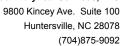




#### **SAMPLE SUMMARY**

Project: CHARAH GW Pace Project No.: 92485285

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92485285001	BG-1	Water	07/08/20 11:50	07/09/20 09:05
92485285002	BG-2	Water	07/08/20 08:55	07/09/20 09:05
92485285003	MW-1	Water	07/08/20 14:40	07/09/20 09:05
92485285004	MW-3	Water	07/07/20 08:10	07/09/20 09:05
92485285005	MW-4	Water	07/06/20 12:25	07/09/20 09:05
92485285006	MW-5	Water	07/07/20 10:20	07/09/20 09:05
92485285007	MW-6	Water	07/06/20 15:30	07/09/20 09:05
92485285008	MW-7R	Water	07/07/20 14:50	07/09/20 09:05
92485285009	MW-8	Water	07/07/20 09:00	07/09/20 09:05
92485285010	LEACHATE	Water	07/06/20 11:20	07/09/20 09:05
92485285011	SW-1	Water	07/06/20 12:00	07/09/20 09:05
92485285012	SW-2	Water	07/06/20 11:45	07/09/20 09:05
92485285013	DUP	Water	07/06/20 14:30	07/09/20 09:05
92485285014	EQBL	Water	07/08/20 12:00	07/09/20 09:05





#### **SAMPLE ANALYTE COUNT**

Project: CHARAH GW Pace Project No.: 92485285

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92485285001	BG-1	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	800	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285002	BG-2	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285003	MW-1	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285004	MW-3	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285005	MW-4	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA

#### **REPORT OF LABORATORY ANALYSIS**



#### **SAMPLE ANALYTE COUNT**

Project: CHARAH GW Pace Project No.: 92485285

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285006	MW-5	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285007	MW-6	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285008	MW-7R	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285009	MW-8	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	JNS	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285010	LEACHATE	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A

#### **REPORT OF LABORATORY ANALYSIS**



#### **SAMPLE ANALYTE COUNT**

Project: CHARAH GW Pace Project No.: 92485285

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470A		1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285011	SW-1	EPA 6010D	DS, RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285012	SW-2	EPA 6010D	RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285013	DUP	EPA 6010D	RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2485285014	EQBL	EPA 6010D	RDT	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	JAL	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A

#### **REPORT OF LABORATORY ANALYSIS**



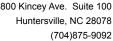
9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

#### **SAMPLE ANALYTE COUNT**

Project: CHARAH GW Pace Project No.: 92485285

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A

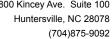
PASI-A = Pace Analytical Services - Asheville PASI-PA = Pace Analytical Services - Greensburg





Project: CHARAH GW Pace Project No.: 92485285

ab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2485285001	BG-1					
EPA 6010D	Arsenic	4.8J	ug/L	10.0	07/13/20 17:10	
PA 6010D	Barium	265	ug/L	5.0	07/13/20 17:10	
PA 6010D	Calcium	21700	ug/L	100	07/13/20 17:10	
PA 6010D	Vanadium	6.8	ug/L	5.0	07/13/20 17:10	
PA 6020B	Boron	6.3J	ug/L	25.0	07/10/20 14:53	
PA 6020B	Lithium	15.0	ug/L	2.5	07/10/20 14:53	
PA 903.1	Radium-226	0.137 ± 0.312	pCi/L		07/23/20 16:06	
		(0.503) C:NA T:91%				
PA 904.0	Radium-228	0.861 ±	pCi/L		07/23/20 14:36	
171004.0	radiani 220	0.435	POWE		01/20/20 14:00	
		(0.760)				
		C:72%				
		T:87%				
otal Radium Calculation	Total Radium	0.998 ±	pCi/L		07/27/20 11:07	
		0.747				
M 2540C-2011	Total Dissalved Calida	(1.26)	ma/l	25.0	07/13/20 14:50	
	Total Dissolved Solids	548	mg/L	25.0		
PA 300.0 Rev 2.1 1993	Chloride	192	mg/L	4.0	07/12/20 09:49	
PA 300.0 Rev 2.1 1993	Fluoride	0.16	mg/L	0.10	07/11/20 20:05	
PA 300.0 Rev 2.1 1993	Sulfate	23.5	mg/L	1.0	07/11/20 20:05	
485285002	BG-2					
PA 6010D	Barium	98.4	ug/L	5.0	07/13/20 17:29	
PA 6010D	Calcium	117000	ug/L	1000	07/15/20 14:27	
PA 6020B	Boron	17.6J	ug/L	25.0	07/10/20 14:57	
PA 6020B	Lithium	14.0	ug/L	2.5	07/10/20 14:57	
PA 7470A	Mercury	0.20	ug/L		07/14/20 13:02	
PA 903.1	Radium-226	0.417 ±	pCi/L	0.20	07/23/20 16:06	
7,000.1	Radiam 220	0.424	PO#E		07720720 10:00	
		(0.642)				
DA 004 0	Radium-228	C:NA T:93% 0.749 ±	nCi/I		07/23/20 14:36	
PA 904.0	Radiuiii-220	0.428	pCi/L		07/23/20 14.30	
		(0.786)				
		C:73%				
		T:87%				
otal Radium Calculation	Total Radium	1.17 ±	pCi/L		07/27/20 11:07	
		0.852				
M 2540C 2014	Total Dissalved Calida	(1.43)	me.//	F0 0	07/40/00 44:54	N 4) A /
M 2540C-2011	Total Dissolved Solids	1080	mg/L		07/13/20 14:51	MW
PA 300.0 Rev 2.1 1993	Chloride	256	mg/L		07/12/20 10:03	
PA 300.0 Rev 2.1 1993	Fluoride	0.15	mg/L		07/11/20 20:19	
PA 300.0 Rev 2.1 1993	Sulfate	135	mg/L	5.0	07/12/20 10:03	
485285003	MW-1					
PA 6010D	Barium	328	ug/L	5.0	07/13/20 17:33	
PA 6010D	Cadmium	0.57J	ug/L	1.0		
PA 6010D	Calcium	254000	ug/L	1000		
PA 6010D	Vanadium	4.9J	ug/L	5.0	07/13/20 17:33	
	· anadiani	7.00	~9, <b>_</b>	0.0	517 107 <u>-</u> 0 17.00	





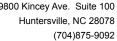
Project: CHARAH GW Pace Project No.: 92485285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2485285003	MW-1					
EPA 903.1	Radium-226	0.391 ± 0.426 (0.670)	pCi/L		07/23/20 16:06	
SPA 904.0	Radium-228	C:NA T:98% 0.627 ± 0.385 (0.710) C:69%	pCi/L		07/23/20 14:36	
otal Radium Calculation	Total Radium	T:87% 1.02 ± 0.811 (1.38)	pCi/L		07/27/20 11:07	
M 2540C-2011	Total Dissolved Solids	2360	mg/L	250	07/13/20 14:51	MW
PA 300.0 Rev 2.1 1993	Chloride	1010	mg/L		07/12/20 10:17	
PA 300.0 Rev 2.1 1993	Fluoride	0.12	mg/L		07/11/20 20:33	
PA 300.0 Rev 2.1 1993	Sulfate	7.0	mg/L		07/11/20 20:33	
2485285004	MW-3					
PA 6010D	Arsenic	5.1J	ug/L	10.0	07/13/20 17:36	
PA 6010D	Barium	610	ug/L	5.0	07/13/20 17:36	
PA 6010D	Calcium	190000	ug/L	500	07/15/20 14:34	
PA 6010D	Molybdenum	8.5	ug/L	5.0	07/13/20 17:36	
PA 6010D	Nickel	4.8J	ug/L	5.0	07/13/20 17:36	
PA 6010D	Vanadium	4.1J	ug/L	5.0	07/13/20 17:36	
PA 6020B	Boron	24.8J	ug/L	25.0	07/10/20 15:19	
PA 6020B	Lithium	70.1	ug/L	2.5	07/10/20 15:19	
PA 903.1	Radium-226	0.804 ± 0.554 (0.756) C:NA T:98%	pCi/L		07/23/20 16:06	
PA 904.0	Radium-228	1.61 ± 0.528 (0.682) C:72% T:85%	pCi/L		07/23/20 14:36	
otal Radium Calculation	Total Radium	2.41 ± 1.08 (1.44)	pCi/L		07/27/20 11:07	
M 2540C-2011	Total Dissolved Solids	2680	mg/L	500	07/11/20 10:47	
PA 300.0 Rev 2.1 1993	Chloride	1100	mg/L	25.0	07/13/20 00:24	
PA 300.0 Rev 2.1 1993	Fluoride	0.33	mg/L		07/11/20 20:47	
PA 300.0 Rev 2.1 1993	Sulfate	40.1	mg/L	1.0	07/11/20 20:47	
485285005	MW-4					
PA 6010D	Antimony	3.4J	ug/L	5.0	07/15/20 13:48	P8
PA 6010D	Barium	341	ug/L	5.0		
PA 6010D	Cadmium	0.47J	ug/L	1.0	07/13/20 17:39	
PA 6010D	Calcium	63200	ug/L	100	07/13/20 17:39	
PA 6010D	Cobalt	8.1	ug/L	5.0	07/13/20 17:39	
PA 6010D	Nickel	8.8	ug/L	5.0	07/13/20 17:39	
PA 6020B	Lithium	25.5	ug/L	2.5	07/10/20 15:23	



Project: CHARAH GW Pace Project No.: 92485285

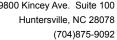
Lab Sample ID	Client Sample ID					
Method	Parameters —	Result	Units	Report Limit	Analyzed	Qualifiers
92485285005	MW-4					
EPA 903.1	Radium-226	0.135 ± 0.417 (0.808)	pCi/L		07/23/20 16:06	
EPA 904.0	Radium-228	C:NA T:90% 0.625 ± 0.456 (0.894) C:70%	pCi/L		07/23/20 14:36	
Total Radium Calculation	Total Radium	T:84% 0.760 ± 0.873 (1.70)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	1140	mg/L	125	07/10/20 16:09	
EPA 300.0 Rev 2.1 1993	Chloride	485	mg/L	10.0		M6
EPA 300.0 Rev 2.1 1993	Fluoride	0.25	mg/L	0.10		
EPA 300.0 Rev 2.1 1993	Sulfate	11.4	mg/L	1.0		
92485285006	MW-5					
EPA 6010D	Barium	110	ug/L	5.0	07/13/20 17:42	
EPA 6010D	Calcium	12700	ug/L	100	07/13/20 17:42	
EPA 6020B	Boron	10.1J	ug/L	25.0	07/10/20 15:26	
EPA 6020B	Lithium	8.5	ug/L	2.5	07/10/20 15:26	
EPA 903.1	Radium-226	0.000 ± 0.319 (0.715) C:NA T:86%	pCi/L		07/23/20 16:06	
EPA 904.0	Radium-228	0.0262 ± 0.308 (0.714) C:70% T:87%	pCi/L		07/23/20 14:36	
Total Radium Calculation	Total Radium	0.0262 ± 0.627 (1.43)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	264	mg/L	25.0	07/11/20 10:47	
EPA 300.0 Rev 2.1 1993	Chloride	23.1	mg/L	1.0	07/11/20 21:43	
EPA 300.0 Rev 2.1 1993	Fluoride	0.56	mg/L	0.10	07/11/20 21:43	
EPA 300.0 Rev 2.1 1993	Sulfate	2.9	mg/L	1.0	07/11/20 21:43	
2485285007	MW-6					
EPA 6010D	Barium	59.7	ug/L		07/13/20 17:45	
EPA 6010D	Calcium	34500	ug/L	100	07/13/20 17:45	
EPA 6010D	Chromium	14.0	ug/L	5.0	07/13/20 17:45	
EPA 6010D	Nickel	8.2	ug/L	5.0		
EPA 6020B	Boron	7.7J	ug/L	25.0		
EPA 6020B	Lithium	23.4	ug/L	2.5	07/10/20 15:38	
EPA 903.1	Radium-226	0.233 ± 0.512 (0.925) C:NA T:98%	pCi/L		07/23/20 16:06	





Project: CHARAH GW Pace Project No.: 92485285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2485285007	MW-6					
EPA 904.0	Radium-228	0.770 ± 0.398 (0.690) C:71% T:87%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	1.00 ± 0.910 (1.62)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	` 614	mg/L	50.0	07/10/20 16:09	
EPA 300.0 Rev 2.1 1993	Chloride	216	mg/L	4.0	07/12/20 11:54	
EPA 300.0 Rev 2.1 1993	Fluoride	0.32	mg/L	0.10	07/11/20 21:57	
EPA 300.0 Rev 2.1 1993	Sulfate	26.2	mg/L	1.0	07/11/20 21:57	
2485285008	MW-7R					
EPA 6010D	Barium	292	ug/L	5.0	07/13/20 17:49	
EPA 6010D	Calcium	91100	ug/L	100	07/13/20 17:49	
EPA 6010D	Chromium	5.9	ug/L	5.0	07/13/20 17:49	
EPA 6010D	Nickel	4.7J	ug/L	5.0	07/13/20 17:49	
EPA 6010D	Vanadium	4.5J	ug/L	5.0	07/13/20 17:49	
PA 6020B	Boron	11.4J	ug/L	25.0	07/10/20 15:41	
EPA 6020B	Lithium	23.3	ug/L	2.5	07/10/20 15:41	
EPA 903.1	Radium-226	0.127 ± 0.306 (0.591) C:NA T:104%	pCi/L		07/23/20 16:20	
PA 904.0	Radium-228	0.343 ± 0.369 (0.768) C:67% T:89%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	0.470 ± 0.675 (1.36)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	884	mg/L	50.0	07/11/20 10:48	
EPA 300.0 Rev 2.1 1993	Chloride	289	mg/L	6.0	07/12/20 12:07	
EPA 300.0 Rev 2.1 1993	Fluoride	0.12	mg/L	0.10	07/11/20 22:11	
EPA 300.0 Rev 2.1 1993	Sulfate	17.3	mg/L	1.0	07/11/20 22:11	
2485285009	MW-8					
EPA 6010D	Barium	1020	ug/L	5.0	07/13/20 17:52	
EPA 6010D	Calcium	95600	ug/L	100	07/13/20 17:52	
EPA 6010D	Chromium	43.5	ug/L	5.0	07/13/20 17:52	
EPA 6010D	Nickel	22.1	ug/L	5.0	07/13/20 17:52	
EPA 6020B	Boron	10.4J	ug/L	25.0	07/10/20 15:45	
EPA 6020B	Lithium	19.6	ug/L	2.5	07/10/20 15:45	
EPA 903.1	Radium-226	0.260 ± 0.362 (0.604) C:NA T:87%	pCi/L		07/23/20 16:20	





Project: CHARAH GW Pace Project No.: 92485285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92485285009	MW-8					
EPA 904.0	Radium-228	0.474 ± 0.384 (0.758) C:66% T:84%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	0.734 ± 0.746 (1.36)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	900	mg/L	50.0	07/11/20 10:48	
EPA 300.0 Rev 2.1 1993	Chloride	318	mg/L	7.0	07/12/20 12:21	
EPA 300.0 Rev 2.1 1993	Fluoride	0.073J	mg/L	0.10	07/11/20 23:06	
EPA 300.0 Rev 2.1 1993	Sulfate	7.8	mg/L	1.0	07/11/20 23:06	
2485285010	LEACHATE					
EPA 6010D	Arsenic	14.6	ug/L	10.0	07/13/20 17:55	
EPA 6010D	Barium	64.0	ug/L	5.0	07/13/20 17:55	
EPA 6010D	Cadmium	0.42J	ug/L	1.0	07/13/20 17:55	
EPA 6010D	Calcium	11600	ug/L	1000	07/15/20 14:37	
EPA 6010D	Cobalt	3.8J	ug/L	5.0	07/13/20 17:55	
EPA 6010D	Molybdenum	249	ug/L	5.0	07/13/20 17:55	
EPA 6010D	Nickel	8.6	ug/L	5.0	07/13/20 17:55	
EPA 6020B	Boron	3470	ug/L	2500	07/10/20 17:00	
EPA 6020B	Lithium	39.1	ug/L	2.5	07/10/20 10:04	
EPA 6020B	Thallium	0.32	ug/L ug/L	0.10	07/10/20 20:12	
EPA 903.1	Radium-226	0.295 ± 0.356 (0.543) C:NA T:90%	pCi/L	0.10	07/23/20 16:20	
EPA 904.0	Radium-228	0.128 ± 0.268 (0.594) C:73% T:92%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	0.423 ± 0.624 (1.14)	pCi/L		07/27/20 11:07	
SM 2540C-2011	Total Dissolved Solids	1400	mg/L	125	07/10/20 16:11	
EPA 300.0 Rev 2.1 1993	Chloride	19.0	mg/L	1.0	07/11/20 23:21	
EPA 300.0 Rev 2.1 1993	Fluoride	0.22	mg/L	0.10	07/11/20 23:21	
EPA 300.0 Rev 2.1 1993	Sulfate	573	mg/L		07/12/20 12:35	
2485285011	SW-1					
EPA 6010D	Arsenic	9.6J	ug/L	10.0	07/13/20 17:58	
EPA 6010D	Barium	1140	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Beryllium	1.7	ug/L	1.0	07/13/20 17:58	
EPA 6010D	Cadmium	0.90J	ug/L	1.0	07/13/20 17:58	
EPA 6010D	Calcium	9390	ug/L	100	07/13/20 17:58	
EPA 6010D	Chromium	22.4	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Cobalt	17.5	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Copper	25.8	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Lead	70.6	ug/L	5.0	07/15/20 14:24	

## **REPORT OF LABORATORY ANALYSIS**

(704)875-9092



#### **SUMMARY OF DETECTION**

Project: CHARAH GW Pace Project No.: 92485285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2485285011	SW-1					
EPA 6010D	Nickel	18.5	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Vanadium	103	ug/L	5.0	07/13/20 17:58	
EPA 6010D	Zinc	115	ug/L	10.0	07/13/20 17:58	
EPA 6020B	Boron	10.9J	ug/L	25.0	07/10/20 15:49	
EPA 6020B	Lithium	9.5	ug/L	2.5	07/10/20 15:49	
EPA 6020B	Thallium	0.26	ug/L	0.10	07/10/20 15:49	
EPA 903.1	Radium-226	1.76 ± 1.06	pCi/L		07/23/20 16:20	
		(0.435) C:NA T:89%				
EPA 904.0	Radium-228	2.16 ±	pCi/L		07/23/20 14:37	
177004.0	radiani 220	0.836	POWE		07720720 14.07	
		(1.25)				
		C:69% T:63%				
otal Radium Calculation	Total Radium	3.92 ± 1.90	pCi/L		07/27/20 11:14	
otal National Calculation	rotal Nation	(1.69)	POIL		37727720 11.14	
SM 2540C-2011	Total Dissolved Solids	1290	mg/L	25.0	07/10/20 16:11	
EPA 300.0 Rev 2.1 1993	Chloride	4.9	mg/L	1.0	07/11/20 23:35	
PA 300.0 Rev 2.1 1993	Fluoride	0.34	mg/L	0.10	07/11/20 23:35	
EPA 300.0 Rev 2.1 1993	Sulfate	1.8	mg/L	1.0	07/11/20 23:35	
2485285012	SW-2					
EPA 6010D	Arsenic	5.1J	ug/L	10.0	07/13/20 18:08	
EPA 6010D	Barium	29.1	ug/L	5.0	07/13/20 18:08	
PA 6010D	Calcium	2830	ug/L	100	07/13/20 18:08	
PA 6020B	Boron	14.0J	ug/L	25.0	07/10/20 15:56	
EPA 903.1	Radium-226	$0.000 \pm$	pCi/L		07/23/20 16:20	
		0.306				
		(0.687) C:NA T:92%				
EPA 904.0	Radium-228	0.847 ±	pCi/L		07/23/20 14:37	
II A 304.0	Nadiam-220	0.527	po#L		01123/20 14.31	
		(0.986)				
		C:65%				
	"	T:75%	0.4		0=10=100 11 11	
otal Radium Calculation	Total Radium	0.847 ± 0.833	pCi/L		07/27/20 11:14	
		(1.67)				
SM 2540C-2011	Total Dissolved Solids	62.0	mg/L	25.0	07/10/20 16:11	
EPA 300.0 Rev 2.1 1993	Chloride	17.4	mg/L		07/11/20 23:48	
EPA 300.0 Rev 2.1 1993	Fluoride	0.069J	mg/L		07/11/20 23:48	
EPA 300.0 Rev 2.1 1993	Sulfate	2.5	mg/L		07/11/20 23:48	
2485285013	DUP					
EPA 6010D	Barium	60.0	ug/L	5.0	07/13/20 18:11	
EPA 6010D	Calcium	34900	ug/L	100	07/13/20 18:11	
EPA 6010D	Chromium	10.4	ug/L	5.0	07/13/20 18:11	
EPA 6010D	Nickel	6.8	ug/L	5.0	07/13/20 18:11	
EPA 6020B	Boron	7.4J	ug/L	25.0	07/10/20 16:00	
EPA 6020B	Lithium	22.8	ug/L	2.5	07/10/20 16:00	



Project: CHARAH GW Pace Project No.: 92485285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92485285013	DUP					
EPA 903.1	Radium-226	-0.135 ± 0.323 (0.808)	pCi/L		07/23/20 16:20	
EPA 904.0	Radium-228	C:NA T:89% 0.737 ± 0.507 (0.984) C:69% T:78%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	0.737 ± 0.830 (1.79)	pCi/L		07/27/20 11:14	
SM 2540C-2011	Total Dissolved Solids	624	mg/L	50.0	07/10/20 16:11	
EPA 300.0 Rev 2.1 1993	Chloride	217	mg/L	4.0	07/12/20 12:49	
EPA 300.0 Rev 2.1 1993	Fluoride	0.33	mg/L	0.10	07/12/20 00:02	
EPA 300.0 Rev 2.1 1993	Sulfate	26.2	mg/L	1.0	07/12/20 00:02	
92485285014	EQBL					
EPA 6020B	Boron	7.1J	ug/L	25.0	07/10/20 16:07	
EPA 903.1	Radium-226	0.000 ± 0.487 (0.997) C:NA T:89%	pCi/L		07/23/20 16:38	
EPA 904.0	Radium-228	0.679 ± 0.425 (0.799) C:72% T:83%	pCi/L		07/23/20 14:37	
Total Radium Calculation	Total Radium	0.679 ± 0.912 (1.80)	pCi/L		07/27/20 11:14	



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: BG-1	Lab ID:	92485285001	Collected:	07/08/20	11:50	Received: 07/	09/20 09:05 N	Matrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Meth	nod: EF	PA 3010A			
	Pace Ana	lytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 13:1	8 7440-36-0	P8
Arsenic	4.8J	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:1	0 7440-38-2	
Barium	265	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:1	0 7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:1	0 7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:1	0 7440-43-9	
Calcium	21700	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:1	0 7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:1	0 7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:1	0 7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:1	0 7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 13:1	8 7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:1	0 7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55			
Vanadium	6.8	ug/L	5.0	3.9	1	07/10/20 01:55			
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55			
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Meth	nod: EF	PA 3010A			
	-	lytical Services							
Boron	6.3J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 14:5	3 7440-42-8	
Lithium	15.0	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 14:5	3 7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36			
7470 Mercury	Analytical	Method: EPA 7	'470A Prepai	ration Meth	od: FF	PA 7470A			
. Tro moroary	-	lytical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:0	0 7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	540C-2011						
2340C Total Dissolved Solids	,	lytical Services							
Total Dissolved Solids	548	mg/L	25.0	25.0	1		07/13/20 14:5	0	
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	300.0 Rev 2.1	1993					
•	-	lytical Services							
Chloride	192	mg/L	4.0	2.4	4		07/12/20 09:4	9 16887-00-6	
Fluoride	0.16	mg/L	0.10	0.050	1			5 16984-48-8	
Sulfate	23.5	mg/L	1.0	0.50	1		07/11/20 20:0		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: BG-2	Lab ID:	92485285002	Collected:	07/08/20	08:55	Received: 07/	09/20 09:05 N	latrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Met	hod: EF	PA 3010A			
	Pace Anal	ytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 13:31	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:29	7440-38-2	
Barium	98.4	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:29	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:29	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:29	7440-43-9	
Calcium	117000	ug/L	1000	942	10	07/10/20 01:55	07/15/20 14:27	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:29	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:29	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:29	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 13:31	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:29	7439-98-7	
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:29	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:29	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:29	7440-22-4	
Vanadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:29	7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 17:29	7440-66-6	
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Met	hod: EF	PA 3010A			
	-	ytical Services							
Boron	17.6J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 14:57	7440-42-8	
Lithium	14.0	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 14:57	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 14:57	7440-28-0	
7470 Mercury	Analytical	Method: EPA 7	470A Prepa	ration Met	hod: EP	'A 7470A			
•	-	ytical Services							
Mercury	0.20	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:02	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011						
	Pace Anal	ytical Services	- Asheville						
Total Dissolved Solids	1080	mg/L	50.0	50.0	1		07/13/20 14:51		MW
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Anal	ytical Services	- Asheville						
Chloride	256	mg/L	5.0	3.0	5		07/12/20 10:03	3 16887-00-6	
Fluoride	0.15	mg/L	0.10	0.050	1		07/11/20 20:19		
Sulfate					-				



Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-1	Lab ID:	92485285003	Collected:	07/08/20	14:40	Received: 07/	09/20 09:05 N	latrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical I	Method: EPA 6	010D Prepa	ration Metl	nod: EF	PA 3010A			
	Pace Analy	tical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 13:3	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:33	7440-38-2	
Barium	328	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:33	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:33	3 7440-41-7	
Cadmium	0.57J	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:33	7440-43-9	
Calcium	254000	ug/L	1000	942	10	07/10/20 01:55	07/15/20 14:3	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:33	3 7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:33	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:33	3 7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 13:3	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:33	7439-98-7	
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:33	3 7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:33	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:33	3 7440-22-4	
Vanadium	4.9J	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:33	3 7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 17:33	7440-66-6	
6020 MET ICPMS	Analytical I	Method: EPA 6	020B Prepa	ration Meth	nod: EF	PA 3010A			
	Pace Analy	tical Services	- Asheville						
Boron	ND	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:1	7440-42-8	
Lithium	31.9	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:1	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 15:15	7440-28-0	
7470 Mercury	Analytical I	Method: EPA 7	470A Prepa	ration Meth	nod: EP	A 7470A			
•	-	tical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:0	7439-97-6	
2540C Total Dissolved Solids	Analytical I	Method: SM 25	540C-2011						
	•	tical Services							
Total Dissolved Solids	2360	mg/L	250	250	1		07/13/20 14:5		MW
300.0 IC Anions 28 Days	Analytical I	Method: EPA 3	00.0 Rev 2.1	1993					
	Pace Analy	tical Services	- Asheville						
Chloride	1010	mg/L	56.0	33.6	56		07/12/20 10:17	16887-00-6	
Fluoride	0.12	mg/L	0.10	0.050	1		07/11/20 20:33		
Sulfate	7.0	mg/L	1.0	0.50	1		07/11/20 20:33		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-3	Lab ID:	92485285004	Collected:	07/07/20	08:10	Received: 07/	09/20 09:05 Ma	atrix: Water	
Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Meth	nod: EF	PA 3010A			
	Pace Anal	ytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 13:38	7440-36-0	P8
Arsenic	5.1J	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:36	7440-38-2	
Barium	610	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:36	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:36	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:36	7440-43-9	
Calcium	190000	ug/L	500	471	5	07/10/20 01:55	07/15/20 14:34	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:36	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:36	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:36	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 13:38	7439-92-1	
Molybdenum	8.5	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:36	7439-98-7	
Nickel	4.8J	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:36	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:36	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:36	7440-22-4	
Vanadium	4.1J	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:36	7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 17:36	7440-66-6	
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Meth	nod: EP	A 3010A			
	Pace Anal	ytical Services	- Asheville						
Boron	24.8J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:19	7440-42-8	
Lithium	70.1	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:19	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 15:19	7440-28-0	
7470 Mercury	Analytical	Method: EPA 7	470A Prepai	ration Meth	nod: EP	A 7470A			
	•	ytical Services	•						
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:12	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011						
	-	ytical Services							
Total Dissolved Solids	2680	mg/L	500	500	1		07/11/20 10:47		
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Anal	ytical Services	- Asheville						
Chloride	1100	mg/L	25.0	15.0	25		07/13/20 00:24	16887-00-6	
Fluoride	0.33	mg/L	0.10	0.050	1		07/11/20 20:47		
Sulfate	40.1	mg/L	1.0	0.50	1		07/11/20 20:47		



Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-4	Lab ID:	9248528500	5 Collecte	d: 07/06/20	0 12:25	Received: 07/	09/20 09:05 Ma	atrix: Water	
Comments: • Sample collection d	ate on containers	s does not ma	atch COC; clie	ent was not	ified. C	Client confirmed 7/	6 as the correct of	collection date	٠.
	<b>-</b> "		Report					0.0.11	
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA	6010D Prep	aration Me	thod: E	PA 3010A			
	•	ytical Service							
Antimony	3.4J	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 13:48	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:39	7440-38-2	
Barium	341	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:39	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:39	7440-41-7	
Cadmium	0.47J	ug/L	1.0	0.40	1		07/13/20 17:39		
Calcium	63200	ug/L	100	94.2	1		07/13/20 17:39		
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:39	7440-47-3	
Cobalt	8.1	ug/L	5.0	3.6	1		07/13/20 17:39		
Copper	ND	ug/L	5.0	4.3	1		07/13/20 17:39		
Lead	ND	ug/L	5.0	4.5	1		07/15/20 13:48		
Molybdenum	ND	ug/L	5.0	3.9	1		07/13/20 17:39		
Nickel	8.8	ug/L	5.0	3.5	1		07/13/20 17:39		
Selenium	ND	ug/L	10.0	4.7	1		07/13/20 17:39		
Silver	ND	ug/L	5.0	2.5	1		07/13/20 17:39		
/anadium	ND	ug/L	5.0	3.9	1		07/13/20 17:39		
Zinc	ND	ug/L	10.0	9.5	1		07/13/20 17:39		
		Ü					01710120 11100		
6020 MET ICPMS	Analytical	Method: EPA	6020B Prep	aration Met	thod: El	PA 3010A			
	Pace Anal	ytical Service	es - Asheville						
Boron	ND	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:23	7440-42-8	
_ithium	25.5	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:23	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 15:23	7440-28-0	
7470 Maraum	Analytical	Mothod: EDA	7470A Prep	aration Mot	hod: El	DA 7470A			
7470 Mercury				aration ivici	illou. Li	FA 1410A			
	Pace Anai	ytical Service	es - Asneville						
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:14	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM	2540C-2011						
	•	ytical Service							
Total Dissolved Solids	1140	mg/L	125	125	1		07/10/20 16:09		
		Ü			•		1		
300.0 IC Anions 28 Days	•		300.0 Rev 2	.1 1993					
	Pace Anal	ytical Service	s - Asheville						
Chloride	485	mg/L	10.0	6.0	10		07/12/20 11:12	16887-00-6	M6
Fluoride	0.25	mg/L	0.10	0.050	1		07/11/20 21:01		
Sulfate	11.4	mg/L	1.0	0.50	1		07/11/20 21:01		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-5	Lab ID:	92485285006	Collected:	07/07/20	10:20	Received: 07/	09/20 09:05 Ma	atrix: Water	
Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	- ——— - Analytical	Method: EPA 6	010D Prepa	ration Metl	nod: EF	PA 3010A		•	
	Pace Anal	ytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:07	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:42	7440-38-2	
Barium	110	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:42	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:42	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:42	7440-43-9	
Calcium	12700	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:42	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:42	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:42	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:42	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:07	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:42	7439-98-7	
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:42	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:42	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:42	7440-22-4	
√anadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:42	7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1		07/13/20 17:42		
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Meth	nod: EF	PA 3010A			
	Pace Anal	ytical Services	- Asheville						
Boron	10.1J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:26	7440-42-8	
Lithium	8.5	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:26	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 15:26	7440-28-0	
7470 Mercury	Analytical	Method: EPA 7	470A Prepai	ration Meth	nod: EF	A 7470A			
·	Pace Anal	ytical Services	- Asheville						
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:17	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011						
	Pace Anal	ytical Services	- Asheville						
Total Dissolved Solids	264	mg/L	25.0	25.0	1		07/11/20 10:47		
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Anal	ytical Services	- Asheville						
Chloride	23.1	mg/L	1.0	0.60	1		07/11/20 21:43	16887-00-6	
Fluoride	0.56	mg/L	0.10	0.050	1		07/11/20 21:43	16984-48-8	
Sulfate	2.9	mg/L	1.0	0.50	1		07/11/20 21:43		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-6	Lab ID:	92485285007	Collected:	07/06/20	15:30	Received: 07/	09/20 09:05 Ma	atrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Metl	nod: EF	PA 3010A			
	Pace Analy	ytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:11	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:45	7440-38-2	
Barium	59.7	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:45	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:45	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:45	7440-43-9	
Calcium	34500	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:45	7440-70-2	
Chromium	14.0	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:45	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:45	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:45	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:11	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:45	7439-98-7	
Nickel	8.2	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:45	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:45	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:45	7440-22-4	
Vanadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:45	7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 17:45	7440-66-6	
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Meth	nod: EF	PA 3010A			
	-	ytical Services							
Boron	7.7J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:38	7440-42-8	
Lithium	23.4	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:38	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36	07/10/20 15:38	7440-28-0	
7470 Mercury	Analytical	Method: EPA 7	470A Prepa	ration Meth	nod: EF	PA 7470A			
		ytical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:19	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011						
	•	ytical Services							
Total Dissolved Solids	614	mg/L	50.0	50.0	1		07/10/20 16:09		
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
-	Pace Analy	ytical Services	- Asheville						
Chloride	216	mg/L	4.0	2.4	4		07/12/20 11:54	16887-00-6	
Fluoride	0.32	mg/L	0.10	0.050	1		07/11/20 21:57		
Sulfate	26.2	mg/L	1.0	0.50	1		07/11/20 21:57		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-7R	Lab ID:	92485285008	Collected:	07/07/20	14:50	Received: 07/	09/20 09:05 N	latrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Met	hod: EF	A 3010A			
	Pace Ana	lytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:14	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:49	7440-38-2	
Barium	292	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:49	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:49	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:49	7440-43-9	
Calcium	91100	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:49	7440-70-2	
Chromium	5.9	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:49	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:49	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:49	7440-50-8	
_ead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:14	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Nickel	4.7J	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:49	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55			
Vanadium	4.5J	ug/L	5.0	3.9	1	07/10/20 01:55			
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55			
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Metl	nod: EF	A 3010A			
	-	lytical Services							
Boron	11.4J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:4	7440-42-8	
Lithium	23.3	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:4	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36			
7470 Mercury	Analytical	Method: EPA 7	470A Prepa	ration Meth	nod: FP	A 7470A			
. Tro moroury	-	lytical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:2	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011						
23400 Total Dissolved Solids	•	lytical Services							
Total Dissolved Solids	884	mg/L	50.0	50.0	1		07/11/20 10:48	3	
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Ana	lytical Services	- Asheville						
Chloride	289	mg/L	6.0	3.6	6		07/12/20 12:07	7 16887-00-6	
Fluoride	0.12	mg/L	0.10	0.050	1		07/11/20 22:11		
Sulfate	17.3	mg/L	1.0	0.50	1		07/11/20 22:11		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: MW-8	Lab ID:	92485285009	Collected:	07/07/20	09:00	Received: 07/	09/20 09:05 N	latrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL .	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Met	hod: EF	PA 3010A			
	Pace Ana	lytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:17	7440-36-0	P8
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:52	7440-38-2	
Barium	1020	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:52	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:52	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:52	7440-43-9	
Calcium	95600	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:52	7440-70-2	
Chromium	43.5	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:52	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:52	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:52	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:17	7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Nickel	22.1	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:52	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55			
Vanadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55			
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Met	hod: EF	PA 3010A			
	-	lytical Services							
Boron	10.4J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:45	7440-42-8	
Lithium	19.6	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:45	7439-93-2	
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36			
7470 Mercury	Analytical	Method: EPA 7	470A Prepa	ration Met	nod: EP	A 7470A			
	-	lytical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:24	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	540C-2011						
20 100 Total Diocolivou Collac	,	lytical Services							
Total Dissolved Solids	900	mg/L	50.0	50.0	1		07/11/20 10:48	;	
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
	Pace Ana	lytical Services	- Asheville						
Chloride	318	mg/L	7.0	4.2	7		07/12/20 12:21	16887-00-6	
Fluoride	0.073J	mg/L	0.10	0.050	1		07/11/20 23:06		
Sulfate	7.8	mg/L	1.0	0.50	1		07/11/20 23:06		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: LEACHATE	Lab ID:	92485285010	Collected:	07/06/20	11:20	Received: 07/	09/20 09:05 Ma	atrix: Water	
Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Met	hod: EF	PA 3010A			
	Pace Anal	ytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:21	7440-36-0	P8
Arsenic	14.6	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:55	7440-38-2	
Barium	64.0	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:55	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:55	7440-41-7	
Cadmium	0.42J	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:55	7440-43-9	
Calcium	11600	ug/L	1000	942	10	07/10/20 01:55	07/15/20 14:37	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:55	7440-47-3	
Cobalt	3.8J	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:55	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:55	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:21	7439-92-1	
Molybdenum	249	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:55	7439-98-7	
Nickel	8.6	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:55	7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:55	7782-49-2	
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 17:55	7440-22-4	
Vanadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 17:55	7440-62-2	
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 17:55	7440-66-6	
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Metl	nod: EF	PA 3010A			
	Pace Anal	ytical Services	- Asheville						
Boron	3470	ug/L	2500	623	100	07/10/20 01:36	07/10/20 16:04	7440-42-8	
Lithium	39.1	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 20:12	7439-93-2	
Thallium	0.32	ug/L	0.10	0.050	1		07/10/20 20:12		
7470 Mercury	Analytical	Method: EPA 7	470A Prepa	ration Meth	nod: FF	PA 7470A			
	-	ytical Services	•						
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:26	7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	540C-2011						
20400 Total Dissolved Collas	•	ytical Services							
Total Dissolved Solids	1400	mg/L	125	125	1		07/10/20 16:11		
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Anal	ytical Services	- Asheville						
Chloride	19.0	mg/L	1.0	0.60	1		07/11/20 23:21	16887-00-6	
Fluoride	0.22	mg/L	0.10	0.050	1		07/11/20 23:21	16984-48-8	
Sulfate	573	mg/L	12.0	6.0	12		07/12/20 12:35		



Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: SW-1	Lab ID:	92485285011	Collected:	07/06/20	12:00	Received: 07/	09/20 09:05 N	//atrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Meth	nod: EF	PA 3010A			
	Pace Ana	lytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/15/20 14:24	4 7440-36-0	P8
Arsenic	9.6J	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 17:5	8 7440-38-2	
Barium	1140	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:5	8 7440-39-3	
Beryllium	1.7	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 17:5	8 7440-41-7	
Cadmium	0.90J	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 17:5	8 7440-43-9	
Calcium	9390	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 17:5	8 7440-70-2	
Chromium	22.4	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 17:5	8 7440-47-3	
Cobalt	17.5	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 17:5	8 7440-48-4	
Copper	25.8	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 17:5	8 7440-50-8	
Lead	70.6	ug/L	5.0	4.5	1	07/10/20 01:55	07/15/20 14:24	4 7439-92-1	
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Nickel	18.5	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 17:5	3 7440-02-0	
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55			
√anadium	103	ug/L	5.0	3.9	1	07/10/20 01:55			
Zinc	115	ug/L	10.0	9.5	1	07/10/20 01:55			
6020 MET ICPMS	Analytical	Method: EPA 6	020B Prepa	ration Meth	nod: EP	A 3010A			
	-	lytical Services							
Boron	10.9J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:4	9 7440-42-8	
Lithium	9.5	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 15:49	9 7439-93-2	
Thallium	0.26	ug/L	0.10	0.050	1	07/10/20 01:36			
7470 Mercury	Analytical	Method: EPA 7	470A Prepai	ration Meth	nod: FP	A 7470A			
. Tro moroary	-	lytical Services							
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:2	8 7439-97-6	
2540C Total Dissolved Solids	Analytical	Method: SM 25	540C-2011						
10400 Total Dissolved Collas	,	lytical Services							
Total Dissolved Solids	1290	mg/L	25.0	25.0	1		07/10/20 16:1	1	
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
	Pace Ana	lytical Services	- Asheville						
Chloride	4.9	mg/L	1.0	0.60	1		07/11/20 23:3	5 16887-00-6	
Fluoride	0.34	mg/L	0.10	0.050	1		07/11/20 23:3		
Sulfate	1.8	mg/L	1.0	0.50	1		07/11/20 23:3		



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: SW-2	Lab ID:	92485285012	Collected:	07/06/20	11:45	Received: 07/	09/20 09:05 Ma	atrix: Water			
Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua		
6010 MET ICP	Analytical Method: EPA 6010D Preparation Method: EPA 3010A										
	Pace Anal	lytical Services	- Asheville								
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/13/20 18:08	7440-36-0			
Arsenic	5.1J	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 18:08	7440-38-2			
Barium	29.1	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 18:08	7440-39-3			
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 18:08	7440-41-7			
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 18:08	7440-43-9			
Calcium	2830	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 18:08	7440-70-2			
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 18:08	7440-47-3			
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 18:08	7440-48-4			
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 18:08	7440-50-8			
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/13/20 18:08	7439-92-1			
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 18:08	7439-98-7			
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 18:08	7440-02-0			
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 18:08	7782-49-2			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 18:08	7440-22-4			
Vanadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 18:08	7440-62-2			
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 18:08	7440-66-6			
6020 MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A										
	Pace Analytical Services - Asheville										
Boron	14.0J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 15:56	7440-42-8			
Lithium	ND	ug/L	2.5	0.39	1		07/10/20 15:56				
Thallium	ND	ug/L	0.10	0.050	1		07/10/20 15:56				
7.470 M	A	Mathadi EDA 7	4704 Decem		d. CC	NA 7470A					
7470 Mercury	Analytical Method: EPA 7470A Preparation Method: EPA 7470A										
	Pace Anal	ytical Services	- Asheville								
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:31	7439-97-6			
2540C Total Dissolved Solids	Analytical	Method: SM 25	40C-2011								
LUTUU TURRI DIGGUIYER GUIRG	Analytical Method: SM 2540C-2011 Pace Analytical Services - Asheville										
Total Dissolved Solids	62.0	mg/L	25.0	25.0	1		07/10/20 16:11				
		•			•		3., 10,20 10.11				
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0 Rev 2.1 1993										
	Pace Anal	ytical Services	- Asheville								
Chloride	17.4	mg/L	1.0	0.60	1		07/11/20 23:48	16887-00-6			
Fluoride	0.069J	mg/L	0.10	0.050	1		07/11/20 23:48	16984-48-8			
	2.5				•		=======				



Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: DUP	Lab ID:	92485285013	Collected:	07/06/20	14:30	Received: 07/	09/20 09:05 N	latrix: Water			
Parameters	Results	Units	Report Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua		
6010 MET ICP	Analytical I	Method: EPA 6	010D Prepa	ration Meth	nod: EF	PA 3010A					
	Pace Analy	tical Services	- Asheville								
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/13/20 18:1	7440-36-0			
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 18:1	7440-38-2			
Barium	60.0	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 18:1	7440-39-3			
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 18:1	7440-41-7			
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 18:1	7440-43-9			
Calcium	34900	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 18:1	7440-70-2			
Chromium	10.4	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 18:1	7440-47-3			
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 18:1	7440-48-4			
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 18:1	7440-50-8			
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55	07/13/20 18:1	7439-92-1			
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 18:1	7439-98-7			
Nickel	6.8	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 18:1	7440-02-0			
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 18:1	7782-49-2			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 18:1	7440-22-4			
√anadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 18:1	7440-62-2			
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55	07/13/20 18:1	7440-66-6			
6020 MET ICPMS	Analytical I	Method: EPA 6	020B Prepa	ration Meth	nod: EP	A 3010A					
	Pace Analy	tical Services	- Asheville								
Boron	7.4J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 16:0	7440-42-8			
Lithium	22.8	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 16:0				
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36					
7470 Mercury	Analytical	Method: EPA 7	470A Prepai	ration Meth	nod: FP	A 7470A					
. Tro moroury		tical Services									
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:3	3 7439-97-6			
2540C Total Dissolved Solids	Analytical Method: SM 2540C-2011 Pace Analytical Services - Asheville										
Total Dissolved Solids	624	mg/L	50.0	50.0	1		07/10/20 16:1	I			
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0 Rev 2.1 1993 Pace Analytical Services - Asheville										
Chloride	217	mg/L	4.0	2.4	4		07/12/20 12:4	9 16887-00-6			
Fluoride	0.33	mg/L	0.10	0.050	1		07/12/20 00:0				
1401140	0.55	g, L	0.10	0.000			51112120 00.0	_ 1000 T-T0-0			



## **ANALYTICAL RESULTS**

Project: CHARAH GW
Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Sample: EQBL	Lab ID:	92485285014	Collected:	07/08/20	12:00	Received: 07/	09/20 09:05 N	latrix: Water	
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical	Method: EPA 6	010D Prepa	ration Metl	nod: EF	A 3010A			
	Pace Ana	lytical Services	- Asheville						
Antimony	ND	ug/L	5.0	3.0	1	07/10/20 01:55	07/13/20 18:15	7440-36-0	
Arsenic	ND	ug/L	10.0	4.7	1	07/10/20 01:55	07/13/20 18:15	7440-38-2	
Barium	ND	ug/L	5.0	3.5	1	07/10/20 01:55	07/13/20 18:15	7440-39-3	
Beryllium	ND	ug/L	1.0	0.70	1	07/10/20 01:55	07/13/20 18:15	7440-41-7	
Cadmium	ND	ug/L	1.0	0.40	1	07/10/20 01:55	07/13/20 18:15	7440-43-9	
Calcium	ND	ug/L	100	94.2	1	07/10/20 01:55	07/13/20 18:15	7440-70-2	
Chromium	ND	ug/L	5.0	3.7	1	07/10/20 01:55	07/13/20 18:15	7440-47-3	
Cobalt	ND	ug/L	5.0	3.6	1	07/10/20 01:55	07/13/20 18:15	7440-48-4	
Copper	ND	ug/L	5.0	4.3	1	07/10/20 01:55	07/13/20 18:15	7440-50-8	
Lead	ND	ug/L	5.0	4.5	1	07/10/20 01:55			
Molybdenum	ND	ug/L	5.0	3.9	1	07/10/20 01:55			
Nickel	ND	ug/L	5.0	3.5	1	07/10/20 01:55			
Selenium	ND	ug/L	10.0	4.7	1	07/10/20 01:55			
Silver	ND	ug/L	5.0	2.5	1	07/10/20 01:55	07/13/20 18:15		
√anadium	ND	ug/L	5.0	3.9	1	07/10/20 01:55	07/13/20 18:15		
Zinc	ND	ug/L	10.0	9.5	1	07/10/20 01:55			
6020 MET ICPMS	Analytical	Method: EPA 6	020R Prena	ration Meth	nod: FE	Δ 3010Δ			
0020 MET 101 M3	=	lytical Services		radon wed	iou. Li	A 30 10A			
Boron	7.1J	ug/L	25.0	6.2	1	07/10/20 01:36	07/10/20 16:07	7440-42-8	
Lithium	ND	ug/L	2.5	0.39	1	07/10/20 01:36	07/10/20 16:07		
Thallium	ND	ug/L	0.10	0.050	1	07/10/20 01:36			
7470 Mercury	Analytical	Method: EPA 7	470A Prenai	ration Meth	nod: FP	Δ 7470Δ			
7470 Mercury	-	lytical Services		radon wea	10u. Li	7.7.47.67.			
Mercury	ND	ug/L	0.20	0.12	1	07/13/20 15:30	07/14/20 13:40	7439-97-6	
•		•		0	•	01710720 10100	01711120 10111		
2540C Total Dissolved Solids	•	Method: SM 25 lytical Services							
Total Dissolved Solids	ND	mg/L	25.0	25.0	1		07/13/20 18:48	3	
300.0 IC Anions 28 Days	Analytical	Method: EPA 3	00.0 Rev 2.1	1993					
•	Pace Ana	lytical Services	- Asheville						
Chloride	ND	mg/L	1.0	0.60	1		07/12/20 00:16	16887-00-6	
Fluoride	ND	mg/L	0.10	0.050	1		07/12/20 00:16		
Sulfate	ND	mg/L	1.0	0.50	1		07/12/20 00:16		

Qualifiers



Mercury

Date: 07/30/2020 12:12 PM

### **QUALITY CONTROL DATA**

Project: **CHARAH GW** 92485285 Pace Project No.:

QC Batch: EPA 7470A 552867 Analysis Method: QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury

ug/L

Laboratory: Pace Analytical Services - Asheville

92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007, Associated Lab Samples:

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 2937897 Matrix: Water

92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007, Associated Lab Samples:

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014 Reporting

Blank Parameter Limit MDL Units Result Analyzed ND 0.20 0.12 07/14/20 12:43

LABORATORY CONTROL SAMPLE: 2937898

LCS LCS % Rec Spike % Rec Limits Qualifiers Parameter Units Conc. Result Mercury ug/L 2.5 2.5 100 80-120

2937900 MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2937899 MSD MS 92485464001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual

75-125 8 25 M1 Mercury 2.0 2.5 2.5 3.8 3.6 74 63 ug/L

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2937985 2937986 MS MSD

MSD MSD 92485488002 Spike Spike MS MS % Rec Max Parameter Conc. Conc. Result % Rec % Rec **RPD** RPD Qual Units Result Result Limits Mercury ND 2.5 2.5 2.6 2.6 104 102 75-125 2 25 ug/L

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

Zinc

Date: 07/30/2020 12:12 PM

QC Batch: 552376 Analysis Method: EPA 6010D
QC Batch Method: EPA 3010A Analysis Description: 6010 MET

ug/L

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007, 92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 2935744 Matrix: Water

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007, 92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

Blank Reporting Parameter MDL Units Result I imit Analyzed Qualifiers Antimony ug/L ND 5.0 3.0 07/15/20 13:12 ND Arsenic ug/L 10.0 4.7 07/13/20 17:03 Barium ND 5.0 07/13/20 17:03 ug/L 3.5 Beryllium ND 1.0 0.70 07/13/20 17:03 ug/L Cadmium ug/L ND 1.0 0.40 07/13/20 17:03 Calcium ug/L ND 100 94.2 07/13/20 17:03 Chromium ND 5.0 3.7 07/13/20 17:03 ug/L Cobalt ug/L ND 5.0 3.6 07/13/20 17:03 Copper ug/L ND 5.0 07/13/20 17:03 07/15/20 13:12 Lead ug/L ND 5.0 4.5 Molybdenum ND 5.0 3.9 07/13/20 17:03 ug/L ND 5.0 3.5 07/13/20 17:03 Nickel ug/L Selenium ND 10.0 07/13/20 17:03 47 ug/L Silver ND 07/13/20 17:03 5.0 2.5 ug/L Vanadium ND 5.0 07/13/20 17:03 ug/L 3.9

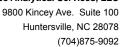
ND

10.0

9.5 07/13/20 17:03

Qualifiers
8

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

MATRIX SPIKE & MATRIX	SPIKE DUPI	LICATE: 2935	746 MS	MSD	2935747							
		92485285001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	ug/L		500	500	546	549	109	110	75-125	0	20	P8
Arsenic	ug/L	4.8J	500	500	559	556	111	110	75-125	1	20	
Barium	ug/L	265	500	500	798	793	107	106	75-125	1	20	
Beryllium	ug/L	ND	500	500	570	566	114	113	75-125	1	20	
Cadmium	ug/L	ND	500	500	534	530	107	106	75-125	1	20	
Calcium	ug/L	21700	5000	5000	27100	27100	108	108	75-125	0	20	
Chromium	ug/L	ND	500	500	526	522	105	104	75-125	1	20	
Cobalt	ug/L	ND	500	500	546	545	109	109	75-125	0	20	
Copper	ug/L	ND	500	500	561	555	112	111	75-125	1	20	
Lead	ug/L	ND	500	500	524	527	105	105	75-125	1	20	
Molybdenum	ug/L	ND	500	500	542	542	108	108	75-125	0	20	
Nickel	ug/L	ND	500	500	534	533	107	106	75-125	0	20	
Selenium	ug/L	ND	500	500	566	563	113	113	75-125	1	20	
Silver	ug/L	ND	250	250	267	265	107	106	75-125	1	20	
Vanadium	ug/L	6.8	500	500	540	536	107	106	75-125	1	20	
Zinc	ug/L	ND	500	500	521	519	104	103	75-125	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

QC Batch: 552378 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007, 92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 2935752 Matrix: Water

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

Blank Reporting Parameter Units Limit MDL Qualifiers Result Analyzed Boron ug/L ND 25.0 6.2 07/10/20 13:21 Lithium ND 0.39 ug/L 2.5 07/10/20 13:21 0.10 Thallium ND 0.050 07/10/20 13:21 ug/L

LABORATORY CONTROL SAMPLE: 2935753 LCS LCS % Rec Spike Parameter Conc. Result % Rec Limits Qualifiers Units Boron 50 52.5 105 80-120 ug/L Lithium 50 54.8 110 80-120 ug/L Thallium ug/L 10 10.8 108 80-120

MATRIX SPIKE & MATRIX SP	IKE DUPLIC	CATE: 2935	754		2935755							
			MS	MSD								
	9	2485285002	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	17.6J	50	50	68.6	69.4	102	104	75-125	1	20	
Lithium	ug/L	14.0	50	50	58.4	58.9	89	90	75-125	1	20	
Thallium	ug/L	ND	10	10	11.4	11.5	114	115	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

QC Batch: 552616 Analysis Method:

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Laboratory: Pace Analytical Services - Asheville

SM 2540C-2011

Associated Lab Samples: 92485285005, 92485285007, 92485285010, 92485285011, 92485285012, 92485285013

METHOD BLANK: 2936759 Matrix: Water

Associated Lab Samples: 92485285005, 92485285007, 92485285010, 92485285011, 92485285012, 92485285013

Blank Reporting

Parameter Units Result Limit MDL Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 25.0 07/10/20 16:08

LABORATORY CONTROL SAMPLE: 2936760

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units **Total Dissolved Solids** 250 244 98 90-110 mg/L

SAMPLE DUPLICATE: 2936761

92485285005 Dup Max
Parameter Units Result RPD RPD Qualifiers

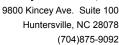
Total Dissolved Solids mg/L 1140 1120 1 25

SAMPLE DUPLICATE: 2936762

Date: 07/30/2020 12:12 PM

92484717009 Dup Max RPD RPD Parameter Units Result Result Qualifiers Total Dissolved Solids 305 326 7 mg/L 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH GW Pace Project No.: 92485285

QC Batch: 552680 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285004, 92485285006, 92485285008, 92485285009

METHOD BLANK: 2937173 Matrix: Water

Associated Lab Samples: 92485285004, 92485285006, 92485285008, 92485285009

Blank Reporting

ParameterUnitsResultLimitMDLAnalyzedQualifiersTotal Dissolved Solidsmg/LND25.025.007/11/20 10:46

LABORATORY CONTROL SAMPLE: 2937174

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units mg/L **Total Dissolved Solids** 250 256 102 90-110

SAMPLE DUPLICATE: 2937175

92484742048 Dup Max Parameter Units Result Result **RPD RPD** Qualifiers 115 **Total Dissolved Solids** 133 mg/L 15 25

SAMPLE DUPLICATE: 2937176

Date: 07/30/2020 12:12 PM

92485285006 Dup Max RPD RPD Parameter Units Result Result Qualifiers Total Dissolved Solids 264 254 mg/L 4 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

QC Batch: 552814 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285001, 92485285002, 92485285003

METHOD BLANK: 2937609 Matrix: Water

Associated Lab Samples: 92485285001, 92485285002, 92485285003

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 25.0 07/13/20 14:48

LABORATORY CONTROL SAMPLE: 2937610

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units **Total Dissolved Solids** mg/L 250 248 99 90-110

SAMPLE DUPLICATE: 2937611

92485302002 Dup Max Parameter Units Result Result **RPD RPD** Qualifiers 202 **Total Dissolved Solids** 186 8 mg/L 25

SAMPLE DUPLICATE: 2937612

Date: 07/30/2020 12:12 PM

92484742059 Dup Max RPD RPD Parameter Units Result Result Qualifiers Total Dissolved Solids 117 117 0 25 mg/L

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW
Pace Project No.: 92485285

QC Batch: 552969 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285014

METHOD BLANK: 2938479 Matrix: Water

Associated Lab Samples: 92485285014

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Total Dissolved Solids mg/L ND 25.0 25.0 07/13/20 18:48

LABORATORY CONTROL SAMPLE: 2938480

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units **Total Dissolved Solids** mg/L 250 250 100 90-110

SAMPLE DUPLICATE: 2938481

Date: 07/30/2020 12:12 PM

Parameter Units Parameter Units Parameter Units Parameter Units Parameter Units Parameter Parameter Units Parameter Result Parameter Result Result Result RPD RPD Qualifiers ND ND S25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

QC Batch: 552692 Analysis Method: EPA 300.0 Rev 2.1 1993

QC Batch Method: EPA 300.0 Rev 2.1 1993 Analysis Description: 300.0 IC Anions

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 2937224 Matrix: Water

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	0.60	07/11/20 17:03	
Fluoride	mg/L	ND	0.10	0.050	07/11/20 17:03	
Sulfate	mg/L	ND	1.0	0.50	07/11/20 17:03	

LABORATORY CONTROL SAMPLE:	2937225	Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Chloride	mg/L	50	51.4	103	90-110	
Fluoride	mg/L	2.5	2.3	93	90-110	
Sulfate	mg/L	50	50.3	101	90-110	

MATRIX SPIKE & MATRIX SI	PIKE DUPL	ICATE: 2937	226		2937227	,						
		92485297001	MS Spike	MSD Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	49.5	50	50	92.6	92.2	86	86	90-110	0	10	M1
Fluoride	mg/L	ND	2.5	2.5	2.3	2.3	87	90	90-110	4	10	M1
Sulfate	mg/L	1.8	50	50	52.6	53.1	102	103	90-110	1	10	

MATRIX SPIKE & MATRIX SP	IKE DUPLI	CATE: 2937	228		2937229							
			MS	MSD								
	ç	92485285005	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	485	50	50	520	518	69	66	90-110	0	10	M6
Fluoride	mg/L	0.25	2.5	2.5	2.6	2.7	96	97	90-110	1	10	
Sulfate	mg/L	11.4	50	50	61.9	62.1	101	101	90-110	0	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92485285

Sample: BG-1 PWS:	<b>Lab ID: 924852</b> Site ID:	285001 Collected: 07/08/20 11:50 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Se	ervices - Greensburg				
Radium-226	EPA 903.1	0.137 ± 0.312 (0.503) C:NA T:91%	pCi/L	07/23/20 16:06	6 13982-63-3	
	Pace Analytical Se	ervices - Greensburg				
Radium-228	EPA 904.0	0.861 ± 0.435 (0.760) C:72% T:87%	pCi/L	07/23/20 14:36	6 15262-20-1	
	Pace Analytical Se	ervices - Greensburg				
Total Radium	Total Radium Calculation	$0.998 \pm 0.747  (1.26)$	pCi/L	07/27/20 11:07	7 7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

Sample: BG-2 PWS:	Lab ID: 9248 Site ID:	<b>S5285002</b> Collected: 07/08/20 08:55 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.417 ± 0.424 (0.642) C:NA T:93%	pCi/L	07/23/20 16:06	5 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.749 ± 0.428 (0.786) C:73% T:87%	pCi/L	07/23/20 14:36	5 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.17 ± 0.852 (1.43)	pCi/L	07/27/20 11:07	7440-14-4	



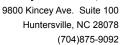
Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-1 PWS:	Lab ID: 9248 Site ID:	5285003 Collected: 07/08/20 14:40 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.391 ± 0.426 (0.670) C:NA T:98%	pCi/L	07/23/20 16:06	3 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.627 ± 0.385 (0.710) C:69% T:87%	pCi/L	07/23/20 14:36	5 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.02 ± 0.811 (1.38)	pCi/L	07/27/20 11:07	7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-3 PWS:	Lab ID: 9248 Site ID:	<b>5285004</b> Collected: 07/07/20 08:10 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.804 ± 0.554 (0.756) C:NA T:98%	pCi/L	07/23/20 16:06	6 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	1.61 ± 0.528 (0.682) C:72% T:85%	pCi/L	07/23/20 14:36	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	2.41 ± 1.08 (1.44)	pCi/L	07/27/20 11:07	7 7440-14-4	





Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-4 Lab ID: 92485285005 Collected: 07/06/20 12:25 Received: 07/09/20 09:05 Matrix: Water

PWS: Site ID: Sample Type:

Comments: • Sample collection date on containers does not match COC; client was notified. Client confirmed 7/6 as the correct collection date.

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.135 ± 0.417 (0.808) C:NA T:90%	pCi/L	07/23/20 16:06	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.625 ± 0.456 (0.894) C:70% T:84%	pCi/L	07/23/20 14:36	15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.760 ± 0.873 (1.70)	pCi/L	07/27/20 11:07	7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-5 PWS:	<b>Lab ID: 92485</b> Site ID:	<b>285006</b> Collected: 07/07/20 10:20 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical S	Services - Greensburg				
Radium-226	EPA 903.1	0.000 ± 0.319 (0.715) C:NA T:86%	pCi/L	07/23/20 16:06	3 13982-63-3	
	Pace Analytical S	Services - Greensburg				
Radium-228	EPA 904.0	0.0262 ± 0.308 (0.714) C:70% T:87%	pCi/L	07/23/20 14:36	3 15262-20-1	
	Pace Analytical S	Services - Greensburg				
Total Radium	Total Radium Calculation	0.0262 ± 0.627 (1.43)	pCi/L	07/27/20 11:07	7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-6 PWS:	<b>Lab ID: 924852</b> Site ID:	285007 Collected: 07/06/20 15:30 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical S	ervices - Greensburg				
Radium-226	EPA 903.1	0.233 ± 0.512 (0.925) C:NA T:98%	pCi/L	07/23/20 16:06	6 13982-63-3	
	Pace Analytical S	ervices - Greensburg				
Radium-228	EPA 904.0	0.770 ± 0.398 (0.690) C:71% T:87%	pCi/L	07/23/20 14:37	7 15262-20-1	
	Pace Analytical S	ervices - Greensburg				
Total Radium	Total Radium Calculation	1.00 ± 0.910 (1.62)	pCi/L	07/27/20 11:07	7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-7R PWS:	Lab ID: 9248 Site ID:	<b>5285008</b> Collected: 07/07/20 14:50 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.127 ± 0.306 (0.591) C:NA T:104%	pCi/L	07/23/20 16:20	0 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.343 ± 0.369 (0.768) C:67% T:89%	pCi/L	07/23/20 14:3	7 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	$0.470 \pm 0.675  (1.36)$	pCi/L	07/27/20 11:07	7 7440-14-4	



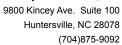
Project: CHARAH GW Pace Project No.: 92485285

Sample: MW-8 PWS:	Lab ID: 9248 Site ID:	<b>5285009</b> Collected: 07/07/20 09:00 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.260 ± 0.362 (0.604) C:NA T:87%	pCi/L	07/23/20 16:20	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.474 ± 0.384 (0.758) C:66% T:84%	pCi/L	07/23/20 14:3	7 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.734 ± 0.746 (1.36)	pCi/L	07/27/20 11:07	7 7440-14-4	



Project: CHARAH GW Pace Project No.: 92485285

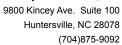
Sample: LEACHATE PWS:	<b>Lab ID: 92485</b> Site ID:	<b>Collected:</b> 07/06/20 11:20 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical S	Services - Greensburg			- 1	
Radium-226	EPA 903.1	0.295 ± 0.356 (0.543) C:NA T:90%	pCi/L	07/23/20 16:20	0 13982-63-3	
	Pace Analytical S	Services - Greensburg				
Radium-228	EPA 904.0	0.128 ± 0.268 (0.594) C:73% T:92%	pCi/L	07/23/20 14:3	7 15262-20-1	
	Pace Analytical S	Services - Greensburg				
Total Radium	Total Radium Calculation	0.423 ± 0.624 (1.14)	pCi/L	07/27/20 11:07	7 7440-14-4	





Project: CHARAH GW Pace Project No.: 92485285

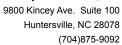
Sample: SW-1 PWS:	Lab ID: 9248 Site ID:	85285011 Collected: 07/06/20 12:00 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg			_	,
Radium-226	EPA 903.1	1.76 ± 1.06 (0.435) C:NA T:89%	pCi/L	07/23/20 16:2	0 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	2.16 ± 0.836 (1.25) C:69% T:63%	pCi/L	07/23/20 14:3	7 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	3.92 ± 1.90 (1.69)	pCi/L	07/27/20 11:14	4 7440-14-4	





Project: CHARAH GW Pace Project No.: 92485285

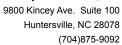
Sample: SW-2 PWS:	Lab ID: 9248 Site ID:	<b>5285012</b> Collected: 07/06/20 11:45 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.000 ± 0.306 (0.687) C:NA T:92%	pCi/L	07/23/20 16:20	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.847 ± 0.527 (0.986) C:65% T:75%	pCi/L	07/23/20 14:37	7 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.847 ± 0.833 (1.67)	pCi/L	07/27/20 11:14	7440-14-4	





Project: CHARAH GW Pace Project No.: 92485285

Sample: DUP PWS:	Lab ID: 9248 Site ID:	<b>5285013</b> Collected: 07/06/20 14:30 Sample Type:	Received:	07/09/20 09:05 N	latrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	-0.135 ± 0.323 (0.808) C:NA T:89%	pCi/L	07/23/20 16:20	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.737 ± 0.507 (0.984) C:69% T:78%	pCi/L	07/23/20 14:37	15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.737 ± 0.830 (1.79)	pCi/L	07/27/20 11:14	7440-14-4	





Project: CHARAH GW Pace Project No.: 92485285

Sample: EQBL PWS:	Lab ID: 9248 Site ID:	<b>5285014</b> Collected: 07/08/20 12:00 Sample Type:	Received:	07/09/20 09:05	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.000 ± 0.487 (0.997) C:NA T:89%	pCi/L	07/23/20 16:38	3 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.679 ± 0.425 (0.799) C:72% T:83%	pCi/L	07/23/20 14:37	7 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.679 ± 0.912 (1.80)	pCi/L	07/27/20 11:14	7440-14-4	



9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH GW Pace Project No.: 92485285

QC Batch: 405278 Analysis Method: EPA 904.0

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 1961132 Matrix: Water

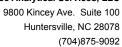
Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 0.185 ± 0.348 (0.765) C:76% T:76%
 pCi/L
 07/23/20 14:36

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH GW Pace Project No.: 92485285

QC Batch: 405261 Analysis Method: EPA 903.1

QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

METHOD BLANK: 1961094 Matrix: Water

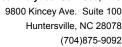
Associated Lab Samples: 92485285001, 92485285002, 92485285003, 92485285004, 92485285005, 92485285006, 92485285007,

92485285008, 92485285009, 92485285010, 92485285011, 92485285012, 92485285013, 92485285014

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-226
 -0.144 ± 0.283 (0.678) C:NA T:87%
 pCi/L
 07/23/20 15:50

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **QUALIFIERS**

Project: CHARAH GW Pace Project No.: 92485285

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **ANALYTE QUALIFIERS**

Date: 07/30/2020 12:12 PM

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.

MW Due to matrix interference, achieving a constant weight is not possible.

P8 Analyte was detected in the method blank. All associated samples had concentrations of at least ten times greater than

the blank or were below the reporting limit.

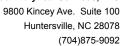


## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytic Batch
92485285001	BG-1	EPA 3010A	552376	EPA 6010D	 552381
92485285002	BG-2	EPA 3010A	552376	EPA 6010D	552381
2485285003	MW-1	EPA 3010A	552376	EPA 6010D	552381
2485285004	MW-3	EPA 3010A	552376	EPA 6010D	552381
2485285005	MW-4	EPA 3010A	552376	EPA 6010D	552381
2485285006	MW-5	EPA 3010A	552376	EPA 6010D	552381
2485285007	MW-6	EPA 3010A	552376	EPA 6010D	552381
2485285008	MW-7R	EPA 3010A	552376	EPA 6010D	552381
2485285009	MW-8	EPA 3010A	552376	EPA 6010D	552381
2485285010	LEACHATE	EPA 3010A	552376	EPA 6010D	552381
2485285011	SW-1	EPA 3010A	552376	EPA 6010D	552381
2485285012	SW-2	EPA 3010A	552376	EPA 6010D	552381
2485285013	DUP	EPA 3010A	552376	EPA 6010D	552381
2485285014	EQBL	EPA 3010A	552376	EPA 6010D	552381
2485285001	BG-1	EPA 3010A	552378	EPA 6020B	552385
2485285002	BG-2	EPA 3010A	552378	EPA 6020B	552385
2485285003	MW-1	EPA 3010A	552378	EPA 6020B	552385
2485285004	MW-3	EPA 3010A	552378	EPA 6020B	552385
2485285005	MW-4	EPA 3010A	552378	EPA 6020B	552385
2485285006	MW-5	EPA 3010A	552378	EPA 6020B	552385
2485285007	MW-6	EPA 3010A	552378	EPA 6020B	552385
2485285008	MW-7R	EPA 3010A	552378	EPA 6020B	552385
2485285009	MW-8	EPA 3010A	552378	EPA 6020B	552385
2485285010	LEACHATE	EPA 3010A	552378	EPA 6020B	552385
2485285011	SW-1	EPA 3010A	552378	EPA 6020B	552385
2485285012	SW-2	EPA 3010A	552378	EPA 6020B	552385
2485285013	DUP	EPA 3010A	552378	EPA 6020B	552385
2485285014	EQBL	EPA 3010A	552378	EPA 6020B	552385
2485285001	BG-1	EPA 7470A	552867	EPA 7470A	552927
2485285002	BG-2	EPA 7470A	552867	EPA 7470A	552927
2485285003	MW-1	EPA 7470A	552867	EPA 7470A	552927
2485285004	MW-3	EPA 7470A	552867	EPA 7470A	552927
2485285005	MW-4	EPA 7470A	552867	EPA 7470A	552927
2485285006	MW-5	EPA 7470A	552867	EPA 7470A	552927
2485285007	MW-6	EPA 7470A	552867	EPA 7470A	552927
2485285008	MW-7R	EPA 7470A	552867	EPA 7470A	552927
2485285009	MW-8	EPA 7470A	552867	EPA 7470A	552927
2485285010	LEACHATE	EPA 7470A	552867	EPA 7470A	552927
2485285011	SW-1	EPA 7470A	552867	EPA 7470A	552927
2485285012	SW-2	EPA 7470A	552867	EPA 7470A	552927
2485285013	DUP	EPA 7470A	552867	EPA 7470A	552927
2485285014	EQBL	EPA 7470A	552867	EPA 7470A	552927
2485285001	BG-1	EPA 903.1	405261		
2485285002	BG-2	EPA 903.1	405261		
2485285003	MW-1	EPA 903.1	405261		
2485285004	MW-3	EPA 903.1	405261		
2485285005	MW-4	EPA 903.1	405261		





## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

MW-6	Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytic Batch
MW-6	92485285006	MW-5	EPA 903.1	405261	_	
MBS285009   MW-78	92485285007					
MR-8						
HS285010						
BS285011   SW-1						
H85285013   DUP						
BS285013   DUP						
BS285014   EQBL						
BG-1	2485285014					
185285002         BG-2         EPA 904.0         405278           185285003         MW-1         EPA 904.0         405278           185285004         MW-3         EPA 904.0         405278           185285005         MW-4         EPA 904.0         405278           185285006         MW-5         EPA 904.0         405278           185285007         MW-6         EPA 904.0         405278           185285008         MW-7R         EPA 904.0         405278           185285010         LEACHATE         EPA 904.0         405278           185285011         SW-1         EPA 904.0         405278           185285012         SW-2         EPA 904.0         405278           185285013         DUP         EPA 904.0         405278           185285014         EOBL         EPA 904.0         405278           185285015         DUP         EPA 904.0         405278           185285016         BG-1         Total Radium Calculation         406774           185285001         BG-1         Total Radium Calculation         406774           185285003         MW-1         Total Radium Calculation         406774           185285004         MW-3         Total Radium Calculati						
185285003   MW-1						
185285004   MW-3						
185285005         MW-4         EPA 904.0         405278           185285006         MW-5         EPA 904.0         405278           185285007         MW-6         EPA 904.0         405278           185285009         MW-7R         EPA 904.0         405278           185285009         MW-8         EPA 904.0         405278           185285011         SW-1         EPA 904.0         405278           185285012         SW-2         EPA 904.0         405278           185285013         DUP         EPA 904.0         405278           185285014         EQBL         EPA 904.0         405278           185285015         SW-2         EPA 904.0         405278           185285014         EQBL         EPA 904.0         405278           185285015         BG-1         Total Radium Calculation         406774           185285000         BG-2         Total Radium Calculation         406774           185285003         MW-1         Total Radium Calculation         406774           185285006         MW-3         Total Radium Calculation         406774           185285007         MW-6         Total Radium Calculation         406774           185285008         MW-7R						
185285006   MW-5						
185285007   MW-6						
485285008         MW-R         EPA 904.0         405278           485285009         MW-8         EPA 904.0         405278           485285010         LEACHATE         EPA 904.0         405278           485285011         SW-1         EPA 904.0         405278           485285012         SW-2         EPA 904.0         405278           485285013         DUP         EPA 904.0         405278           485285014         EGBL         EPA 904.0         405278           485285001         BG-1         Total Radium Calculation         406774           485285002         BG-2         Total Radium Calculation         406774           485285003         MW-1         Total Radium Calculation         406774           485285005         MW-3         Total Radium Calculation         406774           485285006         MW-5         Total Radium Calculation         406774           485285007         MW-6         Total Radium Calculation         406774           485285009         MW-7R         Total Radium Calculation         406774           485285011         SW-1         Total Radium Calculation         406774           485285012         SW-2         Total Radium Calculation         406776						
485285009         MW-8         EPA 904.0         405278           485285010         LEACHATE         EPA 904.0         405278           485285011         SW-1         EPA 904.0         405278           485285012         SW-2         EPA 904.0         405278           485285013         DUP         EPA 904.0         405278           485285014         EQBL         EPA 904.0         405278           485285001         BG-1         Total Radium Calculation         406774           485285002         BG-2         Total Radium Calculation         406774           485285003         MW-1         Total Radium Calculation         406774           485285004         MW-3         Total Radium Calculation         406774           485285005         MW-4         Total Radium Calculation         406774           485285006         MW-5         Total Radium Calculation         406774           485285007         MW-6         Total Radium Calculation         406774           485285008         MW-7R         Total Radium Calculation         406774           485285010         LEACHATE         Total Radium Calculation         406774           485285011         SW-2         Total Radium Calculation         4067						
485285010         LEACHATE         EPA 904.0         405278           485285011         SW-1         EPA 904.0         405278           485285012         SW-2         EPA 904.0         405278           485285013         DUP         EPA 904.0         405278           485285014         EQBL         EPA 904.0         405278           48528501         BG-1         Total Radium Calculation         406774           48528502         BG-2         Total Radium Calculation         406774           48528503         MW-1         Total Radium Calculation         406774           48528504         MW-3         Total Radium Calculation         406774           48528505         MW-4         Total Radium Calculation         406774           48528506         MW-5         Total Radium Calculation         406774           48528507         MW-6         Total Radium Calculation         406774           48528508         MW-7R         Total Radium Calculation         406774           48528501         LEACHATE         Total Radium Calculation         406774           48528501         SW-1         Total Radium Calculation         406776           48528501         SW-2         Total Radium Calculation						
885285011         SW-1         EPA 904.0         405278           885285012         SW-2         EPA 904.0         405278           885285013         DUP         EPA 904.0         405278           885285014         EQBL         EPA 904.0         405278           885285014         EQBL         EPA 904.0         405278           88528501         BG-1         Total Radium Calculation         406774           88528502         BG-2         Total Radium Calculation         406774           88528503         MW-1         Total Radium Calculation         406774           88528504         MW-3         Total Radium Calculation         406774           88528505         MW-4         Total Radium Calculation         406774           88528506         MW-5         Total Radium Calculation         406774           88528507         MW-6         Total Radium Calculation         406774           88528508         MW-7R         Total Radium Calculation         406774           88528509         MW-8         Total Radium Calculation         406774           885285011         SW-1         Total Radium Calculation         406776           885285012         SW-2         Total Radium Calculation         406776						
885285012         SW-2         EPA 904.0         405278           885285013         DUP         EPA 904.0         405278           885285014         EQBL         EPA 904.0         405278           885285014         EQBL         EPA 904.0         405278           885285001         BG-1         Total Radium Calculation         406774           885285002         BG-2         Total Radium Calculation         406774           885285003         MW-1         Total Radium Calculation         406774           885285004         MW-3         Total Radium Calculation         406774           885285005         MW-4         Total Radium Calculation         406774           885285006         MW-5         Total Radium Calculation         406774           885285007         MW-6         Total Radium Calculation         406774           885285008         MW-7R         Total Radium Calculation         406774           885285010         LEACHATE         Total Radium Calculation         406774           885285011         SW-1         Total Radium Calculation         406776           885285012         SW-2         Total Radium Calculation         406776           885285013         DUP         Total Radium Calculat	2485285010					
885285013         DUP         EPA 904.0         405278           885285014         EQBL         EPA 904.0         405278           885285001         BG-1         Total Radium Calculation         406774           885285002         BG-2         Total Radium Calculation         406774           885285003         MW-1         Total Radium Calculation         406774           885285004         MW-3         Total Radium Calculation         406774           885285005         MW-4         Total Radium Calculation         406774           885285006         MW-5         Total Radium Calculation         406774           885285007         MW-6         Total Radium Calculation         406774           885285009         MW-8         Total Radium Calculation         406774           885285010         LEACHATE         Total Radium Calculation         406774           885285011         SW-1         Total Radium Calculation         406776           885285012         SW-2         Total Radium Calculation         406776           885285013         DUP         Total Radium Calculation         406776           885285001         BG-1         SM 2540C-2011         552814           885285002         BG-2         SM	2485285011					
### EQBL ### EPA 904.0 ### 405278  ### ### ### EQBL ### EPA 904.0 ### 405278  ### ### EQBL ### EPA 904.0 ### 405278  ### ### EQBL ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### ### EPA 904.0 ### EPA 904.0 ### 406774  ### EPA 904.0 ### EPA 904.0 ### 406776  ### EPA 904.0 ### 40	2485285012					
885285001         BG-1         Total Radium Calculation         406774           485285002         BG-2         Total Radium Calculation         406774           485285003         MW-1         Total Radium Calculation         406774           485285004         MW-3         Total Radium Calculation         406774           485285005         MW-4         Total Radium Calculation         406774           485285006         MW-5         Total Radium Calculation         406774           485285007         MW-6         Total Radium Calculation         406774           485285008         MW-7R         Total Radium Calculation         406774           485285010         LEACHATE         Total Radium Calculation         406774           485285011         SW-1         Total Radium Calculation         406776           485285012         SW-2         Total Radium Calculation         406776           485285013         DUP         Total Radium Calculation         406776           485285014         EQBL         Total Radium Calculation         406776           485285001         BG-1         SM 2540C-2011         552814           485285002         BG-2         SM 2540C-2011         552814           485285003         MW-1	2485285013					
885285002       BG-2       Total Radium Calculation       406774         885285003       MW-1       Total Radium Calculation       406774         885285004       MW-3       Total Radium Calculation       406774         885285005       MW-4       Total Radium Calculation       406774         885285006       MW-5       Total Radium Calculation       406774         885285007       MW-6       Total Radium Calculation       406774         885285008       MW-7R       Total Radium Calculation       406774         885285010       LEACHATE       Total Radium Calculation       406774         885285011       SW-1       Total Radium Calculation       406776         885285012       SW-2       Total Radium Calculation       406776         885285013       DUP       Total Radium Calculation       406776         885285014       EQBL       Total Radium Calculation       406776         885285001       BG-1       SM 2540C-2011       552814         885285003       MW-1       SM 2540C-2011       552814         885285004       MW-3       SM 2540C-2011       552680         885285005       MW-4       SM 2540C-2011       552616	2485285014	EQBL	EPA 904.0	405278		
885285003         MW-1         Total Radium Calculation         406774           885285004         MW-3         Total Radium Calculation         406774           885285005         MW-4         Total Radium Calculation         406774           885285006         MW-5         Total Radium Calculation         406774           885285007         MW-6         Total Radium Calculation         406774           885285008         MW-7R         Total Radium Calculation         406774           885285019         MW-8         Total Radium Calculation         406774           885285010         LEACHATE         Total Radium Calculation         406774           885285011         SW-1         Total Radium Calculation         406776           885285012         SW-2         Total Radium Calculation         406776           885285013         DUP         Total Radium Calculation         406776           885285014         EQBL         Total Radium Calculation         406776           885285001         BG-1         SM 2540C-2011         552814           885285002         BG-2         SM 2540C-2011         552814           885285003         MW-1         SM 2540C-2011         552680           885285005         MW-4	2485285001	BG-1	Total Radium Calculation	406774		
485285004         MW-3         Total Radium Calculation         406774           485285005         MW-4         Total Radium Calculation         406774           485285006         MW-5         Total Radium Calculation         406774           485285007         MW-6         Total Radium Calculation         406774           485285008         MW-7R         Total Radium Calculation         406774           485285009         MW-8         Total Radium Calculation         406774           485285010         LEACHATE         Total Radium Calculation         406774           485285011         SW-1         Total Radium Calculation         406776           485285012         SW-2         Total Radium Calculation         406776           485285013         DUP         Total Radium Calculation         406776           485285014         EQBL         Total Radium Calculation         406776           485285001         BG-1         SM 2540C-2011         552814           485285002         BG-2         SM 2540C-2011         552814           485285003         MW-1         SM 2540C-2011         552680           485285005         MW-4         SM 2540C-2011         552616	2485285002	BG-2	Total Radium Calculation	406774		
485285005         MW-4         Total Radium Calculation         406774           485285006         MW-5         Total Radium Calculation         406774           485285007         MW-6         Total Radium Calculation         406774           485285008         MW-7R         Total Radium Calculation         406774           485285009         MW-8         Total Radium Calculation         406774           485285010         LEACHATE         Total Radium Calculation         406774           485285011         SW-1         Total Radium Calculation         406776           485285012         SW-2         Total Radium Calculation         406776           485285013         DUP         Total Radium Calculation         406776           485285014         EQBL         Total Radium Calculation         406776           485285015         BG-1         SM 2540C-2011         552814           485285002         BG-2         SM 2540C-2011         552814           485285003         MW-1         SM 2540C-2011         552680           485285005         MW-4         SM 2540C-2011         552616	2485285003	MW-1	Total Radium Calculation	406774		
485285006       MW-5       Total Radium Calculation       406774         485285007       MW-6       Total Radium Calculation       406774         485285008       MW-7R       Total Radium Calculation       406774         485285009       MW-8       Total Radium Calculation       406774         485285010       LEACHATE       Total Radium Calculation       406774         485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552680         485285005       MW-3       SM 2540C-2011       552616	2485285004	MW-3	Total Radium Calculation	406774		
485285007       MW-6       Total Radium Calculation       406774         485285008       MW-7R       Total Radium Calculation       406774         485285009       MW-8       Total Radium Calculation       406774         485285010       LEACHATE       Total Radium Calculation       406774         485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552680         485285004       MW-3       SM 2540C-2011       552616	2485285005	MW-4	Total Radium Calculation	406774		
485285008       MW-7R       Total Radium Calculation       406774         485285009       MW-8       Total Radium Calculation       406774         485285010       LEACHATE       Total Radium Calculation       406774         485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552680         485285004       MW-3       SM 2540C-2011       552616	2485285006	MW-5	Total Radium Calculation	406774		
485285009       MW-8       Total Radium Calculation       406774         485285010       LEACHATE       Total Radium Calculation       406774         485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552680         485285004       MW-3       SM 2540C-2011       552616	2485285007	MW-6	Total Radium Calculation	406774		
485285010       LEACHATE       Total Radium Calculation       406774         485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285008	MW-7R	Total Radium Calculation	406774		
485285011       SW-1       Total Radium Calculation       406776         485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285009	MW-8	Total Radium Calculation	406774		
485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285010	LEACHATE	Total Radium Calculation	406774		
485285012       SW-2       Total Radium Calculation       406776         485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285011	SW-1	Total Radium Calculation	406776		
485285013       DUP       Total Radium Calculation       406776         485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285012					
485285014       EQBL       Total Radium Calculation       406776         485285001       BG-1       SM 2540C-2011       552814         485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616						
485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616	2485285014					
485285002       BG-2       SM 2540C-2011       552814         485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616						
485285003       MW-1       SM 2540C-2011       552814         485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616						
485285004       MW-3       SM 2540C-2011       552680         485285005       MW-4       SM 2540C-2011       552616						
<b>MW-4</b> SM 2540C-2011 552616						
	2485285004	MW-3	SM 2540C-2011	552680		
<b>185285006 MW-5</b> SM 2540C-2011 552680	2485285005	MW-4	SM 2540C-2011	552616		
	2485285006	MW-5	SM 2540C-2011	552680		
<b>185285007 MW-6</b> SM 2540C-2011 552616	2485285007	MW-6	SM 2540C-2011	552616		



## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH GW Pace Project No.: 92485285

Date: 07/30/2020 12:12 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytica Batch
92485285008	MW-7R	SM 2540C-2011	552680		
92485285009	MW-8	SM 2540C-2011	552680		
92485285010	LEACHATE	SM 2540C-2011	552616		
92485285011	SW-1	SM 2540C-2011	552616		
92485285012	SW-2	SM 2540C-2011	552616		
92485285013	DUP	SM 2540C-2011	552616		
92485285014	EQBL	SM 2540C-2011	552969		
92485285001	BG-1	EPA 300.0 Rev 2.1 1993	552692		
92485285002	BG-2	EPA 300.0 Rev 2.1 1993	552692		
92485285003	MW-1	EPA 300.0 Rev 2.1 1993	552692		
92485285004	MW-3	EPA 300.0 Rev 2.1 1993	552692		
92485285005	MW-4	EPA 300.0 Rev 2.1 1993	552692		
92485285006	MW-5	EPA 300.0 Rev 2.1 1993	552692		
92485285007	MW-6	EPA 300.0 Rev 2.1 1993	552692		
92485285008	MW-7R	EPA 300.0 Rev 2.1 1993	552692		
92485285009	MW-8	EPA 300.0 Rev 2.1 1993	552692		
92485285010	LEACHATE	EPA 300.0 Rev 2.1 1993	552692		
92485285011	SW-1	EPA 300.0 Rev 2.1 1993	552692		
92485285012	SW-2	EPA 300.0 Rev 2.1 1993	552692		
92485285013	DUP	EPA 300.0 Rev 2.1 1993	552692		
92485285014	EQBL	EPA 300.0 Rev 2.1 1993	552692		

# Pace Analytical\*

# Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06

Document Revised: February 7, 2018

Page 1 of 2 Issuing Authority: Pace Carolinas Quallty Office

Laboratory receiving samples:

Asheville Eden Greenwood Hu	ntersville 🗹 Raleigh 🗌 Mechanicsville 🗌
Sample Condition Upon Receipt  Client Name:	Project #: WO#:92485285
Courler: Fed Ex UPS USPS Cli Commercial Pace Other:	ent 92485285
Custody Seal Present? Yes No Seals Intact? Yes No	
	Date/Initials Person Examining Contents: DV 7(9/20
Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☑ None ☐ O	ther Biological Tissue Frozen?
Thermometer: 92T061 Type of Ice: Wet B	lue □None □Yes □No ☑N/A
Cooler Temp (°C): Correction Factor: Add/Subtract (°C)	Temp should be above freezing to 6°C
Cooler Temp Corrected (°C):	Samples out of temp criteria. Samples on ice, cooling process has begun
USDA Regulated Soil ( N/A, water sample)  Did samples originate in a quarantine zone within the United States: CA, NY, or SC (check mag	Including Hawaii and Puerto Rico)? Yes No
	Comments/Discrepancy:
Chain of Custody Present?	1.
Samples Arrived within Hold Time?	2.
Short Hold Time Analysis (<72 hr.)?	3.
Rush Turn Around Time Requested?	4.
Sufficient Volume?	5.
Correct Containers Used?	6.
Containers Intact?	7.
Dissolved analysis: Samples Field Filtered?  ☐ Yes ☑No ☐N/A	8.
Sample Labels Match COC?   ☐ Yes ☐ No ☐ N/A	9.
-Includes Date/Time/ID/Analysis Matrix:	
Headspace in VOA Vials (>5-6mm)? □Yes □No ☑N/A	10.
Trip Blank Present?	11.
Trip Blank Custody Seals Present?	
COMMENTS/SAMPLE DISCREPANCY	Field Data Required? ☐Yes ☐No
CLIENT NOTIFICATION/RESOLUTION	Lot ID of split containers:
Person contacted: Date/Tin	ne:
Project Manager SCURF Review:	Date:
Project Manager SRF Review:	Date:



# Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018
Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

WO#:92485285

PM: KLH1

Due Date: 07/16/20

CLIENT: 92-HDR

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	ltem#	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP45-125 mL Plastic H2SO4 (pH < 2) (Cl-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	<b>AG1H-1</b> liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (Cl-	AG15-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4C! (N/A)(CI-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)	BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AGOU-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	_
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	4	/	1	1		/	V	/						/	/	7									20	1			-	
	5	/	1	1			V		/																24					
	6	/	1	1		/	V					/		$\angle$	/	/									V					
8	7						V	/				/				/					_				$\frac{2}{N}$					
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	12		l	(			N																		21					

		pH Ac	justment Log for Pres	erved Samples		
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #
				· ·		

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.



### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority:
Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

WO#: 92485285

PM: KLH1

Due Date: 07/16/20

CLIENT: 92-HDR

1																														
	Item#	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	<b>AG1H</b> -1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-	AG15-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2504 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4CI (N/A)(CI-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)	BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AGOU-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	
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		pH Ad	justment Log for Pres	erved Samples		
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot#
	1					

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (I.e. Out of hold, incorrect preservative, out of temp, incorrect containers.

CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

				6020: B, L 6010: Ca,	1 to	12	1	10	9	8	7	6	5	4	ω	2	-	ITEM#		]	Request	Email:	Charlott	Address:	Company:	Section A
				6020: B, Li, TL 6010: Ca, Sb, As, Ba, Be, Cd, Cr, Co, Pb, Mo, Se, Cu, Ni, Ag, V, Zn	ADDITIONAL COMMENTS	SW-1	LEACHATE	NW-8	MW-7R	MW-6	MW-5	MW-4	MW-3	MARZ.	MW-1	BG-2	BG-1	SAMPLE ID One Character per box. (A-Z, 0-9 /, -) Sample lds must be unique				(805)807-4126 Fax	Charlotte, NC 28212		Company: HDR	A Pilant Information.
			-	, Zn														Waste Water WV Water Waste Water WP Product P Sulf-Solid OIL Wipe AR Other OT Tissue TS	MATRIX CODE		Project #:	Purchase Order #:		Copy To:	Report To: large Buffing	Section B
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CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

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# **Quality Control Sample Performance Assessment**

Analyst Must Manually Enter All Fields Highlighted in Yellow.

, Pace Analytical`

Ra-226 ₹ Analyst: Date: Test: Batch ID: Matrix:

7/16/2020 55079 DW

1961094 0.283 0.678 0.678 -1.00 N/A Pass MB Numerical Performance Indicator; MB Sample ID MB concentration: M/B Counting Uncertainty: MB MDC Method Blank Assessment

MB Status vs Numerical Indicator: MB Status vs. MDC: Laboratory Control Sample Assessmen

MS/MSD 2 MS/MSD . Sample I.D. Sample MS I.D. Sample Collection Date: Sample MSD I.D. MS/MSD Decay Corrected Spike Concentration (pCi/mL): Spike Volume Used in MS (mL): Spike Volume Used in MSD (mL): MS Aliquot (L, g, F): MS Target Conc.(pCi/L, g, F): MSD Aliquot (L, g, F); Sample Result Counting Uncertainty (pCi/L, g, F): Matrix Spike Result Counting Uncertainty (pCi/L, g, F): Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g. F);

MS Numerical Performance Indicator: Spike I.D. MSD Target Conc. (pCi/L, g, F) MSD Spike Uncertainty (calculated) Sample Matrix Spike Result MS Status vs Numerical Indicator. MS Spike Uncertainty (calculated) Sample Result Sample Matrix Spike Duplicate Result MSD Numerical Performance Indicator MS Percent Recovery MSD Percent Recovery MSD Status vs Numerical Indicator MS Status vs Recovery MSD Status vs Recovery Sample Matrix Spike Control Assessment

7723/2020 18-039 31.427 31.427 6.057 4.785 0.225 0.225 0.978 0.978 0.978 1.397 7.37 7.37 7.37 7.37 .CS55079 7723/2020 7723/2020 31.427 0.10 0.649 4.845 0.228 5.437 1.116 1.02 112.23% N/A Pass 135% Aliquot Volume (L, g, F): Target Conc. (pCi/L, g, F): Volume Used (mL): LCS/LCSD Counting Uncertainty (pCi/L, g, F): Count Date Spike I.D. Spike Concentration (pCi/mL): Uncertainty (Calculated) Result (pCi/L, g, F) Numerical Performance Indicator Percent Recovery Status vs Recovery Upper % Recovery Limits: Lower % Recovery Limits: Status vs Numerical Indicator

I		Ì
	Matrix Spike/Matrix Spike Duplicate Sample Assessment	
cate	Sample I.D.	
ž.	Sample MS I.D.	
c	Sample MSD 1.D.	
.9.	Sample Matrix Spike Result:	
NO.	Matrix Spike Result Counting Uncertainty (pCl/l., g, F):	
	Sample Matrix Spike Duplicate Result:	
	Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g, F):	
	Duplicate Numerical Performance Indicator:	
1	(Based on the Percent Recoveries) MS/ MSD Duplicate RPD:	
	MS/ MSD Duplicate Status vs Numerical Indicator:	
	MS/ MSD Duplicate Status vs RPD:	
	% RPD 1 imit-	

Enter Duplic sample IDs other than CS2/ICSD ie space be

Sample I.D.: Duplicate Sample I.D.

Duplicate Sample Assessmen

LCSS5079 5.437 1.116 4.778 0.978 NO 0.871 11.67%

Sample Result (pCi/L, g, F):
Sample Result Counting Uncertainty (pCi/L, g, F):
Sample Duplicate Result (pCi/L, g, F):
Sample Duplicate Result (pCi/L, g, F):

Are sample and/or duplicate results below RL? Duplicate Numerical Performance Indicator;

(Based on the LCS/LCSD Percent Recoveries) Duplicate RPD:

Duplicate Status vs Numerical Indicator: Duplicate Status vs RPD;

MS/MSD Upper % Recovery Limits: MS/MSD Lower % Recovery Limits:

1 of 1

Comments:

## Evaluation of duplicate precision is not applicable if either the sample or duplicate results are below the RL.

N/A Pass 32%

Ra-226 NELAC QC Printed: 7/23/2020 5:14 PM

# Pace Analytical

# **Quality Control Sample Performance Assessment**

Analyst Must Manually Enter All Fields Highlighted in Yellow.

(a. VAL VAL 7/17/2020 55091 WT Analyst: Date: Test Worklist: Matrix:

	Sample Matrix Spike Control Assessment	MS/MSD 1	MS/MSD 2
	Sample Collection Date:		
	Sample I.D.		
	Sample MS I.D.		
	Sample MSD I.D.		
	Spike I.D.:		
	MS/MSD Decay Corrected Spike Concentration (pCi/mL):		
	Spike Volume Used in MS (mL):		
	Spike Volume Used in MSD (mL):		
	MS Aliquot (L, g, F):		
	MS Target Conc.(pCi/L, g, F):		
	MSD Aliquot (L, g, F):		
	MSD Target Conc. (pCi/L, g, F):		
	MS Spike Uncertainty (calculated):		
	MSD Spike Uncertainty (calculated):	•	
	Sample Result:		
-	Sample Result 2 Sigma CSU (pCi/l_, g, F):		
	Sample Matrix Spike Result:		
	Matrix Spike Result 2 Sigma CSU (pCi/L, g, F):		
	Sample Matrix Spike Duplicate Result:		
	Matrix Spike Duplicate Result 2 Sigma CSU (pCi/L, g, F):		
	MS Numerical Performance Indicator:		
	MSD Numerical Performance Indicator.		
	MS Percent Recovery:		
-	MSD Percent Recovery:		
_	MS Status vs Numerical Indicator:		
	MSD Status vs Numerical Indicator:		
	MS Status vs Recovery:		
-	MSD Status vs Recovery:		
	MS/MSD Upper % Recovery Limits:		

CS55091 7/23/2020 20-030 39.085

Count Date: Spike LD.:

Laboratory Control Sample Assessment

Decay Corrected Spike Concentration (pCi/mL):

0.185 0.348 0.765 1.04 Pass Pass

MB Numerical Performance Indicator: MB Status vs Numerical Indicator: MB Status vs. MDC:

MB concentration: MB 2 Sigma CSU: MB MDC:

MB Sample ID

Method Blank Assessmen

		MS Spike Uncertainty (calculated);
	Y	MSD Spike Uncertainty (calculated):
	LCSD55091	Sample Resuit:
	7/23/2020	Sample Result 2 Sigma CSU (pCi/L, g, F):
	20-030	Sample Matrix Spike Result:
	39.085	Matrix Spike Result 2 Sigma CSU (pCi/L, g, F):
	0.10	Sample Matrix Spike Duplicate Result:
	0.821	Matrix Spike Duplicate Result 2 Sigma CSU (pCi/L, g, F):
	4.761	MS Numerical Performance Indicator:
	0.233	MSD Numerical Performance Indicator.
	4.335	MS Percent Recovery:
	1.073	MSD Percent Recovery:
	-0.76	MS Status vs Numerical Indicator:
	91,05%	MSD Status vs Numerical Indicator:
	N/A	MS Status vs Recovery:
	Pass	MSD Status vs Recovery:
	135%	MS/MSD Upper % Recovery Limits:
	%09	MS/MSD Lower % Recovery Limits:
ı		

0.10 0.819 4.772 0.234 5.766 1.301

Aliquot Volume (L, g, F): Target Conc. (pCi/L, g, F):

Volume Used (mL):

Uncertainty (Calculated): Result (pCi/L, g, F): LCS/LCSD 2 Sigma CSU (pCi/L, g, F):

Numerical Performance Indicator:

Percent Recovery: Status vs Recovery:

Status vs Numerical Indicator.

1.48 120.84%

Upper % Recovery Limits: Lower % Recovery Limits:

**Duplicate Sample Assessment** 

	Matrix Spike/Matrix Spike Duplicate Sample Assessment
Enter Duplicate	Sample I.D.
sample IDs if	Sample MS I.D.
other than	Sample MSD I.D.
LCS/LCSD in	Sample Matrix Spike Result:
the space below.	Matrix Spike Result 2 Sigma CSU (pCt/L, g, F):
	Sample Matrix Spike Duplicate Result:
	Matrix Spike Duplicate Result 2 Sigma CSU (pCi/L, g, F):
	Duplicate Numerical Performance Indicator:
	(Based on the Percent Recoveries) MS/ MSD Duplicate RPD:
	MS/ MSD Duplicate Status vs Numerical Indicator:
	MS/ MSD Duplicate Status vs RPD:
	imi I CGR %

LCS55091 LCSD55091 5.766 1.301 4.335 1.073 NO 1.664 28.13%

Sample Result (pCVI/, g, F): Sample Result 2 Sigma CSU (pCVI/, g, F): Sample Duplicate Result (pCVI/, g, F):

Sample Duplicate Resuit 2 Sigma CSU (pCi/L, g, F): Are sample and/or duplicate results below RL? (Based on the LCS/LCSD Percent Recoveries) Duplicate RPD:

Duplicate Numerical Performance Indicator.

Duplicate Status vs Numerical Indicator:

Sample I.D.: Duplicate Sample I.D.

## Evaluation of duplicate precision is not applicable if either the sample or duplicate results are below the MDC,

Duplicate Status vs RPD: % RPD Limit:

Comments:



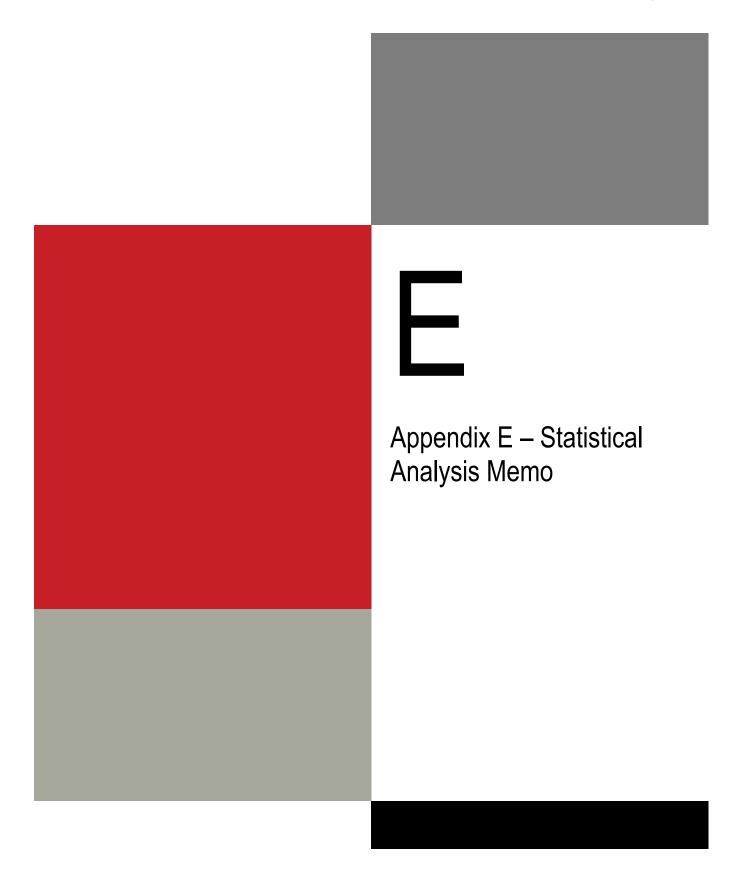
Ra-228 NELAC DW2 Printed: 7/24/2020 8:34 AM

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Appendix D – Electronic Data Deliverables (electronic only)







# Summary of Statistical Analysis and Evaluation for SSIs

Background and Downgradient Wells Charah, LLC

Moncure, Chatham County, North Carolina August 26, 2020



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			on's Outlier Test Results – Downgradient	
			a Distributions – Background	
			nmary of Trend Analysis Results – Background nmary of Trend Analysis Results – Downgradient	
			nmary of Background Preliminary Data Analysis	
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# 1 Introduction

This report summarizes the statistical analysis of background and downgradient groundwater quality for the Charah, LLC Brickhaven No. Mine Tract 'A' Site (Brickhaven Mine) and operating under the Facility Permit #1910-STRUC-2015 as a municipal solid waste land fill (MSWLF). Background groundwater quality was evaluated such that statistically-derived background concentrations could be established for the site. Groundwater quality in downgradient wells was then compared to background concentrations to determine if a statistically significant increase (SSI) over background has occurred, as required by Section .1600 rules of the North Carolina Solid Waste Management Rules 15A NCAC 13B .1600. Sampling results used to establish background threshold values (BTVs) were obtained during twenty monitoring events performed between October 2015 and January 2020. Downgradient sampling results from the detection monitoring round in July 2020 were used to evaluate for SSIs. The current Brickhaven Mine groundwater monitoring network is presented in **Table 1**.

Software packages ProUCL [1], NCSS [2], R [3], and SPSS [4] were used in the production of the statistics. ProUCL is offered by the USEPA, R is a free software environment, NCSS and SPSS are licensed software packages.

**Table 1: Brickhaven Mine Monitoring Well Network** 

Background	Downgradient
BG-1	MVV-1
BG-2	MW-2
	MW-3
	MW-4
	MW-5
	MW-6
	MW-7R
	MW-8

Groundwater samples collected as part of the 15A NCAC 13B .1600 monitoring program were analyzed for EPA Appendix III and Appendix IV constituents, and Appendix I metals. Only non-filtered sample results were utilized for the statistical analysis of monitored constituents. A summary of constituents included in the data analysis is provided in **Table 2**.



**Table 2: Brickhaven Mine Monitored Constituents** 

Appendix I Metals	Appendix III Constituents	Appendix IV Constituents
Copper	Boron	Antimony
Nickel	Calcium	Arsenic
Silver	Chloride	Barium
Vanadium	Fluoride	Beryllium
Zinc	pH (Field)	Cadmium
	Sulfate	Chromium
	Total Dissolved Solids	Cobalt
		Fluoride
		Lead
		Lithium
		Mercury
		Molybdenum
		Radium-226
		Radium-228
		Selenium
		Thallium
		Total Radium



# 2 Statistical Analysis

The background sample size (i.e., quantity of qualifying samples) was evaluated per constituent. Descriptive statistics were calculated for the background data set including non-detect (ND) values and excluding ND values. When NDs were included in the data set, the method detection limit (MDL) was substituted as the ND value for simple descriptive statistics. The analysis was performed with NDs removed to better understand the central tendency and range of the detected values. A summary of the descriptive statistics for the background data set is provided in **Table 3**. Note that for the trend analyses in Section 2.3 and for the establishment of statistically-derived background concentration levels in Section 4, imputation methods using the maximum likelihood method (MLE) for NDs, regression on order statistics (ROS) or Kaplan-Meier (KM) methods, where appropriate, were used.

Following the calculation of descriptive statistics, the statistical analysis for the background data set was performed to evaluate for outliers, data distributions, trends, and spatial variability between the background wells for Appendix I metals, Appendix III and IV constituents, where data quantity and quality permit. Spatial variability between the background wells was evaluated for each consistent to assess whether the data can be pooled for establishing background concentrations. A total of twenty-five samples (twenty monitoring events from well BG-1 and five monitoring events from well BG-2) were included for the descriptive analysis of the background monitoring well results for the monitored constituents. The first monitoring round sampled in August 2015 was not included in the analysis as it was deemed not representative of the other monitoring events as the samples were tested at a different lab. The January 2020 samples for boron were removed from the analysis as they were diluted and could not be properly detected.

For downgradient monitoring results, the data analysis included the calculation of descriptive statistics for Appendix I metals, Appendix III and IV constituents (for the data sets including and excluding ND values), followed by an evaluation of outliers and trends. A total of twenty-one monitoring events performed between November 2015 and July 2020 were included for the descriptive analysis of the downgradient monitoring well results for the monitored constituents. A summary of the descriptive statistics for each downgradient well is provided in **Appendix E.A**.



Table 3: Summary of Background Data Set Descriptive Statistics (BG-1 and BG-2)

		Sample	No. of	No. of With NDs=MDLs Included			With NDs Removed				
Constituent	Unit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
Appendix I Metals											
Copper	ug/L	25	24	2.10	11.4	2.78	2.50	11.4	11.4	11.4	11.4
Nickel	ug/L	25	25	0.900	2.50	2.12	2.50				
Silver	ug/L	25	25	2.50	2.50	2.50	2.50				
Vanadium	ug/L	25	17	1.30	8.30	3.41	2.50	5.10	8.30	5.80	5.40
Zinc	ug/L	25	22	3.90	34.2	6.51	5.00	10.0	34.2	19.4	14.0
				Арр	endix III Con	stituents					
Boron	ug/L	24	15	0.570	7.50	3.74	2.60	5.50	7.50	6.46	6.10
Calcium	ug/L	25	0	20,700	119,000	44,632	29,500	20,700	119,000	44,632	29,500
Chloride	mg/L	25	0	187	311	256	251	187	311	256	251
Fluoride	mg/L	25	0	0.100	0.210	0.146	0.140	0.100	0.210	0.146	0.140
pH (Field)	S.U.	23	0	6.10	7.01	6.56	6.52	6.10	7.01	6.56	6.52
Sulfate	mg/L	25	0	15.1	135	34.8	19.6	15.1	135	34.8	19.6
Total Dissolved Solids	mg/L	24	0	546	1,120	690	647	546	1,120	690	647
				Арр	endix IV Cor	stituents					
Antimony	ug/L	25	25	3.00	3.90	3.66	3.80				
Arsenic	ug/L	25	25	2.50	5.00	4.23	4.70		-		
Barium	ug/L	25	0	93.1	443	291	327	93.1	443	291	327
Beryllium	ug/L	25	25	0.200	0.500	0.428	0.500		-		
Cadmium	ug/L	25	25	0.400	0.500	0.476	0.500		-		
Chromium	ug/L	25	25	1.00	2.50	2.14	2.50		-		
Cobalt	ug/L	25	25	1.10	2.50	2.16	2.50	-		-	
Fluoride	mg/L	25	0	0.100	0.210	0.146	0.140	0.100	0.210	0.146	0.140
Lead	ug/L	25	24	1.60	14.1	2.78	2.50	14.1	14.1	14.1	14.1
Lithium	ug/L	25	2	0.420	36.8	17.8	17.1	11.9	36.8	19.2	17.8
Mercury	ug/L	25	25	0.100	0.100	0.100	0.100				
Molybdenum	ug/L	25	20	0.900	13.6	3.97	2.50	6.80	13.6	10.5	10.8
Radium-226	pCi/L	22	0	-0.206	1.22	0.341	0.340				
Radium-228	pCi/L	22	0	0.0108	1.29	0.596	0.554				
Selenium	ug/L	25	25	4.70	5.00	4.93	5.00				
Thallium	ug/L	25	24	0.0200	13.7	1.78	0.0600	13.7	13.7	13.7	13.7
Total Radium	pCi/L	22	0	0.271	2.09	0.950	0.915				

- 1. ND = not detected above the laboratory method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



# 2.1 Outliers

Outliers are values that are not representative of the population from which they are sampled. The background and downgradient data sets were screened for outliers using Dixon's and Rosner's outlier tests. Dixon's outlier test is suitable for data sets containing less than twenty-five samples, while Rosner's test is suitable for data sets with twenty-five or more samples. The outlier test was conducted using a significance of one percent. For constituents that had NDs, the NDs were removed prior to testing for outliers.

# 2.1.1 Background

Statistical outliers were identified in the background data set evaluated for three Appendix III constituents (calcium, sulfate, and total dissolved solids) and one Appendix IV constituent (barium). The constituent concentrations identified as statistical outliers were sampled from the newly installed background well BG-2, except for total dissolved solids, and are listed in **Table 4**.

Table 4: Dixon's Outlier Test Results - Background

Well	Constituent	Constituent Type	Potential Outlier Value	Units	Sampling Event	Sample Date
BG-1	Total Dissolved Solids	Appendix III	2,630	mg/L	R10	4/3/2017
			89600	ug/L	R17	1/22/2019
			119,000	ug/L	R18	4/16/2019
	Calcium	Appendix III	111000.0	ug/L	R19	7/11/2019
			109000.0	ug/L	R20	10/14/2019
			106000.0	ug/L	R21	1/15/2020
		Appendix III	65	mg/L	R17	1/22/2019
			79.8	mg/L	R18	4/16/2019
BG-2	Sulfate		102	mg/L	R19	7/11/2019
			135	mg/L	R20	10/14/2019
			102.000	mg/L	R21	1/15/2020
		Barium Appendix IV	123	ug/L	R17	1/22/2019
			148	ug/L	R18	4/16/2019
	Barium		108.0	ug/L	R19	7/11/2019
			138.00	ug/L	R20	10/14/2019
			93.10	ug/L	R21	1/15/2020

A visual inspection of concentration vs. time scatter plots for total dissolved solids (**Figure 1**), calcium (**Figure 2**), sulfate (**Figure 3**), and barium (**Figure 4**) reveal the presence of the potential outliers. The statistical outliers were investigated as possible data entry or measurement errors. The value for total dissolved solids was considered an outlier and



removed from the analysis. The remaining values were all within one order of magnitude of other observations and deemed correct. Although the elevated values appears as a statistical outliers, it is within a reasonable range of the remaining concentrations throughout the monitoring period and should not be removed from the data set at this time for purposes of determining background concentrations. Given the variable nature of groundwater samples, the small sample sizes and that it is common for groundwater quality samples to have very low or very high concentrations over time, statistical outliers are expected but do not necessarily signify that the outliers are from different distributions. As additional background samples are collected over time, the variability in concentrations will be better understood. Outlier test results may change and earlier observations thought to be outliers may no longer be outliers.



Figure 1: Total Dissolved Solids Concentrations (mg/L) vs. Time

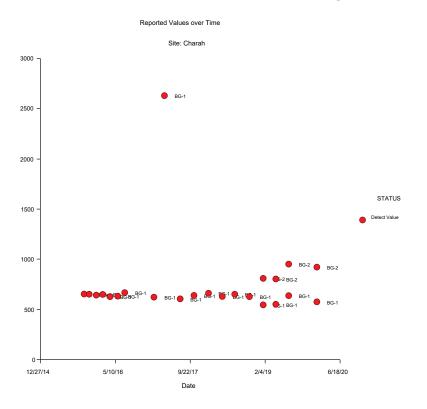


Figure 2: Calcium Concentrations (ug/L) vs. Time

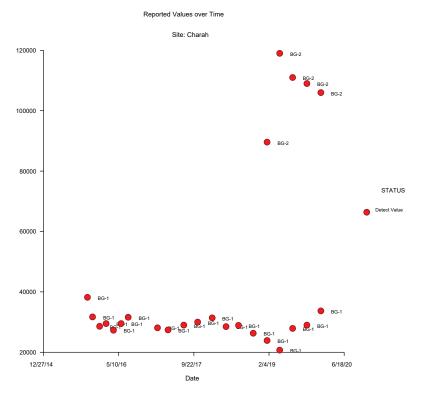




Figure 3: Sulfate Concentrations (mg/L) vs. Time

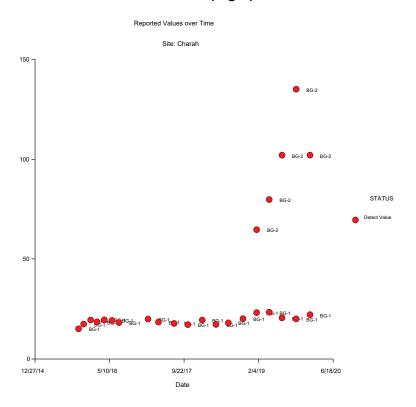
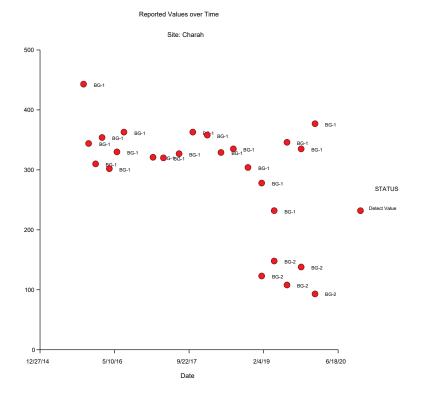


Figure 4: Barium Concentrations (ug/L) vs. Time





# 2.1.2 Downgradient

Statistical outliers were identified for Appendix I metals, Appendix III and Appendix IV constituents in the data sets evaluated for downgradient monitoring wells throughout the monitoring period, and are listed in **Table 5**.

**Table 5: Dixon's Outlier Test Results – Downgradient** 

Well	Constituent	Constituent Type	Potential Outlier Value	Units	Sampling Event	Sample Date
MW-1	pH (Field)	Appendix III	7.30	S.U.	R09	1/25/2017
	Total Dissolved Solids	Appendix III	257	mg/L	R03	11/19/2015
	Calcium	Appendix III	1,300	ug/L	R07	5/27/2016
MW-2	Lithium	Appendix IV	356	ug/L	R08	7/12/2016
	Total Dissolved Solids	Appendix III	1,170	mg/L	R21	1/17/2020
	Molybdenum	Appendix IV	41.0	ug/L	R21	1/17/2020
	Lithium	Appendix IV	236	ug/L	R12	10/18/2017
MW-3	Molybdenum	Appendix IV	35.7	ug/L	R21	1/16/2020
	pH (Field)	Appendix III	6.18	S.U.	R23	7/7/2020
NAVA / 4	Boron	Appendix III	165	ug/L	R12	10/17/2017
MW-4	Cobalt	Appendix IV	21.8	ug/L	R22	4/17/2020
	Boron	Appendix III	39.3	ug/L	R09	1/23/2017
MW-5	Total Dissolved Solids	Appendix III	1,160	mg/L	R12	10/17/2017
	pH (Field)	Appendix III	8.54	S.U.	R22	4/15/2020
MW-6	Chloride	Appendix III	15.3	mg/L	R06	4/5/2016
	Fluoride	Appendix III	0.320	mg/L	R11	7/20/2017
	pH (Field)	Appendix III	9.60	S.U.	R11	7/20/2017
MW 7D	Sulfate	Appendix III	51.2	mg/L	R11	7/20/2017
MW-7R	Fluoride	Appendix IV	0.320	mg/L	R11	7/20/2017
	Nickel	Appendix I Metals	880	ug/L	R19	7/10/2019
	Chromium	Appendix IV	1,940	ug/L	R19	7/10/2019

A visual inspection of concentration vs. time scatter plots for constituents included in the outliers listed in **Table 5** reveal the presence of the potential outliers. Following review of the sampling protocols and field sampling records, there were no obvious reasons for the outliers noted on the sampling dates. The value for each statistical outlier listed above is within a reasonable range of the remaining concentrations for each constituent throughout the monitoring period. The variability in concentrations will be better understood as additional samples are obtained.

<sup>&</sup>lt;sup>1</sup> See Appendix E.B for scatter plots of constituents with downgradient statistically-derived outliers.



# 2.2 Data Distribution

Groundwater data was fitted to known distribution models using Goodness-of-Fit (GOF) tests incorporated into ProUCL. For data sets comprised of 50 or fewer samples, ProUCL's GOF module incorporates the Shapiro-Wilk GOF test to determine normal or lognormal distribution and Anderson-Darling to determine gamma distribution. Normal, lognormal and gamma distributions are parametric distributions. If a data set could not be fit with any of these three parametric distributions, it was considered to follow a nonparametric distribution. Note that ProUCL does not provide GOF results for data sets with less than three detected values due to insufficient data. For purposes of estimating background concentrations, these data sets were treated under non-parametric distribution assumptions with the maximum detected value chosen to represent the background concentrations. In addition, the data for total radium is set to nonparametric as the MDL values were not provided by the laboratory. Data distributions are listed in **Table 6**.

Table 6: Data Distributions - Background

Constituent	Sample Size	No. of NDs	Distribution Fit <sup>1</sup>
	Appendix I I	Metals	
Copper	25	24	Nonparametric
Nickel	25	25	Nonparametric
Silver	25	25	Nonparametric
Vanadium	25	17	Nonparametric
Zinc	25	22	Nonparametric
	Appendix III Co	nstituents	
Boron	24	15	Nonparametric
Calcium	25	0	Nonparametric
Chloride	25	0	Parametric
Fluoride	25	0	Parametric
pH (Field)	23	0	Parametric
Sulfate	25	0	Nonparametric
Total Dissolved Solids	24	0	Nonparametric
,	Appendix IV Co	nstituents	
Antimony	25	25	Nonparametric
Arsenic	25	25	Nonparametric
Barium	25	0	Nonparametric
Beryllium	25	25	Nonparametric
Cadmium	25	25	Nonparametric
Chromium	25	25	Nonparametric
Cobalt	25	25	Nonparametric



Constituent	Sample Size	No. of NDs	Distribution Fit <sup>1</sup>
Fluoride	25	0	Parametric
Lead	25	24	Nonparametric
Lithium	25	2	Parametric
Mercury	25	25	Nonparametric
Molybdenum	25	20	Nonparametric
Radium-226	22	0	Nonparametric
Radium-228	22	0	Nonparametric
Selenium	25	25	Nonparametric
Thallium	25	24	Nonparametric
Total Radium	22	0	Nonparametric

<sup>&</sup>lt;sup>1</sup>Best fit is based on detected data.

# 2.3 Trends

# 2.3.1 Background

Background constituent concentrations in groundwater should demonstrate stationary conditions through time, free of trends. Constituents were analyzed for trends within the data set using a maximum likelihood estimate (MLE) regression for constituents which followed parametric distributions and Mann-Kendall tests for those that were treated under nonparametric distributional assumptions. The MLE regression can be applied to data sets that can be fitted to a specific distribution model and that contain NDs with multiple MDLs. The Mann-Kendall test is suitable for data series with no discernable distributions and only one MDL value for NDs.

Constituents treated under nonparametric data assumptions (either tested as nonparametric or having more than 50 percent NDs) and with multiple MDLs or with less than three detected values were not assessed for trends. A summary of the trend analysis results for constituents with sufficient detected values in the background data set is provided in **Table 7**.

The background well regression analysis showed a potential increasing trend for fluoride (an Appendix III and Appendix IV constituent) and a potential decreasing trend for two Appendix III constituents (chloride and sulfate) and three Appendix IV constituents (barium, lithium, and radium-226). There were no increasing or decreasing trends identified for other monitoring constituents with sufficient data quantity and quality for testing with the MLE analysis or Mann-Kendall test. Although statistical trends were identified for barium, chloride, fluoride, lithium, sulfate, and radium-226-, the results can be misleading due to the short duration of the sampling program.

Table 7: Summary of Trend Analysis Results – Background



Constituent	Trend					
Appendix III	Constituents					
Chloride	$\downarrow$					
Fluoride	1					
Sulfate	<b>↓</b>					
Appendix IV	Constituents					
Fluoride	1					
Lithium	$\downarrow$					
Barium	↓					
Radium-226	<u></u>					

# 2.3.2 Downgradient

Trends were also evaluated for constituents in each downgradient well using the same methods as described above for the background data set. Trends were identified for select constituents at select monitoring well locations, and should be monitored as additional downgradient groundwater data are collected at the site. A summary of the statistical trends identified within the downgradient data set is provided in **Table 8**.

Table 8: Summary of Trend Analysis Results - Downgradient

Ormalitarent		Do	owngradient	Well with Inc	creasing or I	Decreasing 1	rend	
Constituent	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7R	MW-8
		Арр	endix III Co	nstituents		•		
Calcium	1			1				$\downarrow$
Chloride	1		↓		1	↓		$\downarrow$
Fluoride				<b>↓</b>				
pH (Field)	<b>↓</b>					<b>↓</b>	<b>↓</b>	1
Sulfate	<b>↓</b>	<b>↓</b>	1	1		↓	↓	1
Total Dissolved Solids	1			1	1		1	
		Арр	endix IV Co	nstituents				
Barium	1			1	1	$\downarrow$	1	$\downarrow$
Fluoride				<b>↓</b>				
Lithium	1			1		↓	1	$\downarrow$
Molybdenum		$\downarrow$						
Radium-226				1				
Radium-228	1							
Total Radium				1				



# 2.4 Spatial Variability

Spatial variability refers to identifying whether or not there are statistically identifiable differences in mean concentrations or variance levels across the well field (i.e., the pooled background data). Parametric and nonparametric analysis of variance (ANOVA) tests and visual aids (i.e., side-by-side box plots and scatter plots), as needed, were used to evaluate for spatial variability within the background data set to confirm that results from background wells BG-1 and BG-2 were appropriate for pooling and calculating background concentrations for constituents.

Statistical tests indicated that five Appendix III constituents (calcium, fluoride, pH, sulfate, and total dissolved solids) exhibited spatial variability. Statistical spatial variability was also identified for one Appendix IV constituent (barium). Review of side-by-side box plots for the constituents listed above indicated that the statistically-identified variability in concentrations are reasonable and the mean concentrations calculated for the monitoring wells are generally within one order of magnitude of the other. Therefore, the concentration distribution across the background wells should be considered reflective of the hydrogeological regime at the site and the background results are appropriate for pooling and calculating background concentrations at this time.



# 3 Summary of Statistical Analysis

A summary of the statistical analysis results is provided in **Table 9** and discussed below.

- The statistical outlier for total dissolved solids was removed from the dataset. The statistical outliers identified for barium, calcium, and sulfate should not be removed from the data set to be used for developing background concentrations for the site at this time.
- For the background data set, all of the five Appendix I metals exhibited high percentages
  of NDs and will be treated under nonparametric distribution assumptions with the
  maximum detected value chosen to represent background, until additional results can be
  included in the data sets.
- For the background data set, there are currently sufficient data to fit the Appendix III
  constituents to known parametric distribution models (e.g., gamma, lognormal, or
  normal) using GOF tests, except for boron, calcium, sulfate, and total dissolved solids,
  which are nonparametric. Statistical tests conducted under parametric distribution
  assumptions have more power to detect a SSI when compared to tests conducted under
  nonparametric distribution assumptions.
- For the background data set, eleven of the seventeen Appendix IV constituents exhibited high percentages of NDs and will be treated under nonparametric distribution assumptions with the maximum detected value chosen to represent background, until additional results can be included in the data sets. The data for radium-226, radium-228 and total radium is set to a nonparametric distribution as the MDL values were not provided by the laboratory. Currently, the background data sets for fluoride and lithium can be fitted to known parametric distribution models using GOF tests.
- Based on the small data set and short duration of the monitoring program, results from the outlier, trend, and spatial variability analyses should be considered preliminary until additional sample results are included in the data set and re-evaluated.
- The January 2020 monitoring event for boron was not included in the calculation of the background threshold value for boron as the sample was diluted and not representative of the other background sampling events.
- At this time, for the purpose of calculating background concentrations and testing for SSIs over background for Appendix I metals, Appendix III and Appendix IV constituents, results from twenty-five samples (twenty monitoring events taken during October 2015 to January 2020 from BG-1 and five monitoring events taken January 2019 to January 2020 from BG-2) were used. The statistically-derived background concentrations and the evaluation for SSIs over background for Appendix I metals, Appendix III and Appendix IV constituents are included in Section 4.



**Table 9: Summary of Background Preliminary Data Analysis** 

Constituent				<i>y</i> = a.ca. 7 t.
Copper         ✓           Nickel         ✓           Silver         ✓           Vanadium         ✓           Zinc         ✓           Appendix III Constituents           Boron         ✓           Calcium         ✓           Chloride         ✓           Fluoride         ✓           Sulfate         ✓           Total Dissolved Solids         ✓           Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Beryllium         ✓           Cadmium         ✓           Cadmium         ✓           Chromium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓	Constituent		Nonparametric Data Distribution	Trend
Nickel		Appendix I Me	etals	
Silver         ✓           Vanadium         ✓           Zinc         ✓           Appendix III Constituents           Boron         ✓           Calcium         ✓           Chloride         ✓           Fluoride         ✓           Sulfate         ✓           Total Dissolved Solids         ✓           Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Barium         ✓           Beryllium         ✓           Cadmium         ✓           Chromium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Copper		✓	
Vanadium  Zinc  Appendix III Constituents  Boron  Calcium  Chloride  Fluoride  Sulfate  Total Dissolved Solids  Appendix IV Constituents  Antimony  Arsenic  Barium  Arsenic  Barium  Cadmium  Chromium  Chromium  Chromium  Chromium  Chromium  Chromium  Chobalt  Fluoride  Lead  Lithium  Mercury  Molybdenum  Radium-226  Radium-228  Selenium   A Constituents  Appendix IV Constituents  Antimony  Arsenic  Appendix IV Constituents  Append	Nickel		✓	
Zinc         ✓           Appendix III Constituents           Boron         ✓           Calcium         ✓           Chloride         ✓           Fluoride         ✓           Sulfate         ✓           Total Dissolved Solids         ✓           Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Barium         ✓           Beryllium         ✓           Cadmium         ✓           Chromium         ✓           Crobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Silver		✓	
Appendix III Constituents	Vanadium		✓	
Boron         ✓           Calcium         ✓           Chloride         ✓           Fluoride         ✓           Sulfate         ✓           Total Dissolved Solids         ✓           Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Barium         ✓           Beryllium         ✓           Cadmium         ✓           Chromium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Relenium         ✓           Thallium         ✓	Zinc		✓	
Calcium         ✓         ✓           Chloride         ✓         ✓           Fluoride         ✓         ✓           Sulfate         ✓         ✓           Total Dissolved Solids         ✓         ✓           Appendix IV Constituents           Antimony         ✓         ✓           Arsenic         ✓         ✓           Barium         ✓         ✓           Beryllium         ✓         ✓           Cadmium         ✓         ✓           Chromium         ✓         ✓           Chromium         ✓         ✓           Cobalt         ✓         ✓           Fluoride         ✓         ✓           Lead         ✓         ✓           Lithium         ✓         ✓           Molybdenum         ✓         ✓           Radium-226         ✓         ✓           Radium-228         ✓         ✓           Selenium         ✓         ✓	Арр	endix III Cons	stituents	
Chloride         ✓           Fluoride         ✓           Sulfate         ✓           Total Dissolved Solids         ✓           Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Barium         ✓           Cadmium         ✓           Chromium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Boron		✓	
Fluoride         ✓         ✓         ✓           Sulfate         ✓         ✓         ✓           Total Dissolved Solids         ✓         ✓         ✓           Appendix IV Constituents           Antimony         ✓         ✓         ✓           Arsenic         ✓         ✓         ✓           Barium         ✓         ✓         ✓           Beryllium         ✓         ✓         ✓           Cadmium         ✓         ✓         ✓           Chromium         ✓         ✓         ✓           Chromium         ✓         ✓         ✓           Cobalt         ✓         ✓         ✓           Fluoride         ✓         ✓         ✓           Lead         ✓         ✓         ✓           Lithium         ✓         ✓         ✓           Molybdenum         ✓         ✓         ✓           Radium-226         ✓         ✓         ✓           Radium-228         ✓         ✓         ✓           Selenium         ✓         ✓         ✓	Calcium	✓	✓	
Sulfate         ✓         ✓           Total Dissolved Solids         ✓         ✓           Appendix IV Constituents           Antimony         ✓         ✓           Arsenic         ✓         ✓           Barium         ✓         ✓           Beryllium         ✓         ✓           Cadmium         ✓         ✓           Chromium         ✓         ✓           Chromium         ✓         ✓           Cobalt         ✓         ✓           Fluoride         ✓         ✓           Lead         ✓         ✓           Lithium         ✓         ✓           Mercury         ✓         ✓           Molybdenum         ✓         ✓           Radium-226         ✓         ✓           Radium-228         ✓         ✓           Selenium         ✓            Thallium         ✓	Chloride			✓
Total Dissolved Solids    Appendix IV Constituents	Fluoride			✓
Appendix IV Constituents           Antimony         ✓           Arsenic         ✓           Barium         ✓           Beryllium         ✓           Cadmium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Sulfate	✓	✓	✓
Antimony       ✓         Arsenic       ✓         Barium       ✓         Beryllium       ✓         Cadmium       ✓         Chromium       ✓         Cobalt       ✓         Fluoride       ✓         Lead       ✓         Lithium       ✓         Mercury       ✓         Molybdenum       ✓         Radium-226       ✓         Radium-228       ✓         Selenium       ✓         Thallium       ✓	Total Dissolved Solids	✓	✓	
Arsenic       ✓         Barium       ✓         Beryllium       ✓         Cadmium       ✓         Chromium       ✓         Cobalt       ✓         Fluoride       ✓         Lead       ✓         Lithium       ✓         Mercury       ✓         Molybdenum       ✓         Radium-226       ✓         Radium-228       ✓         Selenium       ✓         Thallium       ✓	Арр	endix IV Cons	stituents	
Barium         ✓         ✓           Beryllium         ✓         ✓           Cadmium         ✓         ✓           Chromium         ✓         ✓           Cobalt         ✓         ✓           Fluoride         ✓         ✓           Lead         ✓         ✓           Lithium         ✓         ✓           Mercury         ✓         ✓           Molybdenum         ✓         ✓           Radium-226         ✓         ✓           Radium-228         ✓         ✓           Selenium         ✓            Thallium         ✓	Antimony		✓	
Beryllium         ✓           Cadmium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Arsenic		✓	
Cadmium         ✓           Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Barium	✓	✓	✓
Chromium         ✓           Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Beryllium		✓	
Cobalt         ✓           Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Cadmium		✓	
Fluoride         ✓           Lead         ✓           Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Chromium		✓	
Lead       ✓         Lithium       ✓         Mercury       ✓         Molybdenum       ✓         Radium-226       ✓         Radium-228       ✓         Selenium       ✓         Thallium       ✓	Cobalt		✓	
Lithium         ✓           Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Fluoride			✓
Mercury         ✓           Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Lead		✓	
Molybdenum         ✓           Radium-226         ✓           Radium-228         ✓           Selenium         ✓           Thallium         ✓	Lithium			✓
Radium-226         ✓         ✓           Radium-228         ✓         ✓           Selenium         ✓         ✓           Thallium         ✓         ✓	Mercury		✓	
Radium-228         ✓           Selenium         ✓           Thallium         ✓	Molybdenum		✓	
Selenium  Thallium	Radium-226		✓	✓
Thallium 🗸	Radium-228		✓	
	Selenium		✓	
Total Radium ✓	Thallium		✓	
	Total Radium		✓	

<sup>✓</sup> Constituent was flagged during the statistical analysis



# 4 Evaluation for SSIs over Background

Based on the statistical evaluations performed, background threshold values (BTVs) were determined for the detection monitoring program at the site for Appendix I metals, Appendix III and Appendix IV constituents. For constituents that have all ND background values, the maximum MDL is chosen to represent background and the double quantification rule (DQR) is used to evaluate whether or not there is an SSI. The BTV provided for detection monitoring constituents is the statistically-derived background concentration (i.e., upper prediction limit [UPL]), the maximum detected value or the maximum MDL depending on the level of censorship in each of the background samples. For pH (field), both the UPL and the lower prediction limit (LPL) were computed as pH values above or below the prediction limits at the downgradient wells can be considered statistically significant. The test significance level per constituent has been estimated such that the cumulative false positive rate over all constituent/well pair comparisons is approximately ten percent. The number of verification samples per constituent has been selected to provide sufficient statistical power to detect an SSI when an SSI has occurred conditional to the background sample size, its distributional properties, and the total number of statistical test comparisons. The calculated background concentrations, or BTVs, for each detection monitoring constituent is provided below in **Table** 

**Table 10: Background Concentrations for Detection Monitoring Constituents** 

Constituent	Unit	No. of Verification Samples.	BTV (UPL)								
	Appendix I	Metals									
Copper	ug/L	2	11.4								
Nickel	ug/L	na	2.50								
Silver	ug/L	na	2.50								
Vanadium	ug/L	2	8.30								
Zinc	ug/L	2	34.2								
Appendix III Constituents											
Boron	ug/L	2	7.50								
Calcium	ug/L	2	119,000								
Chloride	mg/L	1	340								
Fluoride	mg/L	1	0.230								
pH (Field)	S.U.	1	5.90* - 7.27								
Sulfate	mg/L	2	135								
Total Dissolved Solids	mg/L	2	1,120								
Д	ppendix IV Co	onstituents									
Antimony	ug/L	na	3.90								
Arsenic	ug/L	na	5.00								
Barium	ug/L	2	443								



Constituent	Unit	No. of Verification Samples.	BTV (UPL)
Beryllium	ug/L	na	0.500
Cadmium	ug/L	na	0.500
Chromium	ug/L	na	2.50
Cobalt	ug/L	na	2.50
Fluoride	mg/L	1	0.230
Lead	ug/L	2	14.1
Lithium	ug/L	1	52.0
Mercury	ug/L	na	0.100
Molybdenum	ug/L	2	13.6
Radium-226	pCi/L	3	1.20
Radium-228	pCi/L	3	1.28
Selenium	ug/L	na	5.00
Thallium	ug/L	2	13.7
Total Radium	pCi/L	3	2.07

### Note:

Downgradient sampling results from the detection monitoring round in July 2020 were used to test for SSIs. For constituents that have all ND background values, the DQR is applied; that is, an SSI is registered for the well-constituent pair if the downgradient concentrations exhibit detects in two consecutive sampling events. Downgradient sampling results from the April 2020 and July 2020 sampling events were used to test for SSIs for constituents that have all ND background values. Downgradient concentrations were compared to the BTVs and are summarized below in **Table 11** through **Table 13**. There are no sample results for downgradient well MW-2 because it was dry. Eight monitoring wells (MW-1 through MW-8) were installed and sampled (October 2015) prior to ash placement, thus representing pre-ash conditions at the site. The range of the concentrations of the pre-ash conditions are included in the tables below as a relative comparison to the current downgradient conditions.

Table 11: Summary of Evaluation for SSIs over Background for Appendix I Metals (Detection Monitoring)

		Appendix I	Metals		
	Copper	Nickel	Silver	Vanadium	Zinc
Unit	ug/L	ug/L	ug/L	ug/L	ug/L
BTV (UPL)	11.4	2.50	2.50	8.30	34.2
Pre-Ash Range	2.50 - 16.4	2.50 - 18.2	2.50 - 2.50	2.50 - 9.90	5.00 - 106
Well		Detection N	Monitoring Rou	nd Results	
MW-1	4.30	3.50	2.50	4.90	9.50
MW-2					

<sup>\*</sup> indicates the lower bound of the pH range is the lower prediction limit (LPL). The upper bound is the UPL. *Italic* concentration indicates a non-detect value and that the DQR is recommended for statistical evaluation.



		Appendix I	Metals								
	Copper	Nickel	Silver	Vanadium	Zinc						
Unit	ug/L	ug/L	ug/L	ug/L	ug/L						
BTV (UPL)	11.4	2.50	2.50	8.30	34.2						
Pre-Ash Range	2.50 - 16.4	2.50 - 18.2	2.50 - 2.50	2.50 - 9.90	5.00 - 106						
Well		Detection Monitoring Round Results									
MW-3	4.30	<u>4.80</u>	2.50	4.10	9.50						
MW-4	4.30	<u>8.80</u>	2.50	3.90	9.50						
MW-5	4.30	3.50	2.50	3.90	9.50						
MW-6	4.30	<u>8.20</u>	2.50	3.90	9.50						
MW-7R	4.30	<u>4.70</u>	2.50	4.50	9.50						
MW-8	4.30	<u>22.1</u>	2.50	3.90	9.50						

Notes:

Italic BTV indicates all background concentrations are non-detects and the DQR is recommended for statistical evaluation of SSIs. Italic concentration indicates a non-detect value.

Well MW-2 was dry in July 2020.

<u>Underlined</u> concentration indicates a detect value for constituents with 100 percent background non-detects.

<u>Bold and underlined</u> concentration indicates an SSI over background. This implies that the April 2020 and July 2020 sampling events exhibited detects for constituents with never-detected background concentrations.

Table 12: Summary of Evaluation for SSIs over Background for Appendix III Constituents (Detection Monitoring)

		Ap	pendix III Con	stituents									
	Boron	Calcium	Chloride	Fluoride	pH (Field)	Sulfate	TDS						
Unit	ug/L	ug/L	mg/L	mg/L	S.U.	mg/L	mg/L						
BTV (UPL)	7.50	119,000	340	0.230	5.90 - 7.27	135	1,120						
Pre-Ash Range	6.20 - 53.1	16,900 - 185,000	22.2 - 1,160	0.0200 - 0.590	6.17 - 7.70	3.70 - 199	296 - 2,770						
Well		Second Detection Monitoring Round Results											
MW-1	6.20	<u>254,000</u>	<u>1,010</u>	0.120	6.46	7.00	<u>2,360</u>						
MW-2					<u>7.58</u>								
MW-3	<u>24.8</u>	<u>190,000</u>	<u>1,100</u>	<u>0.330</u>	6.18	40.1	<u>2,680</u>						
MW-4	6.20	63,200	<u>485</u>	<u>0.250</u>	6.13	11.4	<u>1,140</u>						
MW-5	<u>10.1</u>	12,700	23.1	<u>0.560</u>	<u>5.50</u>	2.90	264						
MW-6	<u>7.70</u>	34,500	216	<u>0.320</u>	6.15	26.2	614						
MW-7R	<u>11.4</u>	91,100	289	0.120	<u>7.35</u>	17.3	884						
MW-8	<u>10.4</u>	95,600	318	0.0730	7.00	7.80	900						

Notes:

Italic BTV indicates all background concentrations are non-detects and the DQR is recommended for statistical evaluation of SSIs. Italic concentration indicates a non-detect value.

Well MW-2 was dry in July 2020.Underlined concentration indicates a detect value for constituents with 100 percent background non-detects.

Bold and underlined concentration indicates an SSI over background. This implies that the April 2020 and July 2020 sampling events exhibited detects for constituents with never-detected background concentrations.

<sup>\*</sup> indicates the lower bound of the pH range is the LPL. The upper bound is the UPL.

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	Appendix IV Constituents																
	Antimony	Arsenic	Barium	Beryll- ium	Cad- mium	Chrom- ium	Cobalt	Fluoride	Lead	Lithium	Mercury	Molyb- denum	Radium- 226	Radium- 228	Selenium	Thallium	Total Radium
Unit	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/L	ug/L	ug/L	ug/L	ug/L	pCi/L	pCi/L	ug/L	ug/L	pCi/L
BTV (UPL)	3.90	5.00	443	0.500	0.500	2.50	2.50	0.230	14.1	52.0	0.100	13.6	1.20	1.28	5.00	13.7	2.07
Pre-Ash Range	3.80 - 12.0	2.50 - 2.50	117 - 1,240	0.500 - 0.500	0.500 - 0.500	2.50 - 33.9	2.50 - 7.00	0.0200 - 0.590	2.50 - 6.30	7.50 - 70.4	0.100 - 0.100	2.50 - 20.6	0.0774 - 0.820	0.0230 - 1.56	5.00 - 5.00	5.00 - 5.00	0.304 - 2.93
Well							Sec	ond Detection	on Monito	ing Round F	Results						
MW-1	3.00	4.70	328	0.700	<u>0.570</u>	3.70	3.60	0.120	4.50	31.9	0.120	3.90	0.391	0.627	4.70	0.0500	1.02
MW-2																	
MW-3	3.00	<u>5.10</u>	<u>610</u>	0.700	0.400	3.70	3.60	0.330	4.50	<u>70.1</u>	0.120	8.50	0.804	<u>1.61</u>	4.70	0.0500	<u>2.41</u>
MW-4	<u>3.40</u>	4.70	341	0.700	<u>0.470</u>	3.70	<u>8.10</u>	<u>0.250</u>	4.50	25.5	0.120	3.90	0.135	0.625	4.70	0.0500	0.760
MW-5	3.00	4.70	110	0.700	0.400	3.70	3.60	<u>0.560</u>	4.50	8.50	0.120	3.90	0.00	0.0262	4.70	0.0500	0.0262
MW-6	3.00	4.70	59.7	0.700	0.400	<u>14.0</u>	3.60	0.320	4.50	23.4	0.120	3.90	0.233	0.770	4.70	0.0500	1.00
MW-7R	3.00	4.70	292	0.700	0.400	<u>5.90</u>	3.60	0.120	4.50	23.3	0.120	3.90	0.127	0.343	4.70	0.0500	0.470
MW-8	3.00	4.70	<u>1,020</u>	0.700	0.400	<u>43.5</u>	3.60	0.0730	4.50	19.6	0.120	3.90	0.260	0.474	4.70	0.0500	0.734

### Notes:

Italic BTV indicates all background concentrations are non-detects and the DQR is recommended for statistical evaluation of SSIs.

Italic concentration indicates a non-detect value.

Well MW-2 was dry in July 2020.

<u>Underlined</u> concentration indicates a detect value for constituents with 100 percent background non-detects.

Bold and underlined concentration indicates an SSI over background. This implies that the April 2020 and July 2020 sampling events exhibited detects for constituents with never-detected background concentrations. The BTV for antimony is a non-detect, represented by the maximum MDL, so the DQR is used for evaluating SSIs. An SSI is registered for antimony in MW-4 because the April 2020 and July 2020 sampling events exhibited detect values.



SSIs were found for one Appendix I metal (nickel), six Appendix III constituents (boron, calcium, chloride, fluoride, pH (field), and total dissolved solids), and eight Appendix IV constituents (antimony, barium, cobalt, chromium, fluoride, lithium, radium-228, and total radium). When the July 2020 sampling event results are compared to the pre-ash sampling results from those eight wells, current downgradient groundwater constituent concentrations are generally similar to concentrations reported prior to ash placement. Of the fourteen constituents with observed SSIs, two (calcium and pH) of them were not within the range of pre-ash conditions. Depending on the data distribution of the constituent, the BTVs have been computed to allow for one to three verification samples. With verification sampling, the validity of the SSIs can be confirmed.



# 5 Appendix E.A: Downgradient Well Descriptive Statistics

Table 14: Summary of Well MW-1 Data Set Descriptive Statistics

Constituent	Unit	Sample	No. of	W	ith NDs=MDl	s Included			With NDs R	emoved				
Constituent	Onit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median			
				Арре	endix I Metals									
Copper	ug/L	21	20	2.10	7.20	2.73	2.50	7.20	7.20	7.20	7.20			
Nickel	ug/L	21	18	0.900	13.3	3.16	2.50	5.60	13.3	8.93	7.90			
Silver	ug/L	21	21	2.50	2.50	2.50	2.50	-						
Vanadium	ug/L	21	16	1.30	7.80	3.08	2.50	4.90	7.80	5.90	5.60			
Zinc	ug/L	21	13	3.90	28.0	9.23	5.00	10.2	28.0	16.0	14.0			
	Appendix III Constituents													
Boron	ug/L	20	12	0.570	14.5	5.10	2.75	6.20	14.5	9.63	9.65			
Calcium	ug/L	21	0	43,100	256,000	141,390	127,000	43,100	256,000	141,390	127,000			
Chloride	mg/L	21	0	167	1,010	554	547	167	1,010	554	547			
Fluoride	mg/L	21	1	0.0200	0.170	0.134	0.130	0.110	0.170	0.140	0.135			
pH (Field)	S.U.	19	0	6.41	7.30	6.69	6.70	6.41	7.30	6.69	6.70			
Sulfate	mg/L	21	0	6.20	11.2	7.98	7.20	6.20	11.2	7.98	7.20			
Total Dissolved Solids	mg/L	21	0	569	2,360	1,235	1,060	569	2,360	1,235	1,060			
				Appendi	x IV Constitue	ents								
Antimony	ug/L	21	20	3.00	6.10	3.77	3.90	6.10	6.10	6.10	6.10			
Arsenic	ug/L	21	21	2.50	5.00	4.21	4.70							
Barium	ug/L	21	0	61.9	363	191	175	61.9	363	191	175			
Beryllium	ug/L	21	21	0.200	0.700	0.452	0.500							
Cadmium	ug/L	21	20	0.400	0.570	0.484	0.500	0.570	0.570	0.570	0.570			
Chromium	ug/L	21	16	1.00	18.4	4.06	2.50	6.60	18.4	10.0	7.40			
Cobalt	ug/L	21	21	1.10	3.60	2.29	2.50							
Fluoride	mg/L	21	1	0.0200	0.170	0.134	0.130	0.110	0.170	0.140	0.135			
Lead	ug/L	21	21	1.60	4.50	2.42	2.50	-						
Lithium	ug/L	21	0	19.2	42.8	31.5	31.8	19.2	42.8	31.5	31.8			
Mercury	ug/L	21	21	0.100	0.120	0.101	0.100							
Molybdenum	ug/L	21	18	0.900	15.1	3.97	2.50	9.00	15.1	12.9	14.5			
Radium-226	pCi/L	19	0	-0.188	1.03	0.366	0.327							
Radium-228	pCi/L	19	0	-0.0467	1.45	0.572	0.511							
Selenium	ug/L	21	21	4.70	5.00	4.93	5.00							
Thallium	ug/L	21	21	0.0200	5.00	1.48	0.0600							
Total Radium	pCi/L	19	0	0.237	2.48	0.960	0.925							

- ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



Table 15: Summary of Well MW-2 Data Set Descriptive Statistics

Comptituent	I Init	Commis Cina	No. of NDs	V	Vith NDs=MD	Ls Included			With NDs F	Removed	
Constituent	Unit	Sample Size	NO. OT NUS	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median
				Appe	ndix I Metals	;					
Copper	ug/L	16	11	2.10	17.2	4.38	2.50	5.00	17.2	8.58	6.60
Nickel	ug/L	16	9	0.900	54.4	11.2	2.50	8.70	54.4	22.6	15.2
Silver	ug/L	16	16	2.50	2.50	2.50	2.50		-	-	
Vanadium	ug/L	16	15	1.30	7.60	2.74	2.50	7.60	7.60	7.60	7.60
Zinc	ug/L	16	8	5.00	113	21.2	7.85	10.7	113	37.5	29.2
				Appendi	x III Constitu	ents					
Boron	ug/L	15	0	37.4	63.9	45.4	44.9	37.4	63.9	45.4	44.9
Calcium	ug/L	16	0	130,000	217,000	193,750	197,000	130,000	217,000	193,750	197,000
Chloride	mg/L	16	0	910	1,360	1,170	1,190	910	1,360	1,170	1,190
Fluoride	mg/L	16	1	0.0200	0.400	0.216	0.220	0.130	0.400	0.229	0.220
pH (Field)	S.U.	13	0	7.50	8.50	7.75	7.60	7.50	8.50	7.75	7.60
Sulfate	mg/L	16	0	73.3	338	186	186	73.3	338	186	186
Total Dissolved Solids	mg/L	16	0	257	11,700	2,948	2,475	257	11,700	2,948	2,475
				Appendix	k IV Constitu	ents					
Antimony	ug/L	16	8	3.00	12.3	6.46	4.75	5.60	12.3	9.13	9.10
Arsenic	ug/L	16	16	2.50	5.00	4.04	5.00				
Barium	ug/L	16	0	177	360	262	263	177	360	262	263
Beryllium	ug/L	16	16	0.200	0.500	0.481	0.500				
Cadmium	ug/L	16	16	0.400	0.500	0.494	0.500			-	
Chromium	ug/L	16	4	1.00	84.0	19.5	7.45	5.10	84.0	25.3	14.9
Cobalt	ug/L	16	16	1.10	2.50	2.41	2.50				
Fluoride	mg/L	16	1	0.0200	0.400	0.216	0.220	0.130	0.400	0.229	0.220
Lead	ug/L	16	16	1.60	2.50	2.44	2.50				
Lithium	ug/L	16	0	53.1	356	150	126	53.1	356	150	126
Mercury	ug/L	16	16	0.100	0.100	0.100	0.100				
Molybdenum	ug/L	16	0	6.70	41.0	13.2	9.65	6.70	41.0	13.2	9.65
Radium-226	pCi/L	15	0	0.580	1.94	0.958	0.945				
Radium-228	pCi/L	15	0	0.433	1.97	1.28	1.37				
Selenium	ug/L	16	16	4.70	5.00	4.98	5.00			-	
Thallium	ug/L	16	15	0.0200	10.3	2.26	0.0600	10.3	10.3	10.3	10.3
Total Radium	pCi/L	15	0	1.12	3.02	2.24	2.37				

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDI
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

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# Table 16: Summary of Well MW-3 Data Set Descriptive Statistics

Constituent	Unit Sam	Sample	No. of		With NDs=MD	Ls Included		With NDs Removed					
Constituent	Unit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median		
				Ар	pendix I Meta	ls							
Copper	ug/L	19	14	2.10	36.0	5.81	2.50	5.30	36.0	14.8	9.20		
Nickel	ug/L	19	13	0.900	86.0	10.0	2.50	4.80	86.0	26.6	6.85		
Silver	ug/L	19	19	2.50	2.50	2.50	2.50						
Vanadium	ug/L	19	15	1.30	13.9	3.66	2.50	4.10	13.9	8.33	7.65		
Zinc	ug/L	19	15	3.90	42.7	9.07	5.00	12.5	42.7	23.5	19.4		
Appendix III Constituents													
Boron	ug/L	18	8	0.570	49.4	20.4	13.2	9.70	49.4	35.1	40.5		
Calcium	ug/L	19	0	117,000	201,000	166,316	169,000	117,000	201,000	166,316	169,000		
Chloride	mg/L	19	0	893	1,280	1,090	1,100	893	1,280	1,090	1,100		
Fluoride	mg/L	19	1	0.0200	0.610	0.375	0.420	0.210	0.610	0.395	0.425		
pH (Field)	S.U.	16	0	6.18	7.77	7.26	7.30	6.18	7.77	7.26	7.30		
Sulfate	mg/L	19	0	9.10	174	74.4	80.2	9.10	174	74.4	80.2		
Total Dissolved Solids	mg/L	19	0	256	3,180	2,022	2,170	256	3,180	2,022	2,170		
				Appen	dix IV Constit	uents							
Antimony	ug/L	19	12	3.00	15.0	6.46	3.90	5.80	11.4	9.53	10.1		
Arsenic	ug/L	19	18	2.50	5.10	4.18	5.00	5.10	5.10	5.10	5.10		
Barium	ug/L	19	0	353	855	613	610	353	855	613	610		
Beryllium	ug/L	19	19	0.200	0.700	0.479	0.500			-			
Cadmium	ug/L	19	19	0.400	0.500	0.484	0.500						
Chromium	ug/L	19	10	1.00	179	18.0	3.70	5.30	179	35.3	9.40		
Cobalt	ug/L	19	18	1.10	6.20	2.61	2.50	6.20	6.20	6.20	6.20		
Fluoride	mg/L	19	1	0.0200	0.610	0.375	0.420	0.210	0.610	0.395	0.425		
Lead	ug/L	19	18	1.60	7.30	2.76	2.50	7.30	7.30	7.30	7.30		
Lithium	ug/L	19	0	36.7	236	99.9	87.8	36.7	236	99.9	87.8		
Mercury	ug/L	19	19	0.100	0.120	0.101	0.100						
Molybdenum	ug/L	19	0	5.10	35.7	10.1	8.10	5.10	35.7	10.1	8.10		
Radium-226	pCi/L	18	0	0.213	1.92	0.928	0.953						
Radium-228	pCi/L	18	0	0.387	2.86	1.53	1.66						
Selenium	ug/L	19	19	4.70	5.00	4.95	5.00						
Thallium	ug/L	19	19	0.0200	5.00	1.64	0.0600						
Total Radium	pCi/L	18	0	0.857	3.92	2.46	2.43						

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 17: Summary of Well MW-4 Data Set Descriptive Statistics



Constituent	Unit Sample			With NDs=MI	)Ls Included		With NDs Removed						
	Onit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median		
				Ар	pendix I Meta	ls							
Copper	ug/L	20	19	2.10	7.60	2.79	2.50	7.60	7.60	7.60	7.60		
Nickel	ug/L	20	11	0.900	11.5	4.58	2.50	5.10	11.5	7.29	6.20		
Silver	ug/L	20	20	2.50	2.50	2.50	2.50						
Vanadium	ug/L	20	19	1.30	10.7	2.80	2.50	10.7	10.7	10.7	10.7		
Zinc	ug/L	20	17	3.90	47.2	8.92	5.00	14.5	47.2	30.4	29.4		
Appendix III Constituents													
Boron	ug/L	19	11	0.570	165	12.4	5.10	5.70	165	26.3	6.60		
Calcium	ug/L	20	0	17,900	71,600	55,160	63,350	17,900	71,600	55,160	63,350		
Chloride	mg/L	20	0	144	567	427	485	144	567	427	485		
Fluoride	mg/L	20	0	0.210	0.420	0.315	0.310	0.210	0.420	0.315	0.310		
pH (Field)	S.U.	18	0	6.10	6.56	6.32	6.31	6.10	6.56	6.32	6.31		
Sulfate	mg/L	20	0	3.40	12.3	9.46	10.8	3.40	12.3	9.46	10.8		
Total Dissolved Solids	mg/L	20	0	395	1,580	1,050	1,150	395	1,580	1,050	1,150		
				Appen	dix IV Constit	uents							
Antimony	ug/L	20	17	3.00	7.00	3.93	3.90	3.40	7.00	5.13	5.00		
Arsenic	ug/L	20	20	2.50	5.00	4.18	4.70						
Barium	ug/L	20	0	85.9	431	272	303	85.9	431	272	303		
Beryllium	ug/L	20	20	0.200	0.700	0.450	0.500						
Cadmium	ug/L	20	19	0.400	0.500	0.479	0.500	0.470	0.470	0.470	0.470		
Chromium	ug/L	20	18	1.00	8.60	2.80	2.50	5.70	8.60	7.15	7.15		
Cobalt	ug/L	20	13	1.10	21.8	4.75	2.50	5.30	21.8	9.31	8.10		
Fluoride	mg/L	20	0	0.210	0.420	0.315	0.310	0.210	0.420	0.315	0.310		
Lead	ug/L	20	20	1.60	4.50	2.42	2.50	-	-	-			
Lithium	ug/L	20	0	15.8	31.7	25.5	26.5	15.8	31.7	25.5	26.5		
Mercury	ug/L	20	20	0.100	0.120	0.101	0.100			-			
Molybdenum	ug/L	20	16	0.900	20.9	5.40	2.50	8.90	20.9	17.1	19.2		
Radium-226	pCi/L	18	0	-0.120	0.913	0.429	0.434		-				
Radium-228	pCi/L	18	0	0.0190	1.35	0.548	0.570	-	-	-			
Selenium	ug/L	20	20	4.70	5.00	4.93	5.00		-				
Thallium	ug/L	20	20	0.0200	5.00	1.56	0.0600	-	-	-			
Total Radium	pCi/L	18	0	0.240	2.26	0.984	0.818		-	-			

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 18: Summary of Well MW-5 Data Set Descriptive Statistics



Constituent	Hoit	Unit Sample Size	No. of		With NDs=MI	OLs Included		With NDs Removed						
Constituent	Onit		NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median			
				Арр	endix I Metal	S								
Copper	ug/L	21	18	2.10	8.00	3.17	2.50	5.60	8.00	6.83	6.90			
Nickel	ug/L	21	19	0.900	9.00	2.82	2.50	8.10	9.00	8.55	8.55			
Silver	ug/L	21	21	2.50	2.50	2.50	2.50							
Vanadium	ug/L	21	21	1.30	3.90	2.34	2.50							
Zinc	ug/L	21	15	3.90	36.1	9.01	5.00	11.4	36.1	18.7	15.1			
Appendix III Constituents														
Boron	ug/L	20	9	0.570	39.3	8.67	10.0	9.80	39.3	13.5	10.8			
Calcium	ug/L	21	0	9,140	16,900	12,359	12,500	9,140	16,900	12,359	12,500			
Chloride	mg/L	21	0	17.6	23.1	20.4	20.5	17.6	23.1	20.4	20.5			
Fluoride	mg/L	21	0	0.410	0.680	0.538	0.550	0.410	0.680	0.538	0.550			
pH (Field)	S.U.	19	0	5.50	8.54	6.92	7.00	5.50	8.54	6.92	7.00			
Sulfate	mg/L	21	0	2.60	5.60	3.65	3.50	2.60	5.60	3.65	3.50			
Total Dissolved Solids	mg/L	21	0	194	1,160	283	246	194	1,160	283	246			
				Append	ix IV Constitu	ents								
Antimony	ug/L	21	21	3.00	3.90	3.66	3.80							
Arsenic	ug/L	21	21	2.50	5.00	4.21	4.70							
Barium	ug/L	21	0	90.7	153	110	110	90.7	153	110	110			
Beryllium	ug/L	21	21	0.200	0.700	0.452	0.500							
Cadmium	ug/L	21	21	0.400	0.500	0.476	0.500							
Chromium	ug/L	21	17	1.00	16.8	3.82	2.50	5.10	16.8	10.6	10.3			
Cobalt	ug/L	21	21	1.10	3.60	2.29	2.50							
Fluoride	mg/L	21	0	0.410	0.680	0.538	0.550	0.410	0.680	0.538	0.550			
Lead	ug/L	21	21	1.60	4.50	2.42	2.50							
Lithium	ug/L	21	1	4.20	11.6	8.45	8.60	6.30	11.6	8.66	8.75			
Mercury	ug/L	21	21	0.100	0.120	0.101	0.100							
Molybdenum	ug/L	21	21	0.900	3.90	2.26	2.50							
Radium-226	pCi/L	19	0	-0.142	0.778	0.131	0.0766							
Radium-228	pCi/L	19	0	-0.0922	1.08	0.350	0.196							
Selenium	ug/L	21	21	4.70	5.00	4.93	5.00							
Thallium	ug/L	21	20	0.0200	14.8	1.95	0.0600	14.8	14.8	14.8	14.8			
Total Radium	pCi/L	19	0	0.0262	1.15	0.515	0.425							

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDI
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 19: Summary of Well MW-6 Data Set Descriptive Statistics



Constituent		Sample	No. of		With NDs=MI	)Ls Included		With NDs Removed					
Constituent	Onit	Size	NDs	Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median		
				Ар	pendix I Meta	ls							
Copper	ug/L	21	20	2.10	5.50	2.67	2.50	5.50	5.50	5.50	5.50		
Nickel	ug/L	21	20	0.900	8.20	2.47	2.50	8.20	8.20	8.20	8.20		
Silver	ug/L	21	21	2.50	2.50	2.50	2.50						
Vanadium	ug/L	21	21	1.30	3.90	2.34	2.50						
Zinc	ug/L	21	17	3.90	17.7	6.60	5.00	11.3	17.7	13.4	12.2		
Appendix III Constituents													
Boron	ug/L	20	11	0.570	10.8	4.55	2.75	6.10	10.8	8.03	7.70		
Calcium	ug/L	21	0	31,300	40,200	35,205	35,400	31,300	40,200	35,205	35,400		
Chloride	mg/L	21	0	15.3	279	226	236	15.3	279	226	236		
Fluoride	mg/L	21	0	0.180	0.520	0.383	0.390	0.180	0.520	0.383	0.390		
pH (Field)	S.U.	18	0	6.15	7.00	6.48	6.44	6.15	7.00	6.48	6.44		
Sulfate	mg/L	21	0	25.4	214	85.9	69.7	25.4	214	85.9	69.7		
Total Dissolved Solids	mg/L	21	0	371	946	670	680	371	946	670	680		
				Appen	dix IV Constit	uents							
Antimony	ug/L	21	21	3.00	3.90	3.66	3.80						
Arsenic	ug/L	21	21	2.50	5.00	4.21	4.70						
Barium	ug/L	21	0	46.9	142	95.6	99.4	46.9	142	95.6	99.4		
Beryllium	ug/L	21	21	0.200	0.700	0.452	0.500						
Cadmium	ug/L	21	21	0.400	0.500	0.476	0.500						
Chromium	ug/L	21	18	1.00	14.0	3.06	2.50	5.30	14.0	8.43	6.00		
Cobalt	ug/L	21	21	1.10	3.60	2.29	2.50						
Fluoride	mg/L	21	0	0.180	0.520	0.383	0.390	0.180	0.520	0.383	0.390		
Lead	ug/L	21	21	1.60	4.50	2.42	2.50						
Lithium	ug/L	21	0	22.7	60.5	38.7	37.1	22.7	60.5	38.7	37.1		
Mercury	ug/L	21	20	0.100	0.320	0.111	0.100	0.320	0.320	0.320	0.320		
Molybdenum	ug/L	21	17	0.900	8.30	3.31	2.50	5.40	8.30	6.83	6.80		
Radium-226	pCi/L	19	0	-0.225	0.910	0.247	0.227						
Radium-228	pCi/L	19	0	0.148	1.07	0.605	0.628						
Selenium	ug/L	21	21	4.70	5.00	4.93	5.00						
Thallium	ug/L	21	20	0.0200	6.20	1.51	0.0600	6.20	6.20	6.20	6.20		
Total Radium	pCi/L	19	0	0.148	1.47	0.871	0.912		-				

- ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 20: Summary of Well MW-7R Data Set Descriptive Statistics



Constituent		Sample	Sample No. of Size NDs		With NDs=MI	)Ls Included		With NDs Removed						
	Offic	Size		Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median			
				Ар	pendix I Meta	ls								
Copper	ug/L	11	8	2.10	79.3	11.3	2.50	7.10	79.3	34.6	17.4			
Nickel	ug/L	11	6	0.900	880	87.0	2.50	4.70	880	189	18.0			
Silver	ug/L	11	11	2.50	2.50	2.50	2.50							
Vanadium	ug/L	11	7	1.30	18.8	6.55	2.50	4.50	18.8	14.3	16.9			
Zinc	ug/L	11	8	3.90	53.4	14.5	5.00	10.7	53.4	39.0	52.8			
Appendix III Constituents														
Boron	ug/L	10	5	2.60	25.3	10.7	12.1	11.4	25.3	16.8	16.5			
Calcium	ug/L	11	0	74,000	104,000	90,282	89,700	74,000	104,000	90,282	89,700			
Chloride	mg/L	11	0	275	312	288	285	275	312	288	285			
Fluoride	mg/L	11	1	0.0500	0.320	0.133	0.120	0.110	0.320	0.141	0.120			
pH (Field)	S.U.	11	0	7.13	9.60	7.62	7.46	7.13	9.60	7.62	7.46			
Sulfate	mg/L	11	0	16.5	51.2	21.3	17.8	16.5	51.2	21.3	17.8			
Total Dissolved Solids	mg/L	11	0	740	990	834	820	740	990	834	820			
				Appen	dix IV Constit	uents								
Antimony	ug/L	11	10	3.00	13.6	4.45	3.90	13.6	13.6	13.6	13.6			
Arsenic	ug/L	11	11	4.70	5.00	4.86	5.00							
Barium	ug/L	11	0	50.1	423	269	264	50.1	423	269	264			
Beryllium	ug/L	11	11	0.200	0.700	0.409	0.500							
Cadmium	ug/L	11	11	0.400	0.500	0.455	0.500							
Chromium	ug/L	11	2	1.00	1,940	190	8.10	5.10	1,940	232	9.60			
Cobalt	ug/L	11	9	1.10	20.4	4.35	2.50	6.70	20.4	13.6	13.6			
Fluoride	mg/L	11	1	0.0500	0.320	0.133	0.120	0.110	0.320	0.141	0.120			
Lead	ug/L	11	9	1.60	6.80	3.29	2.50	6.70	6.80	6.75	6.75			
Lithium	ug/L	11	0	5.60	33.8	25.0	25.4	5.60	33.8	25.0	25.4			
Mercury	ug/L	11	11	0.100	0.120	0.102	0.100							
Molybdenum	ug/L	11	8	0.900	49.5	8.90	2.50	10.7	49.5	26.6	19.5			
Radium-226	pCi/L	9	0	-0.194	1.05	0.312	0.127							
Radium-228	pCi/L	9	0	-0.454	1.01	0.512	0.585							
Selenium	ug/L	11	11	4.70	5.00	4.86	5.00			-				
Thallium	ug/L	11	8	0.0280	0.480	0.0989	0.0600	0.110	0.480	0.237	0.120			
Total Radium	pCi/L	9	0	0.0741	2.00	0.902	0.728							

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.

# Charah, LLC | Summary of Statistical Analysis and Evaluation for SSIs Table 21: Summary of Well MW-8 Data Set Descriptive Statistics



Constituent	Unit Sample	Sample	Sample No. of NDs		With NDs=ME	Ls Included			With NDs F	Removed			
	UIIIL	Size		Minimum	Maximum	Mean	Median	Minimum	Maximum	Mean	Median		
				Ар	pendix I Meta	ls							
Copper	ug/L	21	19	2.10	10.2	3.08	2.50	6.40	10.2	8.30	8.30		
Nickel	ug/L	21	16	0.900	42.1	6.41	2.50	10.8	42.1	20.2	13.8		
Silver	ug/L	21	21	2.50	2.50	2.50	2.50						
Vanadium	ug/L	21	21	1.30	3.90	2.34	2.50						
Zinc	ug/L	21	12	3.90	50.7	13.7	5.00	11.4	50.7	25.1	18.7		
Appendix III Constituents													
Boron	ug/L	20	10	0.570	12.8	6.21	8.80	8.70	12.3	9.81	9.45		
Calcium	ug/L	21	0	91,900	194,000	120,705	108,000	91,900	194,000	120,705	108,000		
Chloride	mg/L	21	0	271	939	461	390	271	939	461	390		
Fluoride	mg/L	21	20	0.0200	0.0730	0.0397	0.0500	0.0730	0.0730	0.0730	0.0730		
pH (Field)	S.U.	19	0	6.70	7.29	6.99	7.00	6.70	7.29	6.99	7.00		
Sulfate	mg/L	21	0	4.40	8.00	6.78	6.90	4.40	8.00	6.78	6.90		
Total Dissolved Solids	mg/L	21	0	224	1,530	964	900	224	1,530	964	900		
				Appen	dix IV Constit	uents							
Antimony	ug/L	21	14	3.00	10.1	4.91	3.90	5.20	10.1	7.46	7.50		
Arsenic	ug/L	21	21	2.50	5.00	4.21	4.70	-					
Barium	ug/L	21	0	976	1,550	1,172	1,130	976	1,550	1,172	1,130		
Beryllium	ug/L	21	21	0.200	0.700	0.452	0.500	-					
Cadmium	ug/L	21	21	0.400	0.500	0.476	0.500	-					
Chromium	ug/L	21	15	1.00	82.0	11.3	2.50	7.40	82.0	33.9	26.9		
Cobalt	ug/L	21	21	1.10	3.60	2.29	2.50	-					
Fluoride	mg/L	21	20	0.0200	0.0730	0.0397	0.0500	0.0730	0.0730	0.0730	0.0730		
Lead	ug/L	21	21	1.60	4.50	2.42	2.50	-					
Lithium	ug/L	21	1	4.20	50.1	27.2	26.8	18.7	50.1	28.4	27.1		
Mercury	ug/L	21	20	0.100	0.370	0.114	0.100	0.370	0.370	0.370	0.370		
Molybdenum	ug/L	21	19	0.900	5.60	2.61	2.50	5.20	5.60	5.40	5.40		
Radium-226	pCi/L	19	0	0.00	1.16	0.548	0.528						
Radium-228	pCi/L	19	0	0.239	1.20	0.738	0.594	-					
Selenium	ug/L	21	21	4.70	5.00	4.93	5.00						
Thallium	ug/L	21	20	0.0200	8.80	1.64	0.0600	8.80	8.80	8.80	8.80		
Total Radium	pCi/L	19	0	0.454	1.94	1.29	1.26						

- 1. ND = not detected above the method detection limit.
- 2. MDL = method detection limit.
- 3. "--" indicates all results for the respective constituent were NDs, or with the case of total radium, NDs were flagged but the laboratory did not provide a value for the MDL.
- 4. Numbers are displayed using the same number of significant figures as reported by the laboratory.
- 5. If a constituent had 100% detections the descriptive statistics provided above are identical for the data including NDs and excluding NDs.



# 6 Appendix E.B: Scatter Plots for Constituents with Downgradient Statistical Outliers

Figure 5: pH (Field) Concentrations (S.U) vs. Time (MW-1)

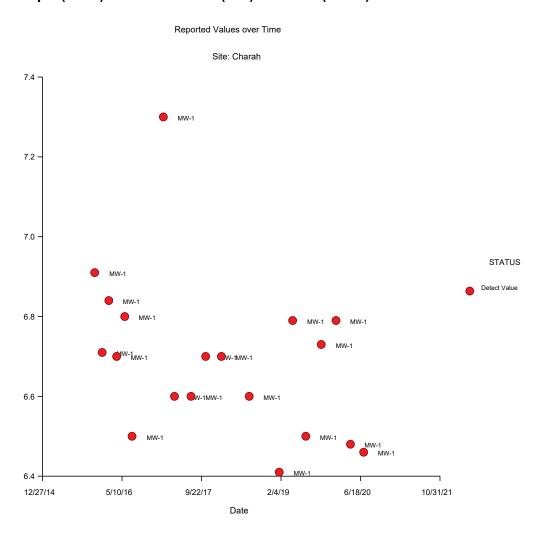




Figure 6: Total Dissolved Solids Concentrations (mg/L) vs. Time (MW-2)

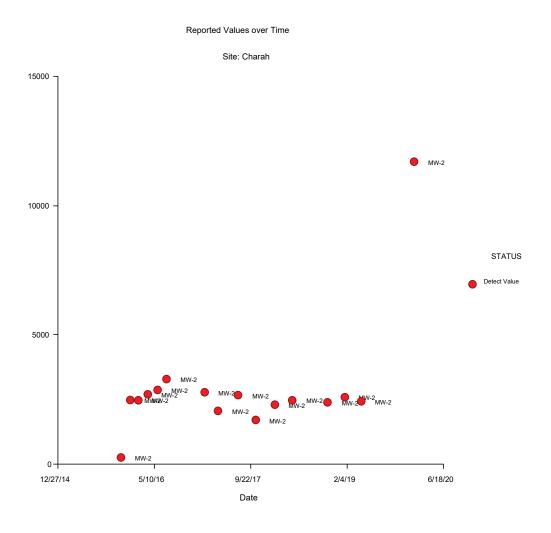




Figure 7: Calcium Concentrations (ug/L) vs. Time (MW-2)

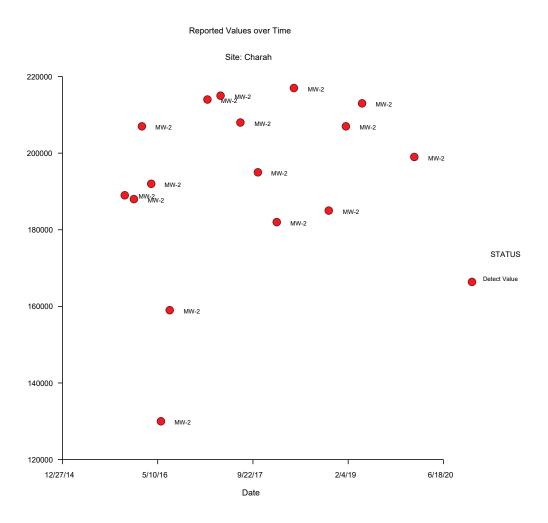




Figure 8: Lithium Concentrations (ug/L) vs. Time (MW-2)

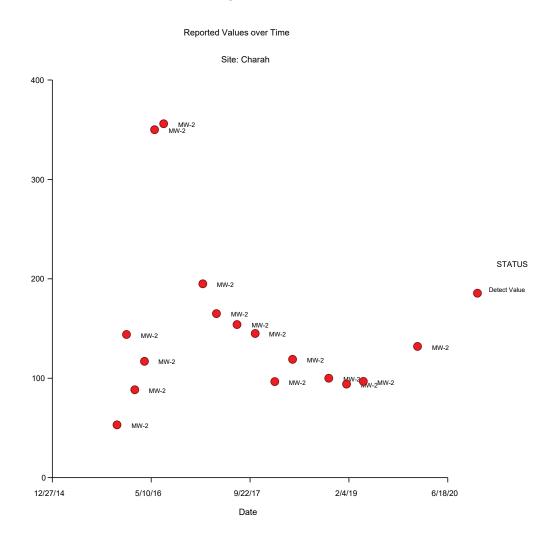




Figure 9: Molybdenum Concentrations (ug/L) vs. Time (MW-2)

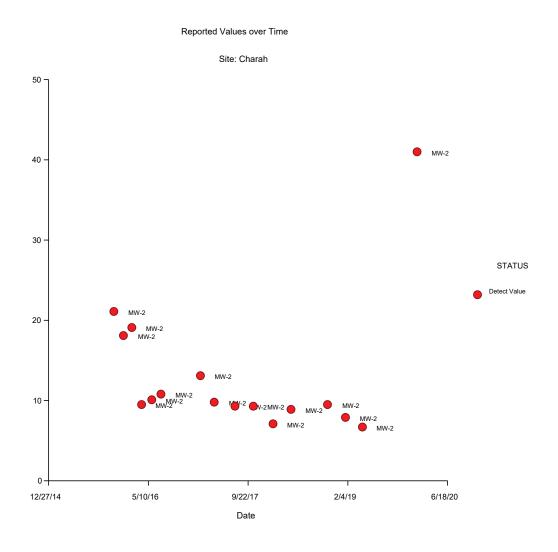




Figure 10: Lithium Concentrations (ug/L) vs. Time (MW-3)

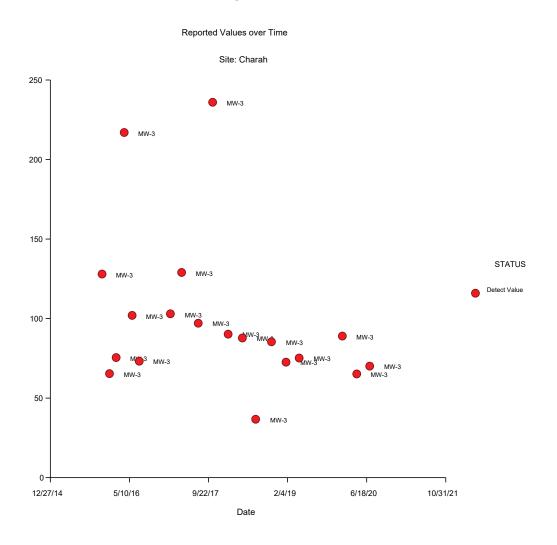




Figure 11: Molybdenum Concentrations (ug/L) vs. Time (MW-3)

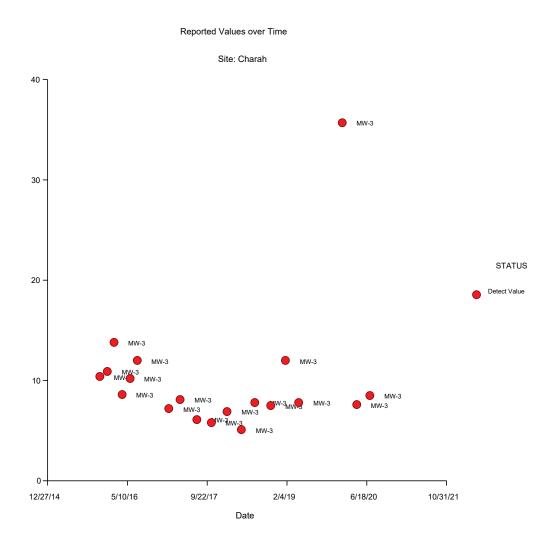




Figure 12: pH (Field) Concentrations (S.U.) vs. Time (MW-3)

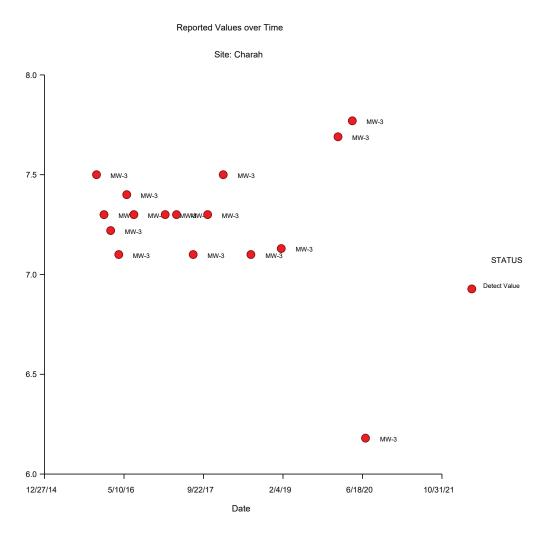




Figure 13: Boron Concentrations (ug/L) vs. Time (MW-4)

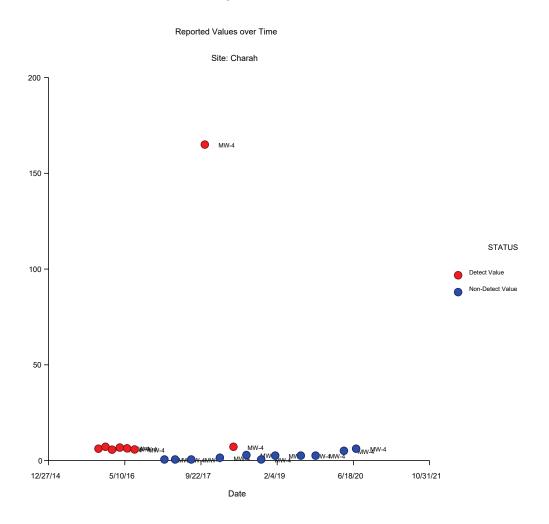




Figure 14: Cobalt Concentrations (ug/L) vs. Time (MW-4)

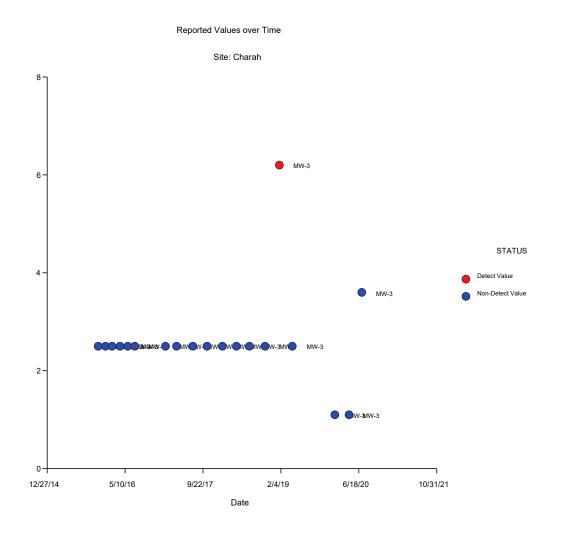




Figure 15: Boron Concentrations (ug/L) vs. Time (MW-5)

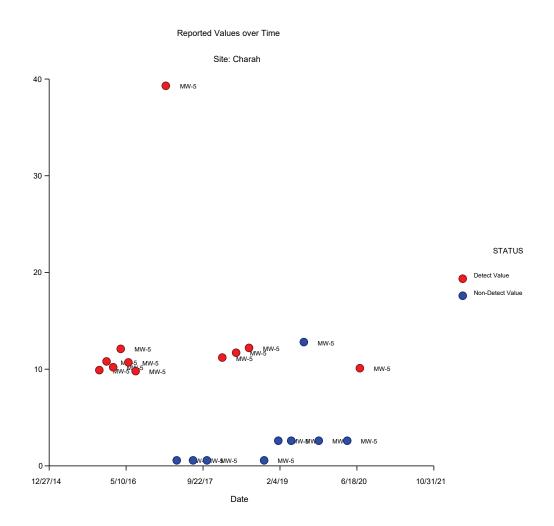




Figure 16: Total Dissolved Solids Concentrations (mg/L) vs. Time (MW-5)

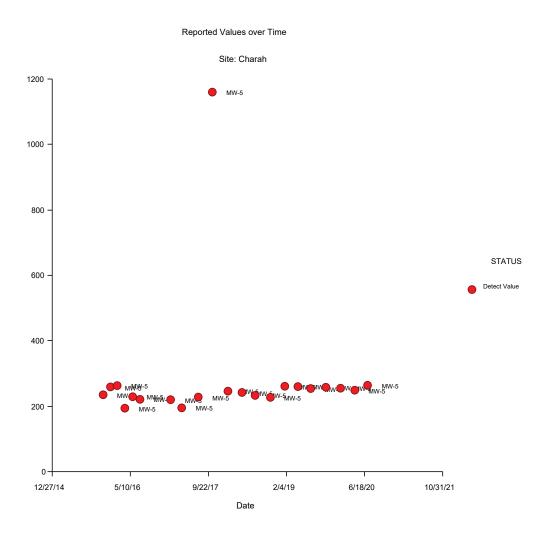




Figure 17: pH (Field) Concentrations (S.U.) vs. Time (MW-5)

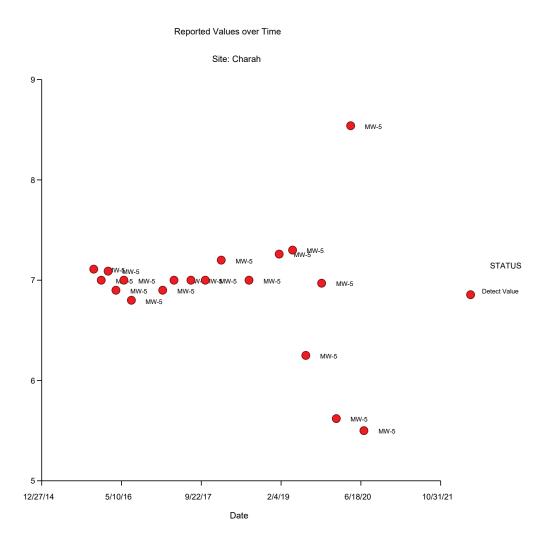




Figure 18: Chloride Concentrations (mg/L) vs. Time (MW-6)

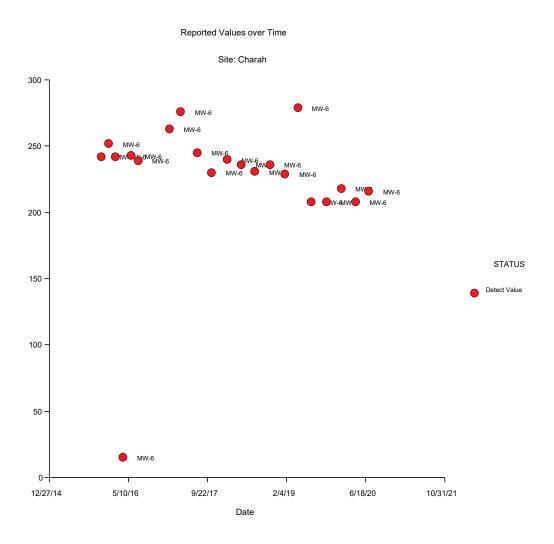




Figure 19: Fluoride Concentrations (mg/L) vs. Time (MW-7R)

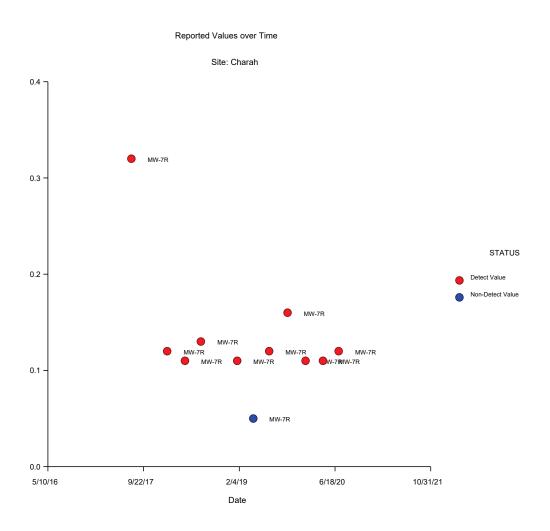




Figure 20: pH (Field) Concentrations (S.U.) vs. Time (MW-7R)

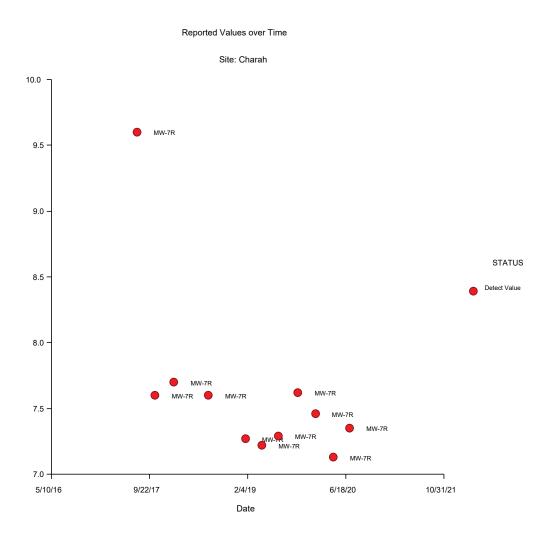




Figure 21: Sulfate Concentrations (mg/L) vs. Time (MW-7R)

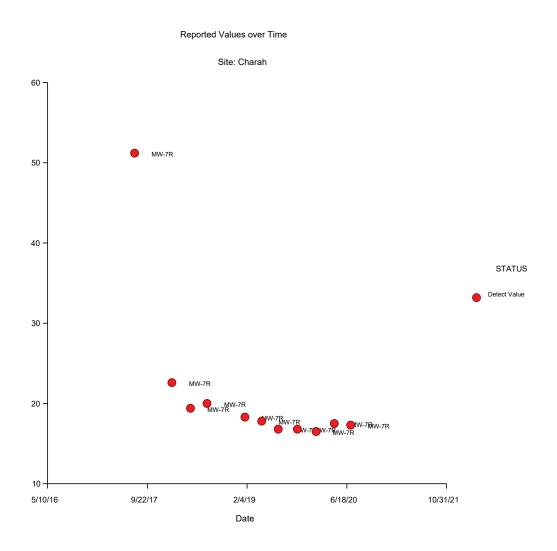




Figure 22: Fluoride Concentrations (mg/L) vs. Time (MW-7R)

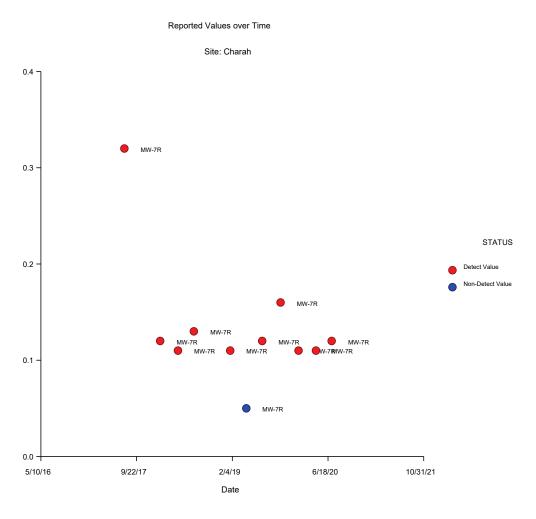




Figure 23: Nickel Concentrations (ug/L) vs. Time (MW-7R)

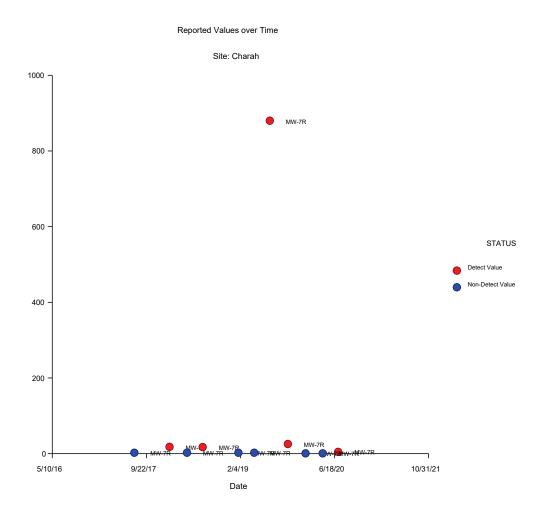
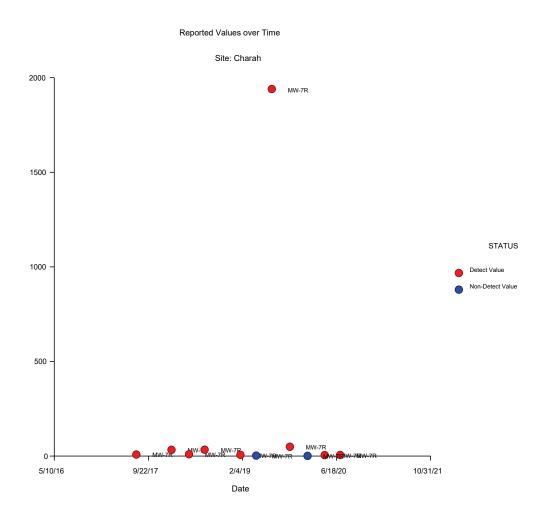




Figure 24: Chromium Concentrations (ug/L) vs. Time (MW-7R)





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- [1] Singh, A. and Ashok Singh. ProUCL 5.1.002 Technical Guide Statistical Software for Environmental Applications for Data Sets with and without Nondetect Observations. EPA/600/R07/041, 2015.
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- [4] IBM Corp. Released 2013. IBM SPSS Statistics for Windows, Version 22.0. Armonk, NY: IBM Corp.

# FDR

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C

Attachment C – Assessment Monitoring Report

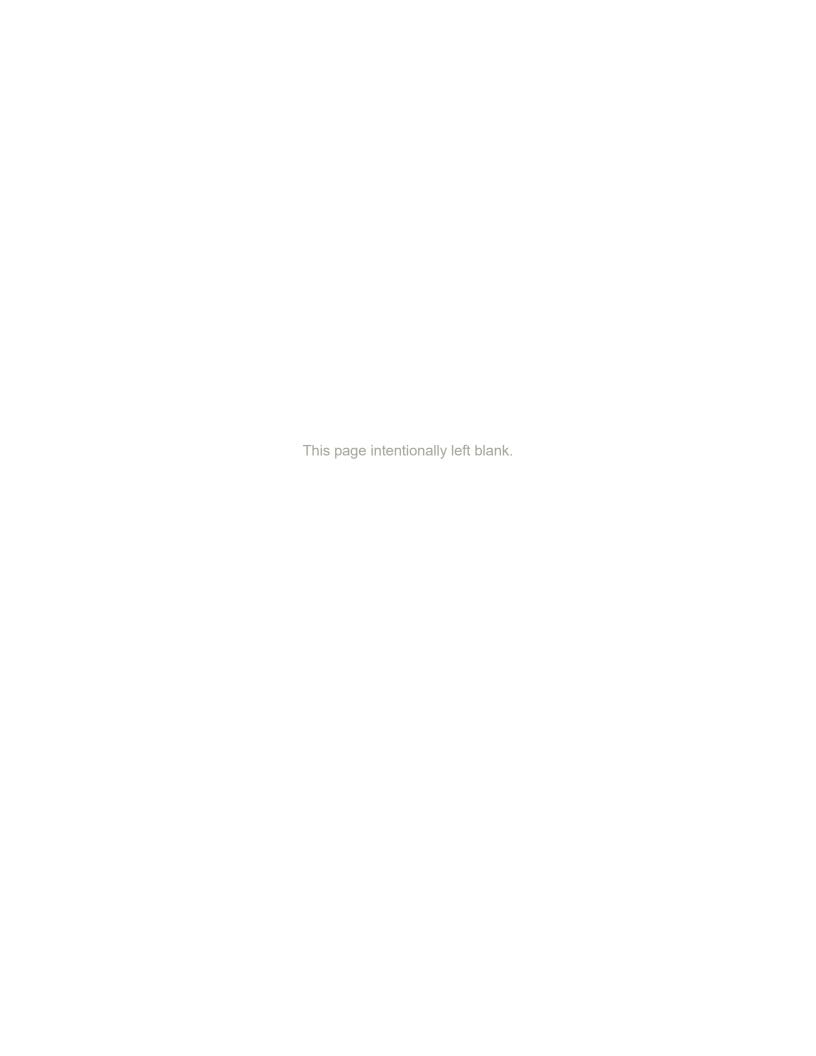


# Assessment Monitoring Report

Brickhaven No. 2 Mine Track "A" Structural Fill

1910-STRUC-2015

Moncure, Chatham County, North Carolina July 24, 2020



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- Appendix F Groundwater and Surface Water Laboratory Report (April 2020)
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- Appendix H Groundwater Flow Model Report

# Signature/Certification Sheet

## Prepared by:

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Name

Shane McDonald

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Senior Geologist

Title

Senior Technical Leader

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Company

HDR Engineering, Inc. of the

Carolinas

Company

HDR Engineering, Inc.

**Signature** 

**Signature** 

#### **Qualified Groundwater Professional Certification:**

I, <u>Mark P. Filardi</u>, a Licensed Geologist for HDR Engineering, Inc. of the Carolinas, do certify the information contained in this report is correct and accurate to the best of my knowledge. HDR Engineering, Inc. of the Carolinas is licensed to practice geology in North Carolina. The certification number of the corporation is C-503

Name:

Signature:

**Professional Certification** 

Number:

Company:

Mark

SEAL 1886

No. 1886

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## 1 Introduction

## 1.1 Purpose

On behalf of Green Meadow, LLC (Green Meadow), HDR Engineering, Inc. of the Carolinas (HDR) has prepared this Assessment Monitoring Report to evaluate the nature and extent of exceedances of groundwater and surface water quality criteria at the Brickhaven No. 2 Mine Tract "A" Structural Fill site in Moncure, Chatham County, North Carolina.

The work summarized herein was conducted to obtain additional geologic, hydrogeologic, and water quality data to advance the current understanding of the site-specific conceptual site model (CSM) and to supplement the Alternate Source Demonstration (ASD) of exceedances that was previously submitted to the North Carolina Department of Environmental Quality (NCDEQ) on March 29, 2019.

## 1.2 Regulatory Compliance

Operating under Facility Permit #1910-STRUT-2015, Charah Solutions, Inc. (Charah) is required to monitor groundwater and surface water quality at designated locations. Per the Water Quality Monitoring Plan¹ (WQMP) (Buxton, 2015a) approved by the North Carolina Department of Environment and Natural Resources (NCDENR) in 2014, Charah began monitoring groundwater and surface water quality in 10 monitoring wells (MW-1 through MW-7R, MW-8, BG-1, and BG-2) and two surface water locations (SW-1 and SW-2) for constituents listed in NCDEQ Solid Waste Appendix I and II, 40 CFR 257 Appendix III, and 40 CFR 257 Appendix IV.

Sampling began in August 2015, prior to placement of coal combustion products (CCP) into the lined Structural Fill. One additional sampling event was conducted in October 2015 prior to commencement of CCP placement in November 2015. Subsequent to the October 2015 event, Charah conducted six additional background sampling events. From January 2017 through July 2019, Charah conducted five semi-annual detection monitoring events. On June 21, 2019, Charah received correspondence from the North Carolina Department of Environmental Quality (NCDEQ) Solid Waste Section requesting that Charah submit an Assessment Work Plan (Plan) in accordance with 15A NCAC 02L .0106 and 15A NCAC 02B .0211 and .0216. NCDEQ cited exceedances of groundwater standards (2L Standards) for barium, chloride, chromium, cobalt, total dissolved solids (TDS), and vanadium, and exceedances of surface water standards (2B Standards) for arsenic, cobalt, copper, lead, TDS, and zinc as cause for the Plan.

On behalf of Charah, HDR submitted a *Groundwater and Surface Water Assessment Monitoring Plan* (Plan) to NCDEQ on August 16, 2019. The plan was approved by NCDEQ in

<sup>&</sup>lt;sup>1</sup> Design Hydrogeologic Report – Addendum, Revision 2. Brickhaven Mine Reclamation Structural Fill Site. 1315 Moncure-Flatwood Road, Moncure, North Carolina. Buxton Environmental, Inc. March 6, 2015.

<sup>&</sup>lt;sup>2</sup> Monitoring has continued since July 2019 with an additional three events.



correspondence dated September 16, 2019 and amended on October 4, 2019. Copies of these correspondence are included in **Appendix A**.

## 1.3 Site Location and Operation

The site is located in Chatham County, approximately four miles southeast of Moncure, North Carolina (**Figure 1.1**). The owner of the site is Green Meadow and Charah is responsible for the operation and maintenance of the Structural Fill. The mine property is approximately 301 acres in total; of which 145 acres is permitted for Structural Fill placement of CCP in a lined storage facility.

The site was previously owned by General Shale, which operated a clay mine for off-site brick manufacturing beginning in 1985. Mined clay was stockpiled and then transported approximately 3.5 miles south to Brickhaven, North Carolina for brick manufacturing.

The area immediately surrounding the site primarily consists of rural residential, commercial, industrial, wooded and agricultural properties. According to information obtained from the Chatham County GIS website (October 2015), municipal water is available to the surrounding area.

Charah began CCP placement in the first composite liner containment system (Cell 1, Sub Cell 1A) on October 23, 2015. Approximately 7.3 million tons of CCP were placed in Cell 1, Cell 2, Cell 6A, Cell 6B, and Cell 6C prior to closure of the Structural Fill on July 11, 2019. CCP materials (including fly ash, bottom ash, boiler slag, and/or flue gas desulfurization materials) were initially brought to the site by truck from October 2015 until transportation was changed to rail in January 2016. The CCP originated from the Duke Energy Carolinas (DEC) Riverbend Steam Station and Duke Energy Progress (DEP) L.V. Sutton Energy Complex (Sutton Plant).

Leachate (i.e., product generated from the liquids present in the fill at the time of placement and/or stormwater that infiltrates the fill) is managed on-site through collection and storage of the resultant liquid. Green Meadow has approved pump and haul permits to dispose of leachate at the City of Sanford's Big Buffalo Creek Wastewater Treatment Plant and the Town of Spring Lake's South Harnett Regional Wastewater Treatment Plant.

## 2 Site Setting

## 2.1 Site Topography and Geographical Setting

Based on review of the 1993 USGS topographic quadrangle (**Figure 2.1**) and GIS mapping, the topography of the site and surrounding area is characterized by moderately rolling hills, which are dissected by dendritic creeks. Prior to mining by General Shale, a topographic ridge was present within the site, extending from the northwestern corner of the present-day Structural Fill toward the southeast. Thus, historic drainage was to the north/northwest/west and to the northeast/east/southeast away from the ridge.



## 2.2 Geologic and Hydrogeologic Setting

## 2.2.1 Regional Geology

The site is located within the Piedmont physiographical province of North Carolina, which is a northeast-southwest trending region extending from New York to Alabama.

According to the 1985 North Carolina Geologic Map prepared by the North Carolina Geological Survey, the site is located in the Triassic Sanford sub-basin of the Deep River Basin within the Piedmont Physiographic Province. The majority of the site is underlain by the Sanford Formation, which is comprised of conglomerate, fanglomerate, sandstone, and mudstone. The far western portion of the site is underlain by the Cummock Formation, comprised of sandstone, mudstone, gray and black coal, and carbonaceous shale. The basin is bounded by felsic metavolcanic rocks within the Carolina Slate Belt approximately 6.5 miles northwest of the site; and is in contact with metamorphosed granite and biotite gneiss and schist of the Raleigh Belt along a normal fault approximately 2.5 miles southeast of the site. The basin formations have been intruded by north northwest-south southeast trending diabase dikes during the Jurassic Period (~144 to 208 Ma) and the basin rocks are cut by northeast-southwest trending normal faults. However, no faults were mapped at the site on the 1985 geologic map (NCDENR, 1985).

In the Piedmont, the bedrock is typically overlain by a mantle of weathered rock (residuum/saprolite), which has an average thickness of approximately 25 feet. The residuum/saprolite consists of varying amounts of unconsolidated clay, silt, and sand, with lesser amounts of rock fragments. Due to the range of the parent rock composition and the variable susceptibility to weathering of each rock type, the residuum/saprolite range widely in color, texture, and thickness. Generally, the residuum/saprolite is thickest near inter-stream divides (ridges) and thins toward stream beds. In profile, the residuum/saprolite normally grades from clayey soils near the land surface to sandier, partially weathered rock above competent bedrock (Buxton, 2014).

#### 2.2.2 Site Geology

The geology of the site can be subdivided into six units which include fill, flood plain, residuum, saprolite, partially weathered rock, and bedrock. These units generally grade downward from residuum, to saprolite, to partially weathered rock and bedrock. Fill materials were limited to the road bed and berm located around the east and west sides of MW-4. Flood plain sediments were only identified at MW-4 on the southeast corner of the site. The following summary of site-specific units is based on boring logs originally included in the *Design Hydrogeologic Report* (Buxton, 2016).

#### 2.2.2.1 FILL

Fill materials were primarily identified in the road bed and berm located around the east and west sides near MW-4 and generally consisted of mottled reddish yellow, orange, brown, and light gray sandy silty clay with quartz gravel.

## **FJS**

#### 2.2.2.2 FLOOD PLAIN

Flood plain sediments were only located adjacent to MW-4 on the southeast corner of the site. Sediments were associated with a former adjacent intermittent tributary creek and can be generally characterized as mottled light gray fine sandy silty clay. The flood plain sediments were approximately 5 feet thick in this area and had been deposited above residuum. Based on geotechnical laboratory data, the flood plain sediments were identified as lean clay (CL) under the Unified Soil Classification System (USCS).

#### 2.2.2.3 **RESIDUUM**

Residuum is characterized as mottled yellowish, brown, orange, and red silty clay and clayey silt. Root structures were common. Residuum was formed from the continued weathering and biologic reworking of saprolite, and ranges from 2 to 15 feet in thickness, when present. Based on geotechnical laboratory data, the residuum consisted of clayey sand (SC), elastic silt (MH), and lean clay (CL) and had a hydraulic conductivity of 2.86 x 10<sup>-7</sup> cm/sec.

#### 2.2.2.4 SAPROLITE

Saprolite is characterized as mottled (black and gray) red and reddish brown sandy silty clay with infrequent quartz gravel and cobbles. Saprolite is characteristically fissile, often breaking in horizontal sheets. Saprolite generally retains the remnant texture, structure and mineral content of the rock from which it was formed, and ranged from 5 to 15 feet in thickness. Saprolite had a standard penetration resistance (N) of less than 100 blows per foot. Based on geotechnical laboratory data, the saprolite consisted of lean clay (CL) with hydraulic conductivity ranging from 7.69 x 10<sup>-8</sup> cm/sec to 3.69 x 10<sup>-9</sup> cm/sec.

#### 2.2.2.5 PARTIALLY WEATHERED ROCK

Partially weathered rock was characterized as mottled (light green and purple) brown, reddish gray, and weak red silty clay and weathered mudstone, which are often fissile. Partially weathered rock generally retains the remnant texture, structure, and mineral content of the rock from which it was formed, and ranged from 5 to 40 feet in thickness. Partially weathered rock had an N-value of 100 blows per foot or greater and can generally be drilled with standard hollow-stem auger drilling technology. Based on geotechnical laboratory data, partially weathered rock consisted of lean clay (CL). Hydraulic conductivity ranged from 2.433 x 10<sup>-4</sup> cm/sec to 7.154 x 10<sup>-8</sup> cm/sec, according to slug or recovery test data (for wells screened solely in partially weathered rock).

#### 2.2.2.6 BEDROCK

Based on rock coring activities conducted near MW-7/MW-7R and visual inspection of the rock exposed on the north side of the MW-4 area, bedrock at the site is primarily composed of reddish to light tan, gray mudstone, cross-bedded muddy sandstone, and muddy sandy conglomerate (rounded quartz gravel and cobbles). Bedrock generally occurs as horizontally oriented and relatively thin intermittent layers (especially within the upper 15 feet) across the site. Bedrock contained horizontal to near vertical fractures. Large fractures were observed in weathered mudstone immediately northeast of well MW-8. The occurrence of bedrock at the site was generally defined by auger refusal.



## 2.2.3 Regional Hydrogeology

The hydrogeologic regime in the Triassic Basin is characterized by fractured, bedded sedimentary sequences underlying saprolite and soil. Groundwater may occur under both unconfined, water table conditions (similar to most Piedmont crystalline sites) and confined conditions. Controls on groundwater flow are a combination of factors including topography, stratigraphic sequence and lithology, distribution and intensity of fractures, presence of diabase intrusions (both dams and sills), basalt flows, and weathering processes of the bedrock (Venkatakrishnan and Gheorghiu 2003).

Groundwater flow has both local and regional components with shallow groundwater discharging locally to nearby streams (and some movement downward into the deeper flow system) and deeper groundwater flow toward points of regional discharge, that are generally higher order stream courses (Venkatakrishnan and Gheorghiu 2003). Both shallow and deep groundwater systems generally flow in a direction similar to the topographic gradient.

Groundwater recharge in the region is derived from infiltration of local precipitation and occurs in areas of higher topography (i.e., hilltops). Groundwater discharge occurs in lowland areas bordering surface water bodies, marshes, and floodplains (LeGrand 2004). Average annual precipitation contributing to recharge in the Piedmont ranges from 42 to 46 inches. Mean annual recharge in the Piedmont ranges from 4.0 to 9.7 inches per year (Daniel 2001).

## 2.2.4 Site Hydrogeology

Site hydrogeology was assessed by Buxton Environmental, Inc. (Buxton) during completion of the *Design Hydrogeological Report*, dated November 6, 2014 and revised on December 31, 2014 and March 6, 2015. A chronological summary of field activities, as they pertain to development of the current conceptual site model (CSM), is provided in **Table 2.1**.

Evaluation of geologic and hydrogeologic data obtained during the above-referenced activities and published data sources (e.g., 1993 USGS Moncure, NC topographic quadrangle) indicate the historic presence of two topographic highs in the north-central and south-central portions of the site prior to development by General Shale. Accordingly, high groundwater elevations were regularly recorded in piezometers PZM-14s (north-central) and PZM-16, -23s, and -25 (south-central), resulting in radial flow from these areas. As piezometers have been abandoned during development of the Structural Fill and compliance monitoring wells have been installed, similar high groundwater elevations have regularly been recorded in wells MW-1 (north-central), and MW-5 and MW-6 (south-central). Since piezometers within the limits of the Structural Fill liner have been abandoned, shallow groundwater has historically been interpreted to flow east and west from the former north-south trending topographic ridge. However, with the addition of monitoring well MW-11, shallow groundwater is now interpreted to flow east, west, and south of the former north-south trending topographic ridge, as shown on **Figure 2.2**. Subsequent groundwater gauging events will be evaluated to validate the southward component of groundwater flow.

Hydraulic conductivities calculated from slug test data in piezometers during the Design Hydrogeologic investigation ranged from  $1.6 \times 10^{-4}$  centimeters per second (cm/sec) to  $3.8 \times 10^{-8}$  cm/sec.

Vertical hydraulic gradients, as calculated in co-located piezometers during three gauging events in 2014, are presented in **Table 2.2**.

Average linear groundwater flow velocities were calculated during the Design Hydrogeologic investigation at piezometers PZM-1, PZM-2, PZM-2D, PZM-5, PZM-8, PZM-10, PZM-12, PZM-13, PZM-15, and PZM-17 using the Darcy equation. Average linear groundwater velocities ranged from 0.0000072 ft/day (0.0026 ft/year) at piezometer PZM-10 to 1.84 ft/day (671.60 ft/year) at piezometer PZM-15. Average linear flow velocities along the eastern side of the site, near compliance wells MW-2 and MW-3, were calculated at 0.51 ft/year in piezometer PZM-2 and 0.47 ft/year at piezometer PZM-8.

Since 2014, HDR has calculated seepage velocities between wells installed roughly perpendicular to the inferred direction of groundwater flow and presented these data in semi-annual monitoring reports. In the most recent semi-annual monitoring report (January 2020), seepage velocities were calculated at 13.3 ft/year between wells MW-1 and MW-2 and 4.8 ft/year between wells MW-5 and MW-4.

## 2.3 Receptor Information

In 2014, Buxton conducted a water supply well survey within 300 feet of the planned limit of fill of the Structural Fill. One on-site water supply well was identified adjacent to a small pond near the equipment parking and maintenance building, approximately 300 feet east of the former location of PZM-1. No additional water supply wells were identified during the survey; however, Buxton did note that the surrounding area has historically been used for rural residences and agriculture. Thus, the potential for water supply wells beyond the 300-foot buffer of the Structural Fill boundary exists.

# 3 Assessment Monitoring

Between November 2019 and May 2020, Charah implemented the Plan pursuant to 15A NCAC 02L.106(g), and 15A NCAC 2B.0211 and .0216 to:

- Evaluate whether the placement of CCP in the Structural Fill or generation of leachate from the Structural Fill has contributed to exceedances of regulatory criteria;
- Identify imminent hazards to public health and safety and take actions to mitigate them in accordance with 15A NCAC 02L.106(f);
- Identify receptors and significant exposure pathways;
- Delineate the horizontal and vertical extent of soil and groundwater contamination and all significant factors affecting contaminant transport; and
- Evaluate geological and hydrogeological features influencing the movement, chemical, and physical character of contaminants.

Work conducted during assessment monitoring provided information sufficient to satisfy the requirements of the rule; however, uncertainties may exist, due in part, to the following factors:

- Constituents of concern are known to be naturally-occurring in soil and groundwater throughout the Piedmont Physiographic Province, which encompasses the site.
- The natural variations and the complex nature of the geological and hydrogeological characteristics involved with the movement, chemical, and physical character of the constituents.
- Use of the site by General Shale Brick, Inc. (General Shale) and its predecessor companies as a clay mine for brick production from 1985 until the mine permit was transferred to Green Meadow, LLC in 2015 and potential geochemical changes that these activities may have imparted on soil and groundwater.
- Potential geochemical impacts on the surface water from the wastewater discharge from: 1) General Shale under National Pollutant Discharge Elimination System (NPDES) permit to the unnamed tributary (east) of the site and 2) the farm pond south of the site. Both discharges are upstream of surface water sample location SW-1.

Sample locations utilized or attempted during the current assessment monitoring activities are shown on **Figure 3.1**.

## 3.1 Ash Evaluation

Between 2012 and 2020, ash has been collected and tested before and after placement in the Structural Fill. HDR compared these laboratory data to groundwater analytical data to evaluate if the lined Structural Fill could be a source of constituents in groundwater or surface water at the site. While the ash testing conducted prior to 2019 was not intended to support assessment monitoring and constituents reported differed, the data is useful in understanding the geochemical disposition of ash placed in the lined Structural Fill. A summary of laboratory results of ash samples collected between 2012 and 2020 is presented in **Table 3.1a** through **Table 3.1c**. Laboratory reports are included in Appendix B.

### 3.1.1 Duke Energy Testing

HDR reviewed laboratory data of ash samples collected by Duke Energy from testing of ash at the Riverbend Steam Station and L.V. Sutton Plant facilities in 2012 and 2014.

The testing conducted at the L.V. Sutton Plant in 2012 consisted of the collection and analysis of one ash sample (Ash Sample) for leaching potential via the toxicity characteristic leaching procedure (TCLP) of volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organochlorine pesticides, chlorinated herbicides, and 8 RCRA metals.

The testing conducted at the Riverbend Plant in 2014 consisted of the collection and analysis of 11 ash samples from five borings at various depths. Laboratory analyses were performed for total PCBs, sulfate, and asbestos, and TCLP 8 RCRA metals.

## **FDS**

## 3.1.2 Chatham County Testing

In-place ash samples have been collected by Charah and Chatham County since 2016. Laboratory analyses have generally been performed on the samples for leaching potential of inorganics, volatile organic compounds (VOCs), semi-volatile compounds (SVOCs), pesticides, and herbicides using TCLP methods; reactive cyanide and sulfide; corrosivity; and ignitability.

#### 3.1.3 Charah Testing

On May 12, 2020, Charah opened the Structural Fill cap in Cell 2D to facilitate testing of ash for beneficial reuse. While the cap was open, HDR collected three samples (ASH-1, ASH-2, and ASH-3) of in-place ash from the base of a 10' x 10' test pit excavated by Charah (**Figure 3.2**). The samples were placed on ice in a laboratory-provided cooler and transported to Pace Analytical Services, LLC (Pace) under chain-of-custody protocol for analysis of total concentrations and leaching potential (via Synthetic Precipitation Leaching Procedure [SPLP]) of inorganics.

## 3.1.4 Summary of Ash Testing Results

A total of 16 ash samples were analyzed for total concentrations and TCLP between 2012 and 2019. A summary of detections is provided below:

- Arsenic levels ranged from 23.9 to 58.4 mg/kg in the total analyses, and 0.013 to 0.056 mg/L for TCLP (only 10 samples above detection limit).
- Barium was detected in all 16 samples ranging from 17.6 to 410 mg/kg total concentration and 0.50 to 3.2 mg/L in the TCLP analyses.
- Chromium ranged from 9.9 to 32.9 mg/kg in the total analyses and 0.02 to 0.044 mg/L in the TCLP analyses (in 4 samples).
- Lead ranged from 6.56-18.8 mg/kg in the total analyses, but were not detected in TCLP analyses.
- Copper ranged from 14.8 to 66 mg/kg in the total analyses and 0.02 to 0.169 mg/L in the TCLP analyses (13 samples).
- Zinc ranged from 13.7 to 42 mg/kg in the total analyses and 0.029 to 0.178 mg/L for TCLP analyses (11 samples).
- Cobalt ranged from 8.9 to 12 mg/kg in the total analyses (4 samples) and was not detected in the TCLP analyses.
- Vanadium ranged from 55.2 to 61 mg/kg in the total analyses (4 samples) and was only detected in 1 sample during the TCLP analyses (0.039 mg/L).

Four samples were analyzed for leachable inorganics using the SPLP method in April 2020. Results of SPLP analyses are summarized as follows:

- Arsenic was detected in all 4 ash samples at concentrations ranging from 0.011 to 0.09 mg/L.
- Barium was also detected in all 4 ash samples at concentrations ranging from 0.13 to 0.35 mg/L.
- Chromium (0.011 mg/L), cobalt (0.011 mg/L), lead (0.016), and vanadium (0.043 mg/L) were only detected in one ash sample.



Copper and zinc were reported below the detection limit in all 4 samples.

## 3.2 Soil

On January 15 and 16, 2020, HDR advanced 10 soil borings (SB1 through SB10) via hand auger to approximate depths of two feet below ground surface (bgs) to evaluate whether historic earthwork conducted by General Shale, in areas not filled with ash, could have affected the geochemistry of subsurface soils and groundwater such that the quality of groundwater in this area exceeded 2L Standards prior to placement of ash in the Structural Fill.

Boring SB1 was advanced adjacent to Sediment Basin #6; borings SB2 through SB9 were advanced within unfilled Cells 3, 4, and 5; and boring SB10 was advanced north of Cell 1. One soil sample was collected from each boring and transported to Pace for analysis of total inorganics using EPA Method 6010, mercury using EPA Method 7471B, and total organic carbon using EPA Method 9060A. Based on the results of totals analyses, three samples (SB-5, SB-6, and SB-7) were activated for leaching potential (SPLP) of inorganics using EPA Method 6010D/3010A and 6020B/3010A, mercury using EPA Method 7470A/1312, TDS using Standard Method (SM) 2540C/EPA Method 1312, fluoride and sulfate using EPA Method 300.0/1312, and chloride using SM4500-CI-E/EPA Method 1312. Laboratory results for analysis of soil samples are presented in **Table 3.2a**. Laboratory results for analysis of SPLP soil samples are presented in **Table 3.2b**. Laboratory reports are included in **Appendix B**.

Barium, chromium, copper, lead, vanadium and zinc were detected at concentrations above the laboratory reporting limit in all 10 samples. Cobalt was detected above the laboratory reporting limit in 9 of 10 samples. Arsenic was detected above the laboratory reporting limit in 8 of 10 samples. A summary of concentrations detected in soil samples is provided below.

- Cobalt and vanadium were only detected in a small portion of the ash samples, but in most or all of the soil samples. Cobalt concentrations in soil ranged from 1.3 to 13.7 mg/kg, while vanadium concentrations in soil ranged from 11.8 to 39.2 mg/kg.
- Arsenic had the tightest range of concentrations from 2.4 to 6 mg/kg.
- Chromium concentrations in soil ranged from 2.1 to 16.9 mg/kg.
- Copper concentrations in soil ranged from 1.8 to 16.5 mg/kg.
- Lead concentrations in soil ranged from 3.1 to 11.7 mg/kg.
- The two constituents exhibiting the widest range of concentrations in the soil were barium (9.1 to 104 mg/kg) and zinc (4.9 to 58.3 mg/kg).
- Chloride concentrations ranged from 30.9 to 50.1 mg/kg in the three samples where it was analyzed.

### 3.3 Groundwater

The current compliance groundwater monitoring network consists of two background wells (BG-1 and BG-2) and eight cross- or down-gradient monitoring wells (MW-1 through MW-7R and MW-8) (see **Figure 3.1**). Each well was installed within the uppermost aquifer underlying the Structural Fill with well screens set to bracket the water table at the time of installation.

#### 3.3.1 Regolith Monitoring Wells

On March 2020, installation of monitoring wells MW-9, MW-10, and MW-11 was attempted; however, only well MW-11 was installed. Wells MW-9 and MW-10 were to be installed within regolith, but auger refusal was encountered above groundwater. Temporary monitoring wells were installed at 31 feet below ground surface (bgs) and 30 feet bgs, respectively, and left overnight to monitor groundwater recharge. The wells remained dry after 24 hours and were abandoned.

Well MW-11 was installed northwest of Sediment Basin #6 to a total depth of 40 feet bgs with a 15-foot pre-packed well screen set to bracket the water table at the time of installation. Note that well MW-11 could not be installed at its proposed location south of Sediment Basin #6 due to access issues. Construction details for MW-11 are presented in **Table 3.3**. Boring logs for MW-9, MW-10, and MW-11; well completion record for MW-11; and survey data for MW-11 are provided in **Appendix C**.

#### 3.3.1.1 BEDROCK MONITORING WELL

Well MW-2D was to be installed as a bedrock well with the screen set at least 10 feet into PWR/bedrock and below the bottom of the adjacent well, MW-2. An 8-inch inside diameter (ID) PVC casing was installed approximately 5 feet deeper than the termination of MW-2, at a depth of 55 feet bgs using an 8½-inch air rotary drill bit. Subsequent to casing installation, the annulus between casing and formation was grouted and allowed to set for 24 hours. The boring was then advanced 35 feet below the bottom of the casing to a total depth of 90 feet bgs. No water-bearing fractures were encountered below the casing during drilling and the well remained dry; thus, the deep boring was abandoned.

#### 3.3.1.2 WELL COMPLETION AND DEVELOPMENT

As noted above, a pre-packed screen was installed in well MW-11 to reduce turbidity during sample collection. Additional #2 sand was placed in the annulus between the pre-packed screen and the formation, extending three feet above the top of the well screen. A bentonite seal hydrated with potable water was placed above the sand pack and topped with cement grout to the ground surface. Well MW-11 was completed with a 2-foot square concrete well pad and new 4-inch steel above-grade lockable cover.

#### 3.3.1.2.1 WELL DEVELOPMENT

Well MW-11 was developed to create an effective filter pack around the well screen and to remove fine particles within the well from the formation near the borehole. Based on site-specific conditions per 15A NCAC 02C .0108(p), pumping was used to stress the formation around the screen and the filter pack so that mobile silts and clays were pulled into the well and removed. Development was considered complete when development water was visually clear (< 10 Nephelometric Turbidity Units [NTU] Turbidity) and sediment free.

#### 3.3.1.2.2 SLUG TESTS

On April 17, 2020, a slug test was conducted in monitoring well MW-11, in accordance with the requirements of the NCDENR Memorandum titled "Performance and Analysis of Aquifer Slug Tests and Pumping Tests Policy" dated May 31, 2007.



Slug test field data was analyzed via Aqtesolv and the USGS Spreadsheets for the Analysis of Aquifer-Test and Slug-Test Data, Version 1.2 (Open-File Report 02-197) using the Bouwer and Rice method. The results of both the Aqtesolv and USGS slug test analysis showed that the predicted transmissivity (K value) of the formation at well MW-11 is 0.01 feet per day (ft/d). The USGS graph is shown on **Figure 3.3**. Slug test input data is presented in **Appendix D**.

#### 3.3.2 Groundwater Sampling and Analysis

Subsequent to installation and development of MW-11, monitoring wells were sampled using low-flow sampling techniques in accordance with USEPA Region 1 Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (revised September 19, 2017) between April 14 and 16, 2020.

Groundwater samples were analyzed by Pace for the constituents listed in the site-specific WQMP and in **Table 3.4**. Sample collection, handling and storage was conducted in general accordance with accepted protocol, including chain-of-custody documentation. One duplicate sample was collected and analyzed in accordance with the requirements of the WQMP during the sampling event to evaluate variance in sampling and analysis.

Groundwater sample results were compared to Class GA Standards as found in 15A NCAC 02L.0202 Groundwater Quality Standards (2L Standards), last amended on April 1, 2013, Interim Maximum Allowable Concentrations (IMACs), and statistically-derived site-specific background concentrations.

Concentrations of the following constituents exceeded 2L Standards or IMACs in one or more wells during the April 2020 sampling event: chloride, pH, TDS, antimony, barium, cobalt, and vanadium. Exceedances of regulatory criteria are summarized as follows:

- Chloride concentrations exceeded the 2L Standard of 250,000 μg/L in wells MW-1, MW-3, MW-4, MW-7R, and MW-8; exceedances ranged from 281,000 μg/L to 986,000 μg/L.
- The pH values did not fall within 2L Standards for the following wells: BG-1, MW-1, MW-4, and MW-5.
- TDS concentrations exceeded the 2L Standard of 250,000 μg/L in all wells analyzed except MW-5 and MW-11; exceedances ranged from 574,000 μg/L to 2,170,000 μg/L.
- Antimony concentrations exceeded the 2L Standard of 1 μg/L in wells MW-4, MW-8, and MW-11 with exceedances ranging from 5.2 μg/L to 7.7 μg/L. Note that the MRL was 5.0 μg/L for all samples except MW-3, for which the MRL was 25.0 μg/L.
- Barium concentrations exceeded the 2L Standard of 700  $\mu$ g/L in well MW-8 with a concentration of 1,110  $\mu$ g/L.
- Cobalt concentrations exceeded the IMAC of 1 µg/L in well MW-4 with a concentration of 21.8 µg/L. Note that the method reporting limit (MRL) was 5.0 µg/L, which exceeds the IMAC.
- Vanadium concentrations exceeded the IMAC of 0.3 μg/L in wells BG-1, MW-3, and MW-4 with exceedances ranging from 6.8 μg/L to 10.7 μg/L. Note that the MRL was 5.0 μg/L, which exceeds the IMAC.



Analytical results are presented in **Table 3.5**. Concentration versus time plots generated for three constituents (barium, chloride, and TDS) with the most frequent detections and/or exceedances are included in **Appendix E**.

The presence of naturally occurring inorganic constituents above regulatory criteria is common in North Carolina due to various geologic conditions. The presence of naturally occurring metals (i.e., weathering of crystalline parent material) is discussed in more detail in the *Initial Background Groundwater & Surface Water Monitoring Event* (Buxton, 2015c). The laboratory report for the April 2020 sampling event is provided in **Appendix F**. Electronic data deliverables (EDDs) are provided in **Appendix G**.

#### 3.4 Surface Water

As previously mentioned, concentrations of arsenic, cobalt, copper, lead, TDS, and zinc that exceeded 2B Standards have been reported in surface water samples collected from the SW-1 sample location, located approximately 3,000 feet south of the southern-most permitted waste boundary and approximately 4,800 feet south/southeast of the final limit of CCP waste placed in Cell 6C. Under ambient conditions, this sample location has the potential to receive discharge from two unnamed streams and an approximate 0.75-acre farm pond, as well as permitted NPDES discharges from the site and adjacent mine operated by General Shale. The purposes of the surface water assessment were to evaluate the potential for groundwater to discharge to surface water and to evaluate other potential sources of constituents observed in samples collected at the SW-1 location.

#### 3.4.1 Surface Water Flow Measurements

The stream flow measurements were taken on January 16, 2020, following four days of precipitation, and are thus not representative of baseflow conditions. While, the January 2020 flow data cannot be directly compared to the groundwater model predicted baseflow (see Section 3.6) because they reflect both groundwater discharge and surface runoff, they can be used as an upper bound to qualify the model. As presented in **Table 3.6**, baseflow measurements predicted from the model are significantly lower than the stream flows measured on-site, given that stream flow measurements were taken a few days after a significant rain event.

#### 3.4.2 Surface and Free Water Sampling

To further delineate the nature and source of constituents in surface water, HDR collected water samples from the locations specified in **Table 3.7** and shown on **Figure 3.1**.

At each location, one sample was collected close to the surface (i.e., 0 foot to 1 foot from surface) of the water body. Prior to sampling, the depth of the water body was measured by slowly lowering a measuring tape until the bottom surface is encountered, being careful to avoid suspending sediment. The depth to bottom was noted, and the sampler was slowly lowered to the desired depth to collect the sample. Each sample was transferred into laboratory-provided sample containers and analyzed for the same constituents as groundwater samples (**Table 3.4**). A summary of laboratory results of surface and free water sampling is provided below. Laboratory results are presented in **Table 3.8**. Laboratory reports are included in **Appendix F**.

The results of analyses indicate the following:

- Concentrations of calcium, chloride, fluoride, sulfate, TDS, barium, lead, radium, copper, nickel, vanadium, and zinc were detected above the laboratory reporting limits in one or more surface and free water samples collected during the April 2020 sampling event.
- The concentration of copper (7.00 µg/L) reported in the sample collected from location SW-5 was equal to the 2B Standard. Location SW-5 was located approximately 1,500 feet downstream of the southernmost site property boundary and receives water from off-site sources. No other constituent concentrations equaled or exceeded 2B Standards.
- Laboratory reporting limits for mercury, thallium, and silver exceeded the 2B Standards; however, no detections above the RL were reported for surface or free water samples collected during the April 2020 sampling event.

#### 3.5 Leachate

The leachate management system for the Structural Fill consists of a series of perforated HDPE pipes within the lined area that drain to a sump in Cell 1. The sump is operated with two pumps to pump leachate to three onsite storage tanks. The leachate enclosure and tanks are inspected annually and have shown no signs of leakage; the leachate collection pipes have been reported to be in good working order.

Leachate is periodically (a few times a week to daily) pumped from the tanks to trucks for off-site transportation to one of the approved disposal locations. Operationally, Charah has minimized leachate generation by limiting the area of exposed CCP to rain via placement of interim cover soils prior to final cap installation in 2020. Additionally, Charah constructed soil berms around the top of the slopes to prevent leachate runoff from active placement areas and had placed geocomposite wick drains with stone in the CCP fill area to collect and transmit leachate to the leachate system.

The positive effects of management of exposed CCP are demonstrated on **Figure 3.4**. Prior to the Structural Fill being substantially covered by June 2019, leachate generation was partially correlated with rainfall, as indicated by a coefficient of determination (R²) of 0.53. After June 2019, there is no correlation with rainfall and the R² decreases to 0.02. Thus, the quantity of leachate generated, as a function of rainfall, was significantly reduced after the Structural Fill was covered. An engineered cap has since been constructed, which will further reduce the infiltration of precipitation into the Structural Fill and the generation of leachate.

As of February 2020, Charah transported 116,330,636 gallons of leachate to the approved disposal locations since CCP placement began in October 2015. In 2019, 19,180,000 gallons of leachate were generated by the Structural Fill and approximately 62 inches of rainfall were recorded at the site. Given the area of the Structural Fill, this is equivalent to approximately 10 inches of recharge, indicating that approximately 16% of the annual precipitation became leachate in the Structural Fill. Note that as described above, recharge generation does not appear to be influenced by precipitation during the second half of 2019, so the leachate that was generated during this time likely represents water being removed from storage via gravity



drainage in the Structural Fill. An evaluation of leachate and groundwater data is provided in Section 4.

#### 3.6 Groundwater Modeling

The purpose of groundwater modeling was to evaluate potential migration of CCP constituents in groundwater and surface water in the vicinity of the site. The groundwater model was developed using the groundwater modeling pre- and post-processing software Groundwater Modeling System (GMS) coupled with MODFLOW-2005 and the U.S. Army Corps of Engineers software MT3DMS (Zheng and Wang 1999). The groundwater flow model was constructed using geologic and hydrogeologic data obtained for the site and surrounding areas, as identified in the Groundwater Flow Model Report included in Appendix H. The flow model was calibrated to the mean water levels measured in 10 monitoring wells at the RSFS between August 2015 and October 2019. The calibrated model was used as the flow basis to simulate particle movement in groundwater using MT3DMS. This is the equivalent of simulating a conservative tracer and estimating the farthest extent the trace would travel with the known subsurface conditions. A point source, which is a continual source, was added in model Layer 2 under the lined Structural Fill. A source term of 1 mg/L was chosen to simulate an estimated plume which represents the percentage of the original input concentration being transported downgradient during the simulated time frame. The MT3DMS modeling simulated one stress period from January 2014 to May 2020 (2338 days). This time frame was chosen to simulate the length of time CCP constituents have been contained in the lined Structural Fill.

Modeling results are summarized as follows:

- Water levels simulated by the model were consistent with water levels measured in onsite monitoring wells between August 2015 and October 2019, as indicated by water
  levels at individual points approaching the mean water level for that period and the
  overall predicted-to-observed water level residuals having a Root Mean Squared Error
  (RMSE) of 5.18 feet, which is less than the root mean square of two standard deviations
  for the observed data. This shows that the model predicted water levels are within the
  observed conditions and the model adequately represents groundwater flow given the
  measured conditions at the site.
- Groundwater flow direction simulated by the model is consistent with observations and measurements from recent semi-annual sampling activities. Groundwater flows east and west from a north-south trending historic ridge through the site.
- Particle tracking was used to simulate the farthest extent a CCP constituent would travel, given the hydrogeologic regime modeled. The model estimated that in most directions, groundwater only moved a few tens of feet from the base of the Structural Fill. At one location in the southeast corner of the Structural Fill, a small, low-concentration plume was predicted to move to the southeast. This plume remained within the footprint of the former mine and within the permitted boundary of the Structural Fill. Except for this location, water from beneath the Structural Fill would not have traveled far enough to reach the monitoring wells during the simulated timeframe and no water from the beneath the Structural Fill would arrive at surface water.

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 The model indicates that if constituents escaped the liner, they would remain on-site, mostly directly beneath the Structural Fill and be found mostly in the Residuum, Transition Zone and PWR layers modeled.

### 4 Geochemical Evaluation

Given that SSIs have been reported in groundwater at the site, the source of constituents of concern (CoCs) was investigated by evaluating the constituents detected in ash, soil, leachate, groundwater, and surface water. Groundwater CoCs include: barium, chloride, chromium, cobalt, TDS, and vanadium. Surface water CoCs include: arsenic, cobalt, copper, lead, TDS, and zinc. Given the low hydraulic conductivity of on-site soils and that CCP were placed in an engineered, lined Structural Fill, it is unlikely that the presence of CoCs in groundwater and surface water is a result of a leak in the liner system. As indicated by the groundwater model, the travel time it would take for a particle to be released from the lined Structural Fill and arrive at on-site monitoring wells or surface water bodies exceeds the time that CCP has been in place at the Structural Fill. The following geochemical evaluation supplement the groundwater modeling results.

#### 4.1 Leachate Evaluation

Leachate from the lined Structural Fill has been routinely collected and disposed of at two approved off-site water treatment plants. Leachate samples have been collected from the leachate tanks on a semi-annual basis throughout the active life of the Structural Fill and have been consistently analyzed for the constituents detected in the monitoring wells and surface water.

#### 4.1.1 Boron

Figure 4.1 compares the boron levels in the leachate from various groundwater samples collected over time. The USEPA promulgated the Federal CCR Rule in 2015, which identified boron as an Appendix III indicator constituent for detection monitoring because boron acts as a tracer and does not attenuate onto aquifer solids via sorption or precipitation of new minerals. Thus, boron that leaches from CCP into aquifer materials should be detectable in groundwater downgradient of the Structural Fill. In addition, boron is typically present at much lower concentrations in groundwater, or not at all, if a source such as CCP is not present. Figure 4.1 shows the high boron concentrations one would expect from CCP in the analyzed leachate samples from the Structural Fill and much lower/not detected boron concentrations in the groundwater adjacent to the lined Structural Fill. Moreover, the low levels of boron detected in the groundwater do not show the same patterns over time as those in the leachate, as one would expect to see if the boron in the groundwater was derived from the deposited CCP. Figure 4.2 is a box and whisker plot showing the range of concentrations found in each medium (leachate, groundwater, background groundwater and surface water). It shows that, where detected outside of the leachate, boron is orders of magnitude lower in concentration than in the leachate. The importance here is that other CCP constituents in the leachate (which are less mobile than boron) cannot be transported to the monitoring wells without boron also migrating to the monitoring wells at a similar relative concentration (or boron-enriched if the other constituent is attenuated during transport). Similarly, if boron is not present at similar relative concentrations in surface water, then it is unlikely the other constituents detected there originated from leachate that is rich in boron.

#### 4.1.2 Arsenic, Vanadium, and Zinc

Arsenic is considered a CoC for surface water because it was detected in 4 of 39 surface water samples. Arsenic was detected in 10 of 18 leachate samples; however, arsenic has not been detected in groundwater samples above the laboratory reporting limit. Thus there is no progression from the Structural Fill to the surface water. This precludes the leachate from being the source of arsenic found in the surface water. Similarly, vanadium and zinc were detected in the leachate and surface water, but were only detected sporadically in the groundwater (**Figures 4.3** and **4.4** are box and whisker plots of vanadium and zinc).

#### **4.1.3** Cobalt

Cobalt is similar in that it was only detected sporadically and there is no pattern that shows a connection between the Structural Fill and the groundwater or surface water. **Figure 4.5** compares the cobalt concentrations in groundwater samples to leachate samples. The detections of cobalt are sporadic with only four detections in the leachate, eight detections in the groundwater and eleven detections in surface water. Cobalt concentrations are variable in that occasionally, they are higher in groundwater than in CCP leachate, while other times, concentrations are higher in leachate than groundwater. There is no indication that the CCP is contributing cobalt to the groundwater, and little likelihood that that the groundwater from the mined area might be contributing to the cobalt concentrations in the CCP leachate. Instead, it appears that the cobalt concentrations are independent of each other. Without a clear connection between the leachate and the groundwater it is unlikely that the cobalt in the surface water originated from the CCP.

#### 4.1.4 Barium

**Figure 4.6** compares barium concentrations in groundwater samples to leachate and **Figure 4.7** is a box and whisker plot of barium in the leachate, groundwater, background groundwater, and surface water. The situation is almost the inverse of boron, in that the barium concentrations are much higher in the groundwater and surface water samples than in the leachate samples. Again, there is no indication that the barium in the CCP is contributing to the elevated barium concentrations in the groundwater, nor little indication that the barium concentrations in the groundwater are affecting barium levels in the leachate water. Instead, it is likely that the barium concentrations in both are largely being affected by the respective sulfate concentrations and precipitation of barium sulfate. Sulfate was present in the leachate, groundwater and surface water, but was at higher concentrations in the leachate. Barium will combine with sulfate to form relatively insoluble barium sulfate when both are present at sufficient concentrations. This likely accounts for the lack of barium in the leachate and shows that the barium in the groundwater and surface water did not originate from the leachate.

#### 4.1.5 Other Inorganics

This relationship is also seen for chloride, chromium, copper, and lead. **Figure 4.8** is a box and whisker plot for chloride. Chloride was only detected once in the leachate but is present in the

groundwater and occasionally in surface water. **Figure 4.9** is a box and whisker plot of chromium. Chromium was only detected twice in the leachate, but has been detected sporadically in the groundwater and surface water. **Figure 4.10** is a box and whisker plot of copper, with copper only being detected three times in the leachate, but sporadically being detected at higher concentrations in groundwater and surface water. **Figure 4.11** is a box and whisker plot of lead. Lead was not detected in the leachate, was detected three times in the groundwater, and 16 times in the surface water. Again, this shows that there are other sources of these constituents to the groundwater or surface water.

#### 4.1.6 Cation and Anion Comparisons

Further analyses of the chemistry of the leachate compared to the groundwater and surface water can be used to show that leachate is chemically distinct from the groundwater and surface water. A comparison of the content of dissolved calcium sulfate (gypsum) and calcium chloride show that the leachate is rich in gypsum and depleted of calcium chloride, while the inverse is true for groundwater and surface water (depleted of gypsum). **Figure 4.12** is plot of sulfate to calcium. It shows that the leachate falls in a distinct area from the other sampled media and along a trend line indicating the possible presence of gypsum. **Figure 4.13** is a plot of chloride to calcium; because chloride was not detected in the leachate, it falls along a line at the bottom of the plot, while other media are spread across the plot.

The molar ratios of cation to anion for calcium to sulfate and calcium to chloride were calculated. The closer the ratio is to 1, the more likely either gypsum or calcium chloride is dominant as the dissolved calcium compound in the water. **Figure 4.14** is a plot of the gypsum cation to anion molar ratio to the calcium chloride cation to anion molar ratio. As can be seen, leachate is grouped near the gypsum ratio of 1 line and far from the calcium chloride line. Surface water is grouped between the leachate and the groundwater, so there is not a gradient from leachate through groundwater to surface water, which would be expected if leachate were leaking into the groundwater and then being transported to the surface water.

#### 4.2 Ash and Soil

To further assess the source of the constituents, the results of analyses of ash and soil samples, including TCLP and SPLP results, were compared to assess if the constituents detected in groundwater and surface water were present and mobile in the environment. For the ash, the results of leachate analyses are a better integration of the mobile constituents in the Structural Fill; however, TCLP was run in the past on ash samples and SPLP was run on three samples that were collected as opportunistic samples when the cap was temporarily opened in early 2020.

Arsenic, which was detected above NCDEQ standards in surface water but not groundwater, was detected in both soil and ash, with the ash being about one order of magnitude more concentrated than the soil. Arsenic was detected in TCLP and SPLP analyses of the ash, but not SPLP analyses of the soil.

Barium, which was detected above NCDEQ standards in groundwater but not surface water, was detected in both soil and ash, with the ash being about one order of magnitude more

concentrated than the soil. Barium was also detected in TCLP analyses of the ash and in SPLP analyses of ash and soil samples. The concentrations of barium in the SPLP analyses were similar for soil and ash tested.

Chromium, which was detected above NCDEQ standards in groundwater but not surface water, was detected at similar and slightly higher concentrations in ash than in soil. Chromium was only sporadically detected in TCLP analyses (5 of 11 samples) and SPLP analyses (1 of 4 samples) of ash. Chromium was detected in 1 of 3 soil SPLP samples at roughly half the detected concentration in the one ash SPLP sample.

Cobalt, which was detected above NCDEQ standards in both surface water and groundwater, was detected in 4 of 17 ash samples. One detection was reported in a sample analyzed in 2014, prior to commencement of filling; the other three detections were from the set of samples collected in 2020, which were all collected in close proximity to each other, so may not represent a large portion of the Structural Fill. Cobalt was not detected in any of the quarterly samples collected by Chatham County as ash was placed in the Structural Fill between 2016 and 2019. Cobalt was detected in 8 of 10 soil samples at similar or slightly lower concentrations to the ash. Cobalt was not detected in the ash TCLP analyses and was detected in one of three ash SPLP analyses. Cobalt was not detected in the soil SPLP analyses.

Copper, which was detected above NCDEQ standards in surface water but not groundwater, was detected in both soil and ash samples, with the concentrations in ash being slightly higher than in the soil. Copper was detected in all the ash TCLP analyses, but not in the ash SPLP analyses. Copper was detected below the copper BTV in one of the three soil sample SPLP analyses.

Lead, which was only detected above NCDEQ standards in surface water, was detected in soil and ash, with the soil concentrations being similar to the ash concentrations. Lead had an estimated detection below the detection limit in 1 of 14 ash TCLP analyses. Similarly only one of four ash SPLP analyses had a low concentration detection. Lead was not detected in the soil SPLP samples.

Vanadium, which was detected above NCDEQ standards in groundwater but not surface water, was detected in the one ash sample which was collected and analyzed in 2014, prior to CCP placement in the Structural Fill, and in each of the soil samples. The vanadium concentration in the ash sample was slightly higher than in the soil samples. Vanadium was detected in the ash TCLP and SPLP analyses conducted on the same ash sample. The results of SPLP analyses in two of three samples exceeded the vanadium BTV and 2L Standard.

Zinc, which was detected above NCDEQ standards in surface water but not groundwater, was detected in the ash samples and the soil samples at similar concentrations. Zinc was detected in the TCLP analyses of ash samples, but was not detected in the one SPLP analysis done on ash. Zinc was detected above its BTV in the three soil SPLP analyses.

These analyses indicate that the constituents that are detected in groundwater and surface water are, to varying degrees, available in both soil and ash. Because the groundwater samples



and surface water samples are total water samples and were not filtered, and because more soluble constituents such as boron are not present in the groundwater or surface water at comparable concentrations, the sporadic detections of metals in both groundwater and surface water can be explained as the result of suspended solids in the water, which contain soil particles that naturally contain the detected metals. As seen from the soil SPLP analyses, dissolved vanadium and zinc can be produced from the soil at concentrations exceeding the BTV, and for vanadium, the 2L Standard. Also, it is important to note that all three soil SPLP analyses resulted in TDS and pH exceeding both the BTV and the 2L Standard.

# 5 Summary and Conclusions

The site assessment program at the site included advancement of soil borings, installation of monitoring wells, sampling and analysis of a variety of media, and slug testing to assess the physical and geochemical properties of soil, groundwater, and surface water in the vicinity of the Structural Fill. A groundwater model was constructed using site-specific and regional data to evaluate the potential for constituents to migrate from the Structural Fill, if released. These data were also used in a geochemical evaluation to assess the occurrence of constituents detected in the groundwater and surface water. The results of this work indicate the following:

- The constituents in groundwater are different than what was detected in surface water; therefore a complete pathway for constituent migration is not demonstrated. Thus, it is unlikely the constituents found in the surface water originated at the Structural Fill (even if the constituents are detected in the leachate of the Structural Fill).
- Tracer constituents, such as boron, are not present at significant concentrations in either
  the groundwater or the surface water. Boron is a conservative tracer, so its ratio to the
  less mobile constituents (e.g. arsenic) should increase down-gradient of the Structural
  Fill. However, boron is at low concentrations or not present in down-gradient
  groundwater. This shows that the ash and leachate, which are a source of boron, are not
  the source of the other constituents in groundwater and/or surface water.
- Groundwater modeling showed that, due to the low hydraulic conductivity of the clay-rich soil of the former clay mine, groundwater and any constituents found in the groundwater will move very slowly through the aquifer materials. Model estimated groundwater velocities are too low for the constituents to have been transported from the Structural Fill to the monitoring wells where they have been detected. For this same reason, the constituents could not have arrived at the surface water, an even farther transport distance, in the 4.5 years since CCP has been placed in the lined Structural Fill.
- Analyses of soil and ash samples show that the constituents detected in the
  groundwater and surface water are also found in the soil. This shows that soil is an
  alternative source for the constituents and would explain the lack of boron in the
  groundwater and surface water samples. Because the water samples are not filtered, it
  is possible that soil particles became suspended solids during sampling which resulted
  in the detections of constituents.

The Structural Fill is engineered and lined with an active leachate collection system. The leachate collected represents a reasonable portion of the precipitation that fell on the Structural Fill (about 16 percent of precipitation became leachate). By collecting and disposing of the leachate off-site, the likelihood that leachate escaped the liner is greatly reduced. The analyses show that is unlikely that the Structural Fill is the source of the constituents in the groundwater and less likely that it is the source of constituents in the surface water.

## 6 Recommendation

Based upon the conclusions made from the site assessment program, HDR recommends that Charah Brickhaven No. 2 Mine Tract "A" Structural Fill remain in detection monitoring on a semi-annual basis.



# **Tables**

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Table 2.1 - Chronology of Subsurface Exploration

Date	Investigation	Work Completed
	Phase	
August 5 – 14, 2014	Design Hydrogeologic Report	Installation of 15 shallow and intermediate depth piezometers (PZM-1, PZM-3, PZM-4, PZM-5, PZM-6, PZM-8, PZM-10, PZM-11, PZM-12, PZM-13, PZM-15, PZM-16, PZM-18, PZM-19 and PZM-20). Installation of 4 nested shallow and intermediate piezometer pairs (PZM-7s/PZM-7, PZM-9s/PZM-9, PZM-14s/PZM-14, and PZM-17s/PZM-17). Installation of 1 nested intermediate and deep piezometer pair (PZM-2/PZM-2D). Collection and select testing of 154 split-spoon Standard Penetration Tests (SPT) and five Shelby Tube samples. Completion of 6 water level gauging events in piezometers PZM-1 through PZM-18) on August 21, September 3, September 18, October 1, October 14, and October 31, 2014. Completion of slug tests in piezometers PZM-1, PZM-2, PZM-2D, PZM-5, PZM-8, PZM-12, PZM-13, PZM-15 and PZM-17.
November 24 – December 2, 2014	Design Hydrogeologic Report – Addendum, Revision 1	Installation of 8 shallow and intermediate piezometers (PZM-21, PZM-22, PZM-24, PZM-25, PZM-26, PZM-27, PZM-28, and PZM-29). Installation of 1 nested shallow and intermediate piezometer pair (PZM-23s/PZM-23). Collection of 67 SPT samples.
March 6, 2015	Design Hydrogeologic Report – Addendum, Revision 2	Updated Water Quality Monitoring Plan (WQMP) as follows: Proposed compliance monitoring network to consist of 1 up-gradient well (MW-1) and 7 cross- or down-gradient wells (MW-2 through MW-8); Four piezometers (PZM-1 [MW-4], PZM-22 [MW-5], PZM-27 [MW-7], and PZM-28 [MW-8]) installed during the Design Hydrogeologic investigation were to be converted from piezometers to permanent compliance monitoring wells. Proposed 2 surface water sampling locations: 1 collected at a tributary creek of Gulf Creek which crosses Moncure-Flatwood Rd. approximately 2,000 feet south of the site (SW-1); and one surface water sample will be collected along Shaddox Creek approximately 2,000 feet west of the site (SW-2). Proposed 1 composite leachate sample be collected from the above-ground holding tank. Identified that only 1 sampling event would be conducted prior to CCP placement, as agreed upon with Ms. Elizabeth Werner of NCDEQ on February 20, 2015.
September 17, 2015	Compliance Well Installation / Abandonment	Summarized abandonment of PZM-28 (dry), which was proposed to be converted to compliance monitoring well MW-8. A deeper replacement well (MW-8) was installed adjacent to PZM-28.
August 13 – December 2, 2014	Compliance Well Installation	Conversion of piezometers PZM-1, PZM-22, and PZM-27 to monitoring wells MW-4, MW-5, and MW-7, respectively.

Date	Investigation Phase	Work Completed
June 19 – 30, 2015	Compliance Well Installation / Piezometer Abandonment	Installation of monitoring wells MW-1, MW-2, MW-3, MW-6, MW-8, and BG-1. Slug testing of wells MW-1 through MW-8 and BG-1. Abandonment of piezometers PZM-5, PZM-10, PZM-11, PZM-12, PZM-13, PZM-15, PZM-16, PZM-18, PZM-29, PZM-2/2D, PZM-7s/7, PZM-14s/14, and PZM-17S/17.
July 30, 2015	Piezometer Abandonment	Abandonment of PZM-9s and PZM-9
February 8 – 9, 2016	Piezometer Abandonment	Abandoned piezometers PZM-21, PZM-23s, PZM-23, PZM-24, PZM-25, and PZM-26
April 18 – 19, 2017	Compliance Well Installation / Piezometer Abandonment	Abandoned piezometers PZM-3, PZM-4, PZM-6, PZM-8, PZM-19 Installed monitoring well MW-7R
December 26, 2018	Compliance Well Installation	Installation of additional background well BG-2

**Table 2.2 - Vertical Hydraulic Gradients** 

Well Pair	Date	Vertical Gradient (ft/ft)	Direction
PZM-2 and PZM-2D	August 21, 2014	0.29	$\downarrow$
	December 21, 2014	0.24	$\downarrow$
PZM-14s and PZM-14	October 31, 2014	0.006	$\downarrow$
	December 21, 2014	0.19	$\downarrow$
PZM-23s and PZM-23	December 21, 2014	0.48	$\downarrow$

Table 3.1a - Ash Sample Analytical Results - Total Concentrations

ID	Ash Sample (12-14940)	Pond: 4050360-01	Brickhaven Cell 2C	1-25-17 Split	4-5-17 Split	7-17-17 Split	10-18-2017 Split	01-22-18 Split	04-25-18 Split	7-19-18 Split	10-24-18 Split	1-24-19 Split	4-18-19 Split	7-10-19 Split	Ash-1	Ash-2	Ash-3
Date	6/28/2012	5/15/2014	11/11/2016	1/25/2017	4/5/2017	8/3/2017	10/18/2017	1/22/2018	4/25/2018	7/19/2018	10/24/2018	1/24/2019	4/18/2019	7/10/2019	5/12/2020	5/12/2020	5/12/2020
Report	Duke Energy	Duke Energy	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Charah	Charah	Charah
Percent Solids	61.2	70.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH	-	5.7	5.88	6.86	6.25	7.55	7.12	5.14	6.72	7.79	5.76	7.93	6.58	5.64	-	-	-
Aluminum mg/kg	-	10000	7250	6920	8670	12000	12900	5210	8590	15800	20500	10800	11900	8970	-	-	-
Antimony mg/kg	-	< 0.35	<1.16	<1.40	<1.34	<1.32	<1.23	<1.19	<1.21	<1.22	<1.14	<1.28	<1.21	<1.10	<2.6	<2.5	0.49*
Arsenic mg/kg	-	39	23.9	41.4	42.7	38.6	51.0	31.5	46.7	50.0	58.4	35.3	35.3	27.9	55.3	53.0	48.3
Barium mg/kg	-	410	168	283	302	17.6	309	173	260	336	330	266	145	263	340	318	277
Beryllium mg/kg	-	3.9	1.65	2.34	2.96	2.13	2.90	1.42	1.53	2.69	3.02	2.93	1.26	1.80	2.8	2.8	2.1
Boron mg/kg	-	<35	•	-	-	-	-	ı	ı	•	-	•	-	-	23.2*	20.9*	17.5
Cadmium mg/kg	-	<0.35	<0.116	<0.140	<0.134	<0.132	<0.123	<0.119	<0.121	<0.122	<0.114	<0.128	<0.121	<0.110	<0.51	<0.50	0.23
Calcium mg/kg	-	2200	-	-	-	-	-	ı	1	1	-	•	-	-	2410	2370	1980
Chromium mg/kg	-	13	12.3	12.6	24.1	32.5	17.9	9.90	15.3	23.6	26.7	20.6	32.9	13.7	16.6	15.8	13.6
Cobalt mg/kg	-	12	-	-	-	-	-	1	•	-	-	-	-	-	11.1	10.8	8.9
Copper mg/kg	-	66	33.8	47.4	43.0	14.8	51.0	23.1	26.1	42.5	64.9	39.1	41.4	26.7	65.9	62.7	58.1
Iron mg/kg	-	9800	11100	11100	14000	17300	16700	25400	30300	25100	24100	16800	26600	19110	-	-	-
Lead mg/kg	-	14	8.69	11.8	14.0	6.56	13.9	7.11	10.9	12.6	18.8	14.0	10.4	10.5	16.8	16.5	13.8
Lithium mg/kg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<148	<152	<158
Magnesium mg/kg	-	750	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese mg/kg	-	50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury mg/kg	-	0.035	0.046	0.070	0.188	0.118	0.072	0.136	0.336	0.173	0.091	0.197	0.126	0.050	0.028	0.028	0.032
Molybdenum mg/kg	-	<14	2.18	3.52	3.51	2.75	3.24	2.85	1.92	5.22	3.37	2.14	3.22	<1.10	<2.6	1.4*	2.5
Nickel mg/kg	-	22	12.6	16.3	21.2	15.1	19.0	10.5	12.0	18.6	24.9	20.3	18.3	15.4	-	-	-
Phosphorus mg/kg	-	390	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium mg/kg	-	2000	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium mg/kg	-	2.5	<1.16	<1.40	7.46	<1.32	<1.23	<1.19	<1.21	<1.22	<1.14	7.12	<1.21	<1.10	<5.1	2.7*	0.71*
Silver mg/kg	-	<0.35	<1.16	<1.40	<1.34	<1.32	<1.23	<1.19	<1.21	<1.22	<1.14	<1.28	<1.21	<1.10	-	-	-
Sodium mg/kg	-	<350	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium mg/kg	-	240	112	14.3	205	192	182	158	66.2	23.7	218	208	93.9	129	-	-	-
Thallium mg/kg	-	<0.71	-	-	-	-	-	-	-	-	-	-	-	-	<5.1	2.8*	0.77*
Vanadium mg/kg	-	56	-	-	-	-	-	-	-	-	-	-	-	-	61.0	57.6	55.2
Zinc mg/kg	-	26	18.7	21.7	34.7	24.3	36.8	13.7	17.7	28.8	42.0	34.2	28.6	39.0	28.5	28.3	23.4

mg/kg= milligram per kilogram

<sup>\*</sup> Estimated concentration above the adjusted Method Detection Limit (MDL) and below the adjusted Reporting Limit

<sup>- =</sup> not tested

Table 3.1b - Ash Sample Analytical Results - TCLP

ID	Ash Sample 12-1490	Pond: 4050360-01	Brickhaven Cell 2C	1-25-17 Split	4-5-17 Split	7-17-17 Split	10-18-2017 Split	01-22-18 Split	04-25-18 Split	7-19-18 Split	10-24-18 Split	1-24-19 Split	4-18-19 Split	7-10-19 Split
Date	6/8/2012	5/15/2014	11/11/2016	1/25/2017	4/5/2017	7/17/2017	10/18/2017	1/22/2018	4/25/2018	7/19/2018	10/24/2018	1/24/2019	4/18/2019	7/10/2019
Report	Duke Energy	Duke Energy	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County	Chatham County
Aluminum-TCLP mg/L	-	< 0.50	0.548	1.16	0.999	3.85	1.38	0.627	1.15	1.64	0.728	0.890	0.522	0.334
Antimony-TCLP mg/L	-	< 0.050	<0.010	<0.01	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Arsenic-TCLP mg/L	<0.100	< 0.050	0.015	0.042	0.032	0.048	0.046	<0.010	0.016	0.036	<0.010	0.056	0.013	0.016
Barium-TCLP mg/L	3.00	<5.0	1.00	1.26	1.9	3.20	1.34	0.511	0.985	2.03	0.501	1.95	0.950	0.658
Beryllium-TCLP mg/L	•	<0.010	0.002	0.003	0.002	0.005	0.004	0.002	0.002	0.005	0.001	0.003	0.001	<0.001
Boron-TCLP mg/L	•	<2.5	-	-	-	-	•	-	-	-	-	-	-	-
Cadmium-TCLP mg/L	<0.100	<0.025	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Calcium-TCLP mg/L	•	8.3	-	-	-	-	-	-	-	-	-	-	-	-
Chromium-TCLP mg/L	<0.100	<0.25	<0.010	<0.010	<0.010	0.023	<0.010	<0.010	0.020	0.030	<0.010	<0.010	<0.010	0.044
Cobalt-TCLP mg/L	•	<0.025	-	-	-	-	•	-	-	-	-	-	-	-
Copper-TCLP mg/L	•	0.082	0.054	0.169	0.043	0.157	0.096	0.035	0.020	0.059	0.025	0.040	0.038	0.029
Iron-TCLP mg/L	•	<5.0	<0.050	<0.050	<0.050	0.260	< 0.050	<0.050	0.056	0.086	<0.050	0.325	0.070	1.77
Lead-TCLP mg/L	<0.100	<0.050	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Magnesium-TCLP mg/L	-	0.6	-	-	-	-	-	-	-	-	-	-	-	-
Manganese-TCLP mg/L	-	0.073	-	-	-	-	-	-	-	-	-	-	-	-
Mercury-TCLP mg/L	<0.002	<0.010	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020	<0.0020
Molybdenum-TCLP mg/L	-	<0.050	<0.010	<0.010	0.012	<0.010	<0.010	<0.010	<0.010	0.037	<0.010	<0.01	<0.010	<0.010
Nickel-TCLP mg/L	•	< 0.050	0.017	0.087	0.059	0.026	0.015	0.033	0.108	0.027	0.019	0.017	0.015	0.045
Phosphorus-TCLP mg/L	-	0.086	-	-	-	-	-	-	-	-	-	-	-	-
Potassium-TCLP mg/L	-	<2.5	-	-	-	-	-	-	-	-	-	-	-	-
Selenium-TCLP mg/L	<0.100	<0.10	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100	<0.100
Silver-TCLP mg/L	<0.100	<0.25	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Sodium-TCLP mg/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strontium-TCLP mg/L	-	0.82	0.646	0.108	0.824	1.27	1.11	0.531	1.00	0.151	0.692	1.09	0.702	0.594
Thallium-TCLP mg/L	-	<0.050	-	-	_	-	-	-	-	-	-	-	-	-
Vanadium-TCLP mg/L	•	0.039	-	-	-	-	-	-	-	-	-	-	-	-
Zinc-TCLP mg/L	-	<1.5	0.046	0.135	0.169	0.049	0.042	0.029	0.048	0.178	0.034	<0.100	0.078	0.071

TCLP = Toxicity Characteristic Leaching Procedure

- = not tested

mg/L = milligram per liter

Table 3.1c - Ash Sample Analytical Results - SPLP

ID	Pond: 4050360-01	Ash-1	Ash-2	Ash-3
Date	5/15/2014	5/12/2020	5/12/2020	5/12/2020
Report	Duke Energy	Charah	Charah	Charah
Aluminum-SPLP mg/L	<0.10	-	-	-
Antimony-SPLP mg/L	<0.010	0.0052	0.0054	0.0064
Arsenic-SPLP mg/L	0.011	0.090	0.048	0.085
Barium-SPLP mg/L	0.3	0.13	0.18	0.35
Beryllium-SPLP mg/L	<0.0020	<0.0010	<0.0010	0.0029
Boron-SPLP mg/L	<0.50	0.051*	0.064*	0.096*
Cadmium-SPLP mg/L	<0.0010	<0.0010	<0.0010	<0.0010
Calcium-SPLP mg/L	2.6	7.5	5.7	6.1
Chromium-SPLP mg/L	<0.0050	<0.0050	<0.0050	0.011
Cobalt-SPLP mg/L	<0.0050	<0.0050	<0.0050	0.011
Copper-SPLP mg/L	<0.010	<0.0050	<0.0050	0.047
Iron-SPLP mg/L	<0.10	-	ı	-
Lead-SPLP mg/L	<0.0050	<0.0050	<0.0050	0.016
Lithium-SPLP (ug/L)	-	3.5	3.5	19.9
Magnesium-SPLP mg/L	0.28	-	ı	-
Manganese-SPLP mg/L	<0.010	-	-	-
Mercury-SPLP mg/L	<0.00020	<0.00020	<0.00020	<0.00020
Molybdenum-SPLP mg/L	<0.010	0.016	0.018	0.027
Nickel-SPLP mg/L	<0.010	-	-	-
Phosphorus-SPLP mg/L	-	-	-	-
Potassium-SPLP mg/L	<0.50	-	-	-
Selenium-SPLP mg/L	<0.020	0.0053*	<0.010	<0.010
Silver-SPLP mg/L	<0.0050	-	-	-
Sodium-SPLP mg/L	1.8	-	-	-
Strontium-SPLP mg/L	0.2	-	-	-
Thallium-SPLP mg/L	<0.010	<5.5	<5.5	<5.5
Vanadium-SPLP mg/L	0.043	0.11	0.083	0.14
Zinc-SPLP mg/L	<5.0	<0.050	0.011*	0.056

SPLP = Synthetic Precipitation Leaching Procedure

mg/L = milligram per liter

<sup>\*</sup> Estimate Below practical quantitation limit (PQL)

<sup>- =</sup> not tested



Table 3.2a - Soil Boring Analytical Results

							Bori	ng ID				
Analyte	Industrial/Commercial PSRG	Protection of Groundwater PSRG	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7	SB-8	SB-9	SB-10
Antimony	93	0.9	<0.58	<0.54	<0.41	<0.48	<0.41	<0.59	<0.35	<0.42	<0.46	<0.43
Arsenic	3	5.8	0.74J	5.6	4.7	0.94J	4.1	<u>6.0</u>	4.1	3.3	5.1	2.4
Barium	47,000	580	9.1	36.4	35.9	16.8	98.9	104	79.9	40.4	33.7	39.3
Beryllium	470	63	<0.12	0.32	0.22	0.058J	0.52	0.75	0.45	0.22	0.23	0.33
Boron	47,000	45	<5.8	<5.4	2.2J	<4.8	2.2J	<5.9	1.9J	<4.2	2.7J	<4.3
Cadmium	200	3	<0.12	<0.11	<0.083	<0.096	0.053J	<0.12	<0.071	<0.084	< 0.92	<0.086
Calcium	NE	NE	21.8	227	94.4	74.1	1830	2190	1090	421	212	113
Chromium	350,000	360,000	2.1	12.3	11.8	3.0	6.3	11.9	8.0	9.7	16.9	3.5
Cobalt	70	0.9	0.51J	<u>1.8</u>	<u>2.1</u>	0.47J	8.2	<u>13.7</u>	<u>7.2</u>	3.0	1.3	3.8
Copper	9,300	700	1.9	10.8	12.4	2.5	10.9	16.5	2.4	5.5	4.6	1.8
Lead	800	270	3.1	6.2	11.7	4.5	9.5	10.9	9.3	7.2	6.8	8.9
Lithium	470	42	<35.5	<157	<31.5	<33.8	<174	<164	<32.6	<34.4	<37.9	<33.7
Mercury	9.7	1	0.021	0.0056J	0.0093	0.0081	<0.0038	0.0050	0.0039J	0.016	0.022	0.016
Molybdenum	1,200	7.1	<0.58	0.29J	0.52	<0.48	<0.41	<0.59	0.24J	0.71	0.36J	<0.43
Selenium	1,200	2.1	<1.2	<1.1	<0.83	<0.96	<0.81	<1.2	<0.71	<0.84	< 0.92	<0.86
Thallium	2.3	0.28	<1.2	<1.1	<0.83	<0.96	<0.81	<1.2	<0.71	<0.84	0.59J	<0.86
Vanadium	1,200	350	11.8	39.2	13.6	20.8	19.6	37.0	13.2	16.3	34.3	12.3
Zinc	70,000	1,200	4.9	8.9	14.7	7.1	58.3	58.0	14.2	18.0	5.8	13.2
Mean Total Organic Carbon	NE	NE	6540	2730	<657	3010	<731	1240	1890	11200	2160	6140

all units in milligrams per kilogram (mg/kg) unless otherwise noted <0.58 = constituent not detected at or above the laboratory reporting limit NE = not established

Shaded = concentration reported above Industrial/Commercial PSRG

**Bold/Underlined** = concentration exceeded Protection of Groundwater PSRG

J = Estimated concentration above the method detection limit and below the reporting limit.



Table 3.2b - Soil Boring SPLP Analytical Results

	2L	BTV		Boring ID	
Analyte	Standard / IMAC	(1Q2020)	SB-5	SB-6	SB-7
Antimony	1	3.9	<5.0	<5.0	<5.0
Arsenic	10	5	<10	<10	<10
Barium	700	443	180	110	210
Beryllium	4	0.5	<1	<1	<1
Boron	700	7.5	<u>91.4</u>	<u>87.4</u>	<250
Cadmium	2	0.5	<1	<1	<1
Calcium	NE	119,000	<1,000	<1,000	<1,000
Chloride	250,000	340,000	40,200	30,900	50,100
Chromium	10	2.5	<u>5.9</u>	<5.0	<5.0
Cobalt	1	2.5	<5.0	<5.0	<5.0
Copper	1,000	11.4	5.8	<5.0	<5.0
Fluoride	2,000	230	230	<100	230
Lead	15	14.1	<5.0	<5.0	<5.0
Lithium	NE	52	6.0	<2.5	<2.5
Mercury	1	0.1	<0.20	<0.20	<0.20
Molybdenum	NE	13.6	<5.0	<5.0	<5.0
Selenium	20	5	<10	<10	<10
Sulfate	250,000	135,000	2,400	3,200	2,600
Thallium	0.2	13.7	<0.10	<0.10	<0.10
Total Dissolved Solids	500,000	1,120,000	<u>1,460,000</u>	610,000	1,610,000
Vanadium	0.3	8.3	<u>21</u>	<5	<u>13</u>
Zinc	1000	34.2	<u>61</u>	<u>57</u>	<u>81</u>
pH (Std. Units)	6.5-8.5	5.90 - 7.27	<u>5.2</u>	<u>4.6</u>	<u>5.0</u>

all units in micrograms per liter ( $\mu g/L$ ) unless otherwise noted

<5.0 = constituent not detected at or above the laboratory reporting limit

Shaded = concentration reported above (or below for pH) established 2L Standard or IMAC

**Bold/Underlined** = concentration exceeded BTV

2L Standard = North Carolina Groundwater Protection Standard (T15A NCAC 02L .0202)

IMAC = Interim Allowable Maximum Concentration

Table 3.3 - Well Construction Details and Groundwater Elevations

Well ID	Northing	Easting	TOC Elev. (ft.)	TD (ft. BTOC)	Screen Length (ft.)	Screened Interval (ft. BTOC)	DTW (ft. BTOC)	GW Elevation (ft.)	Lithologic Unit
BG-1	670898.50	1996348.25	228.19	43.05	15	28.05 - 43.05	9.20	218.99	Layered Rock/PWR*
BG-2	669278.99	1990476.10	194.23	26.11	10	16.11 - 26.11	10.75	183.48	Layered Rock/PWR*
MW-1	674737.98	1993417.69	280.08	75.30	15	60.30 - 75.30	57.76	222.32	Layered Rock/PWR*
MW-2	673677.07	1994537.54	231.76	50.15	15	35.15 - 50.15	35.06	196.70	Layered Rock/PWR*
MW-3	672474.63	1994834.76	222.56	43.36	15	28.36 - 43.36	19.46	203.10	PWR
MW-4	671326.48	1994974.40	217.13	25.34	10	15.34 - 25.34	12.34	204.79	Residuum/PWR
MW-5	671081.19	1993779.03	244.86	46.14	10	36.14 - 46.14	21.66	223.20	PWR
MW-6	671267.71	1992793.49	230.95	29.47	15	14.47 - 29.47	6.12	224.83	Residuum/PWR
MW-7	672306.28	1992642.35	231.71	17.18	10	7.18 - 17.18	16.24	215.47	Residuum/PWR
MW-7R	672221.96	1992702.98	239.94	39.94	10	29.94 - 39.94	21.02	218.92	Residuum/PWR
MW-8	673304.83	1992200.37	236.47	49.06	15	34.06 - 49.06	36.29	200.18	PWR
MW-11	670446.25	1993476.57	219.23	43.50	15	28.50 - 43.50	11.23	208.00	Residuum/PWR

Top-of-casing, ground surface elevations and horizontal locations at MW-4 (PZM-1), MW-5 (PZM-22) and MW-7 (PZM-27) surveyed by Lawrence Surveying of Monroe, NC. Top-of-casing, ground surface elevations and horizontal locations at BG-1, MW-1, MW-3, MW-6, MW-8, MW-7R, and MW-11 surveyed by McAdams of Durham, NC. Top-of-casing, ground surface and horizontal location at monitoring well MW-2 surveyed by Gregory C. Bewley.

TD=total depth; TOC=top of casing; DTW = Depth-to-Water; BTOC = below top-of-casing; GW = groundwater; NA = not available

Depth to water measurements obtained on April 14 2020, to the nearest 0.01 foot with a water level meter.

Based on NAD 83 NGVD88.

<sup>\* =</sup> interpreted lithologic unit based on relative drilling hardness and geologic judgment during well installation.

Table 3.4 - Groundwater and Surface Water Parameters and Analytical Methods

PARAMETER	UNITS	METHOD
Field parameters		
pH	SU	Field water quality meter
Specific Conductance	µS/cm	Field water quality meter
Temperature	°C	Field water quality meter
Dissolved Oxygen	mg/L	Field water quality meter
Oxidation Reduction Potential	mV	Field water quality meter
Turbidity	NTU	Field turbidity meter
40 CFR Part 257, Appendix III C	onstituent	•
Boron	μg/L	EPA Method 6020B
Calcium	μg/L	EPA Method 6010D
Chloride	μg/L	EPA Method 300.0
Fluoride	μg/L	EPA Method 300.0
pH	SU	EPA Method 9040B (or similar)
Sulfate	μg/L	EPA Method 300.0
TDS	μg/L	SM 2540C
40 CFR Part 258, Appendix IV C	onstituent	s
Antimony	μg/L	EPA Method 6010D
Arsenic	μg/L	EPA Method 6010D
Barium	μg/L	EPA Method 6010D
Beryllium	μg/L	EPA Method 6010D
Cadmium	μg/L	EPA Method 6010D
Chromium	μg/L	EPA Method 6010D
Cobalt	μg/L	EPA Method 6010D
Fluoride	μg/L	EPA Method 300.0
Lead	μg/L	EPA Method 6010D
Lithium	μg/L	EPA Method 6020B
Mercury	μg/L	EPA Method 7470A
Molybdenum	μg/L	EPA Method 6010D
Selenium	μg/L	EPA Method 6010D
Thallium	μg/L	EPA Method 6020B
Radium 226	pCi/L	EPA Method 903.1
Radium 228	pCi/L	EPA Method 904.0
Total Radium	pCi/L	Total Radium Calculation
40 CFR Part 258 Appendix I Me	tals	
Copper	μg/L	EPA Method 6010D
Nickel	μg/L	EPA Method 6010D
Silver	μg/L	EPA Method 6010D
Vanadium	μg/L	EPA Method 6010D
Zinc	μg/L	EPA Method 6010D

Notes:  $SU - Standard\ Units$ ;  $\mu S/cm - microSiemen\ per\ centimeter$ ;  $^{\circ}C - degrees\ Celsius$ ;  $mg/L - milligrams\ per\ liter$ ; mV - millivolt;  $NTU - nephelometric\ turbidity\ units$ ;  $\mu g/L - micrograms\ per\ liter$ ;  $pCi/L - picoCuries\ per\ liter$ .

Table 3.5 - Groundwater Analytical Results - April 2020

	2L Standard /	BTV					Groundwa	ater Analy	sis					
Analyte	IMAC	(1Q2020)	BG-1	BG-2	MW-1	MW-2	MW-3	MW-4	MW-5	MW-6	MW-7R	MW-8	MW-11	DUP-1 (MW-6)
EPA APPENDIX III														
Boron	700	7.50	<25.0	<25.0	<25.0	DRY	<50.0	<50.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0
Calcium	NE	119,000	21,100	114,000	256,000	DRY	174,000	67,200	12,600	35,700	98,500	103,000	23,800	36,300
Chloride	250,000	340,000	190,000	247,000	905,000	DRY	986,000	475,000	22,400	208,000	281,000	310,000	169,000	209,000
Fluoride	2,000	230	220	200	170	DRY	<u>470</u>	<u>350</u>	<u>610</u>	<u>370</u>	110	<100	130	<u>380</u>
pH (standard units)	6.5-8.5	5.90 - 7.27	6.25	6.82	6.48	DRY	7.77	6.20	8.59	NA	7.13	7.04	6.54	NA
Sulfate	250,000	135,000	23,500	136,000	7,200	DRY	48,700	11,800	3,600	25,400	17,500	7,800	3,600	25,300
Total Dissolved Solids	500,000	1,120,000	574,000	1,050,000	2,170,000	DRY	2,030,000	1,200,000	249,000	610,000	854,000	842,000	465,000	618,000
EPA APPENDIX IV														
Antimony	1	3.90	<5.0	<5.0	<5.0	DRY	<25.0	<u>7.0</u>	<5.0	<5.0	<5.0	<u>5.2</u>	<u>7.7</u>	<5.0
Arsenic	10	5.00	<10.0	<10.0	<10.0	DRY	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Barium	700	443	251	99.8	349	DRY	<u>628</u>	431	113	49.6	320	<u>1,110</u>	43.6	49.9
Beryllium	4	0.500	<1.0	<1.0	<1.0	DRY	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium	2	0.500	<1.0	<1.0	<1.0	DRY	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium	10	2.50	<5.0	<5.0	<5.0	DRY	<u>5.8</u>	<u>8.6</u>	<5.0	<5.0	<u>5.1</u>	<5.0	<5.0	<5.0
Cobalt	1	2.50	<5.0	<5.0	<5.0	DRY	<5.0	<u>21.8</u>	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Fluoride	2,000	230	220	200	170	DRY	<u>470</u>	<u>350</u>	<u>610</u>	<u>370</u>	110	<100	130	<u>380</u>
Lead	15	14.1	<5.0	<5.0	<5.0	DRY	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Lithium	NE	52.0	19.1	17.3	42.8	DRY	<u>65.2</u>	25.2	9.6	27.3	33.8	24.3	9.4	25.5
Mercury	1	0.100	<0.20	<0.20	<0.20	DRY	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Molybdenum	NE	13.6	<5.0	8.1	<5.0	DRY	7.60	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Selenium	20	5.00	<10.0	<10.0	<10.0	DRY	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Thallium	0.2	13.7	<0.10	<0.10	<0.10	DRY	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Radium 226 (pCi/l)	NE	1.20	0.158	0.134	0.327	DRY	<u>1.23</u>	0.60	0.211	0.224	1.05	0.768	0.137	-0.21
Radium 228 (pCi/l)	NE	1.28	0.608	0.915	0.735	DRY	1.22	0.643	0.154	0.202	0.509	1.04	0.473	0.302
Combined Radium (pCi/l)	NE*	2.07	0.766	1.05	1.060	DRY	<u>2.45</u>	1.25	0.365	0.426	1.560	1.81	0.61	0.302
EPA APPENDIX I METALS														
Copper	1,000	11.4	<5.0	<5.0	<5.0	DRY	<5.0	7.6	8.0	<5.0	<5.0	6.4	<5.0	<5.0
Nickel	100	2.50	<5.0	<5.0	<5.0	DRY	<u>5.8</u>	<u>11.5</u>	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Silver	20	2.50	<5.0	<5.0	<5.0	DRY	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vanadium	0.3	8.30	6.8	<5.0	<5.0	DRY	6.9	<u>10.7</u>	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Zinc	1,000	34.2	<10.0	<10.0	10.2	DRY	13.5	<u>47.2</u>	13.1	<10.0	<10.0	11.4	14.5	<10.0

all units in  $\mu g/L$  unless otherwise noted

\* = no established 2L Standard. 5 pCi/l is the Federal Standard BTV = background threshold value calculated for January 2020

NE = not established

μg/l = micrograms per liter

pCi/I = picocuries per liter

Shaded = concentration reported above (or below for pH) established 2L Standard or IMAC

**Bold/Underlined** = concentration exceeded BTV

2L Standard = North Carolina Groundwater Protection Standard (T15A NCAC 02L .0202)

IMAC = Interim Allowable Maximum Concentration

pH was field tested

Groundwater samples collected from April 14-16, 2020 and analyzed for above parameters by Pace Analytical Services, LLC

Table 3.6 - Measured Stream Flow - January 16, 2020

Location	Meas	sured	<b>Groundwater Model</b>
	Total Area (in²)	Total Flow (gpm)	Predicted Baseflow (gpm)
SW-1	202.633	665.4	2.54
SW-2	282.475	372.7	22.95
SW-3	386.399	402.2	22.95

in<sup>2</sup> = squared inches gpm = gallons per minute

Table 3.7 - Surface and Free Water Sample Locations

Sample ID	Location
SW-1	Existing SW-1 location ~3,000 feet south of permitted waste boundary on Gulf Creek Tributary
SW-2	Existing SW-2 location south of confluence of Shaddox Creek and Shaddox Creek Tributary
SW-3	Proposed location on Shaddox Creek Tributary ~1,700 feet west of permitted waste boundary
SW-4	Proposed location adjacent to proposed regolith well MW-11 and south of Sediment Basin #6; on unnamed tributary (west)
FW-1	Proposed location in Mine Pond
FW-2	Proposed location in Sediment Basin #7
FW-3	Proposed location in Sediment Basin #6

Notes:

- SW surface water
   FW free water

Table 3.8 - Surface Water Analytical Results - April 2020

Analyte		Leachate Analysis								
	2B Standard	SW-1	SW-2	SW-3*	SW-4*	SW-5*	FW-1*	FW-2*	FW-3*	LEACHATE
EPA APPENDIX III										
Boron (µg/I)	NE	<50.0	<50.0	<25.0	<25.0	<25.0	<25.0	<25.0	<25.0	3,430
Calcium (µg/l)	NE	6,760	12,600	6,290	4,600	3,610	7,710	13,400	8,410	329,000
Chloride (µg/l)	250,000	4,000	70,800	37,400	20,900	7,300	21,700	43,600	3,600	18,400
Fluoride (µg/l)	1,800	230	<100	<100	<100	170	290	240	<100	260
pH (standard units)	6.0-9.0	7.09	8.15	6.35	6.34	6.78	7.57	7.35	6.89	NA
Sulfate (µg/l)	250,000	1,500	7,100	5,600	5,100	4,400	57,900	17,000	17,700	597,000
TDS (µg/I)	500,000	450,000	374,000	191,000	107,000	325,000	299,000	174,000	94,000	1,520,000
EPA APPENDIX IV										
Antimony (µg/I)	5.6	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Arsenic (µg/l)	10	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	28.2
Barium (µg/I)	1,000	454	154	99.1	55.3	154	165	39.1	40.2	70.4
Beryllium (µg/l)	6.5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Cadmium (µg/I)	2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Chromium (µg/I)	50	18.4	5.8	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Cobalt (µg/l)	3	15.6	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Fluoride (µg/l)	1,800	230	<100	<100	<100	170	290	240	<100	260
Lead (µg/l)	25	32.3	<5.0	6.5	<5.0	9.4	8.0	<5.0	<5.0	<5.0
Lithium (µg/l)	NE	7.5	<5.0	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	53.0
Mercury (µg/I)	0.012	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20
Molybdenum (μg/l)	160	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	249
Selenium (µg/I)	5	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Thallium (µg/l)	0.24	<0.20	<0.20	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	0.33
Radium 226 (pCi/l)	NE	0.428	0.222	-0.085	-0.131	0.179	0.232	0.315	0.372	0.193
Radium 228 (pCi/l)	NE	0.894	0.297	0.179	0.428	0.329	0.485	-0.0369	-0.502	0.319
Combined Radium (pCi/l)	NE	1.32	0.519	0.179	0.428	0.508	0.717	0.315	0.372	0.512
EPA APPENDIX I METALS										
Copper (µg/I)	7	19.8	6.0	<5.0	<5.0	7.0	6.8	<5.0	<5.0	<5.0
Nickel (µg/I)	88	14.8	<5.0	<5.0	<5.0	<5.0	6.9	<5.0	<5.0	6.8
Silver (µg/I)	0.06	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Vanadium (µg/l)	NE	63.1	15.6	7.2	<5.0	16.2	11.8	<5.0	<5.0	6.6
Zinc (µg/I)	50	84.5	22.2	11.9	<10.0	21.6	17.9	<10.0	11.3	11.1

NE = not established

 $\mu$ g/l = micrograms per liter

pCi/I = picocuries per liter

Shaded = concentration reported above (or below for pH) established 2B Standard

**Bold/Underlined** = concentration exceeded BTV

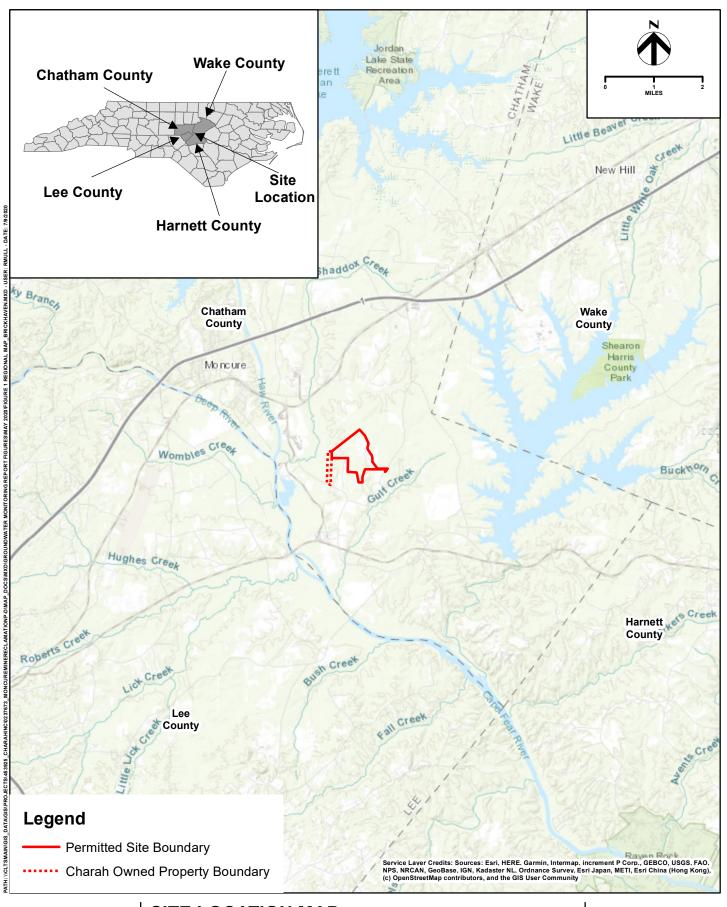
2B Standard = North Carolina Surface Water and Wetland Standards (15A NCAC 02B) or National Criteria per EPA for Class WS-IV Waters pH was field tested

Surface water samples SW-1 and SW-2 collected from April 14-16, 2020 and analyzed for above parameters by Pace Analytical Services, LLC

<sup>\*</sup> Samples collected from January 15-16, 2020 by HDR and analyzed for above parameters by Pace Analytical Services, LLC

# Figures

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SITE LOCATION MAP CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA

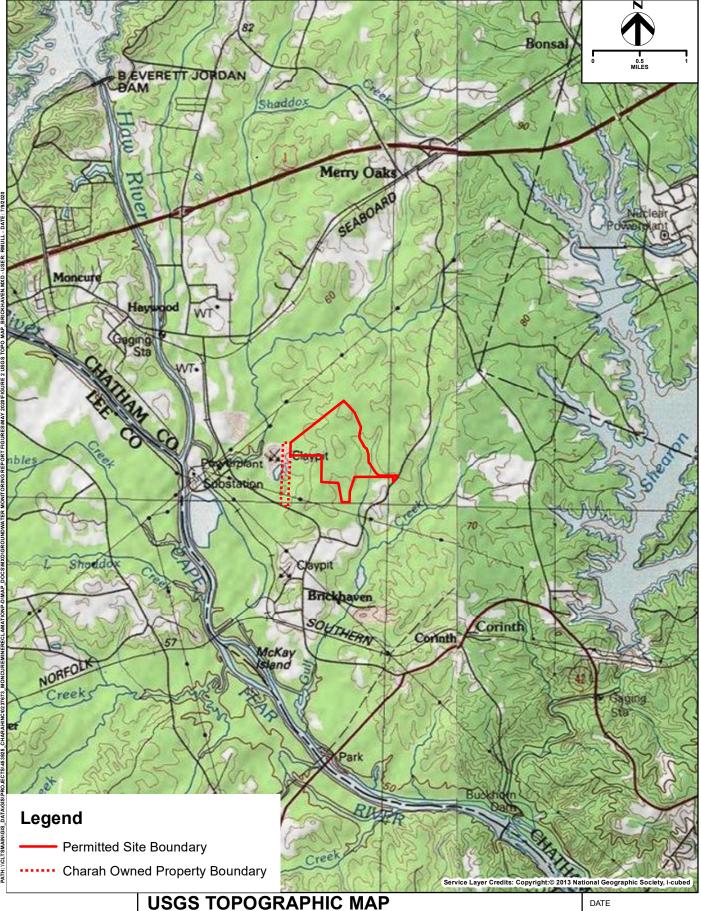
BRICKHAVEN NO. 2 MINE TRACT "A"

DATE

JULY 2020

FIGURE

1.1





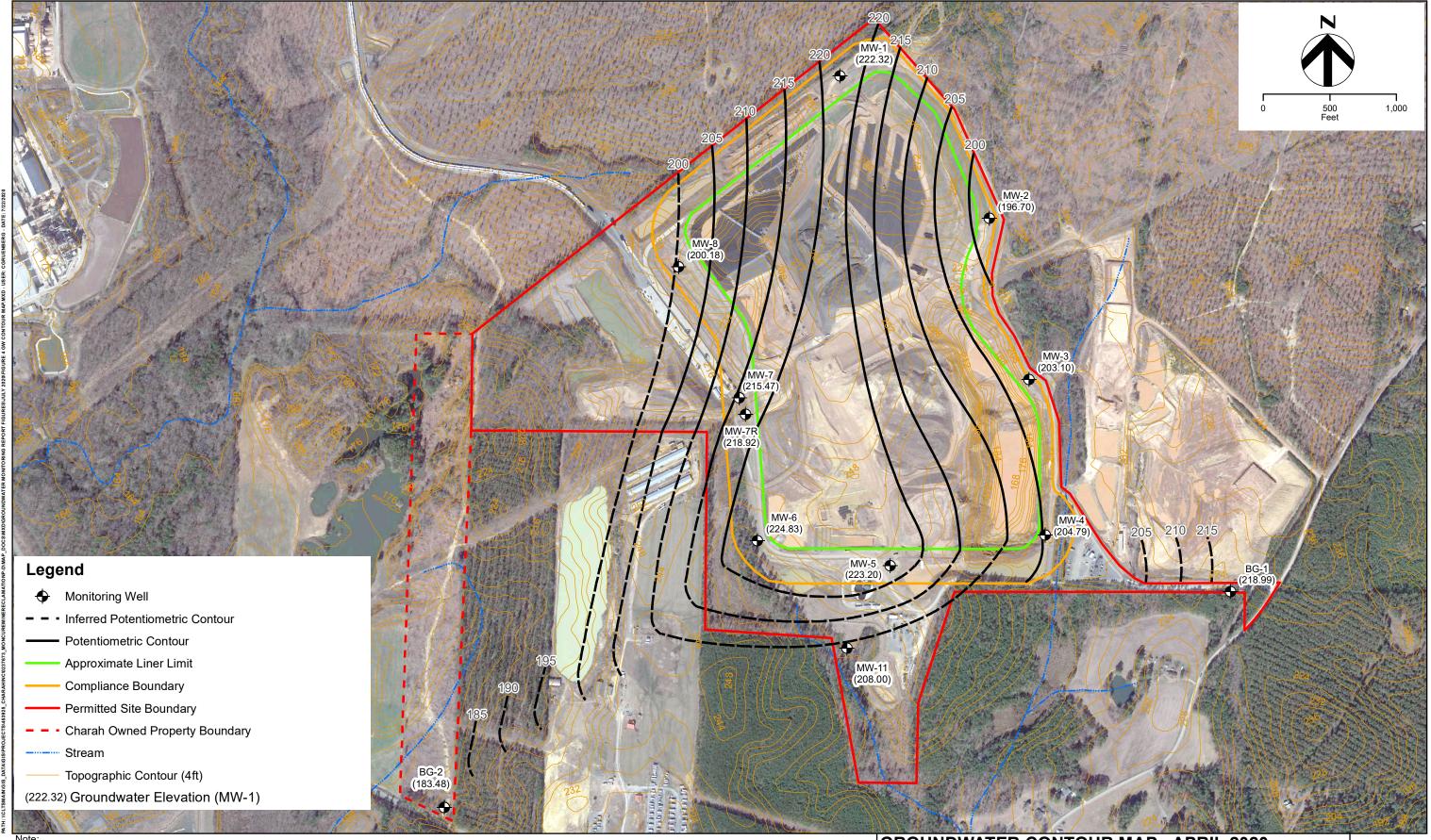
USGS TOPOGRAPHIC MAP CHARAH SOLUTIONS, INC MONCURE, NORTH CAROLINA

FIGURE

2.1

**JULY 2020** 

BRICKHAVEN NO. 2 MINE TRACT "A"



- Groundwater elevations derived from depth to water measurements collected on April 14, 2020.
   Topography data for the site was obtained from NCDOT Geographic Information System (GIS) website (Dated 2007).
   Groundwater contours near MW-11 inferred based on one gauging event. Contours may be adjusted as additional gauging events are conducted.

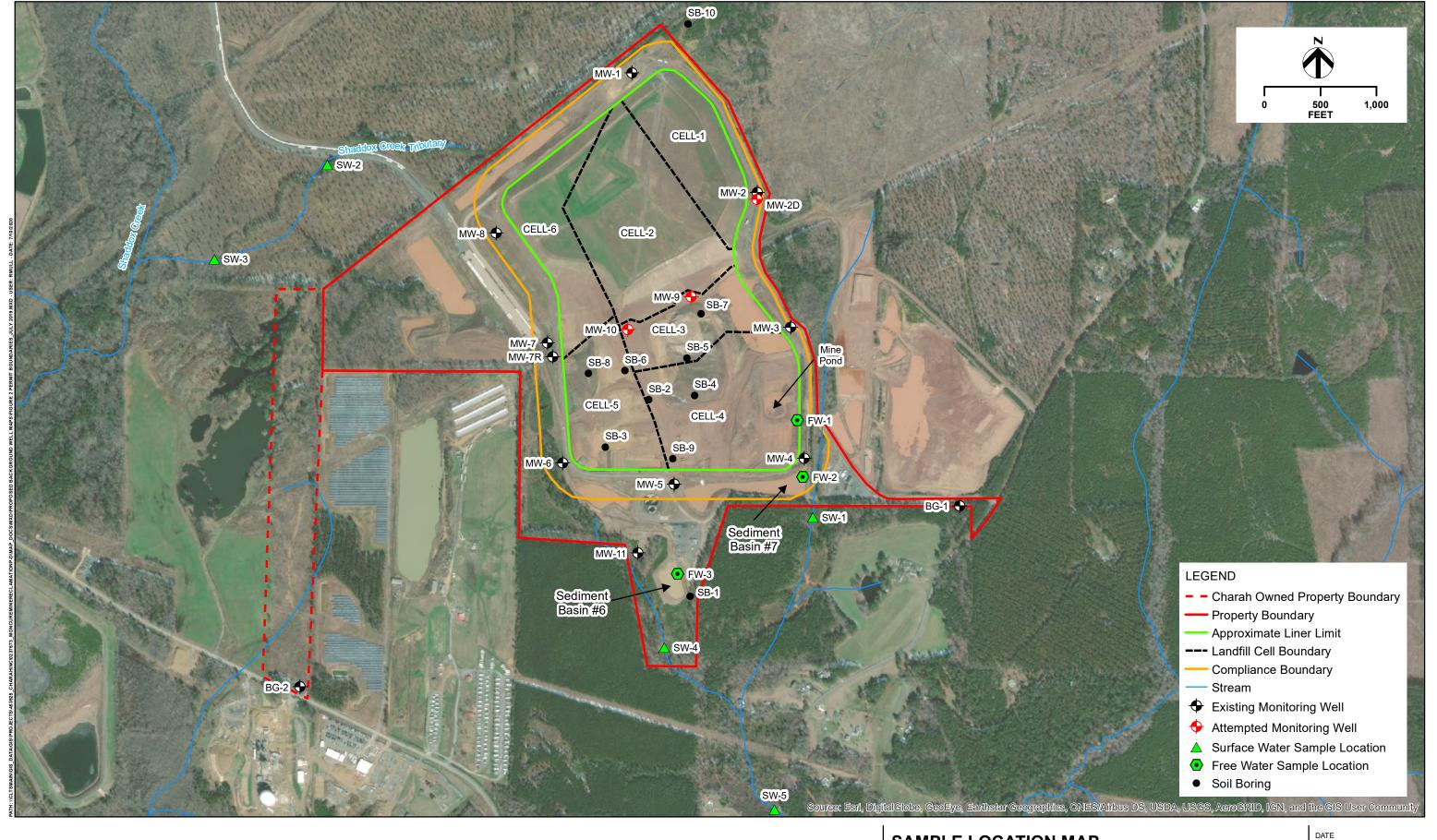
**GROUNDWATER CONTOUR MAP - APRIL 2020** CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE TRACT "A"

**JULY 2020** 

FIGURE

2.2





SAMPLE LOCATION MAP CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

,,,,\_ || || |

JULY 2020

3.1

FIGURE

BRICKHAVEN NO. 2 MINE "A"





TEST PIT SAMPLE LOCATION MAP CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

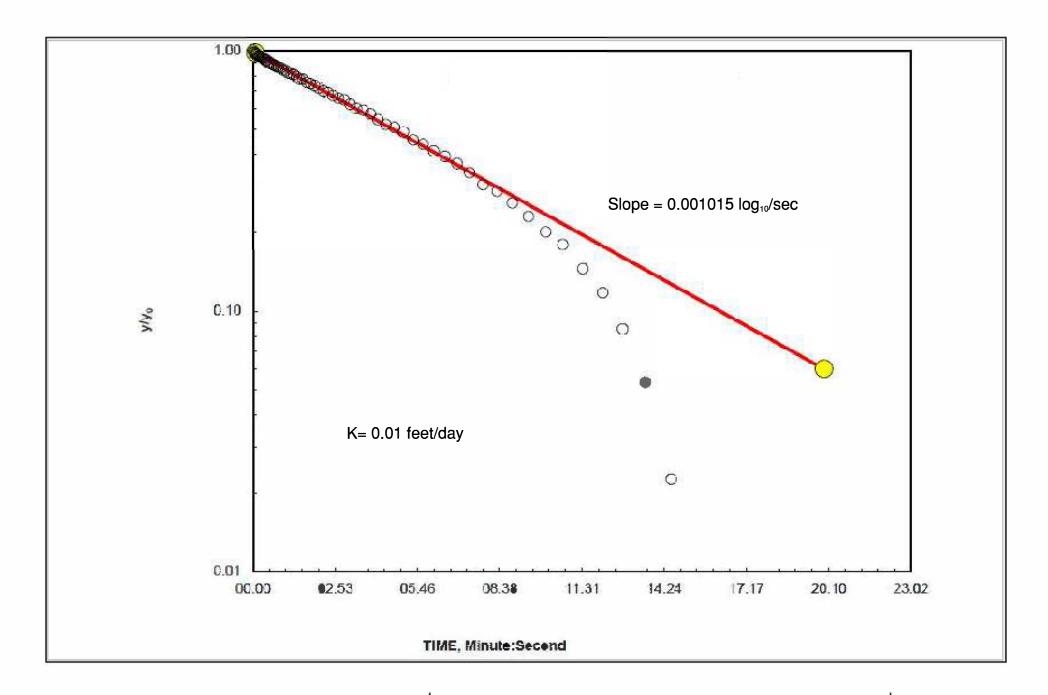
FIGURE

BRICKHAVEN NO. 2 MINE TRACT "A"

JULY 2020

3.2







USGS Slug Test Bouwer and Rice Method CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

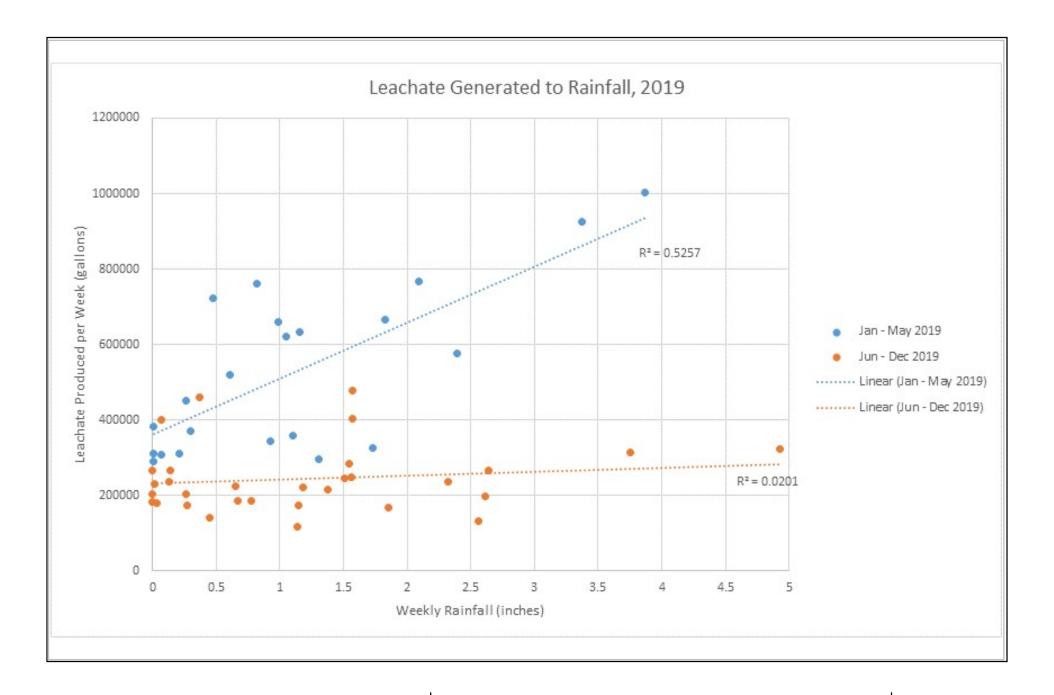
BRICKHAVEN NO. 2 MINE "A"

DATE JUL

**JULY 2020** 

**FIGURE** 

3.3





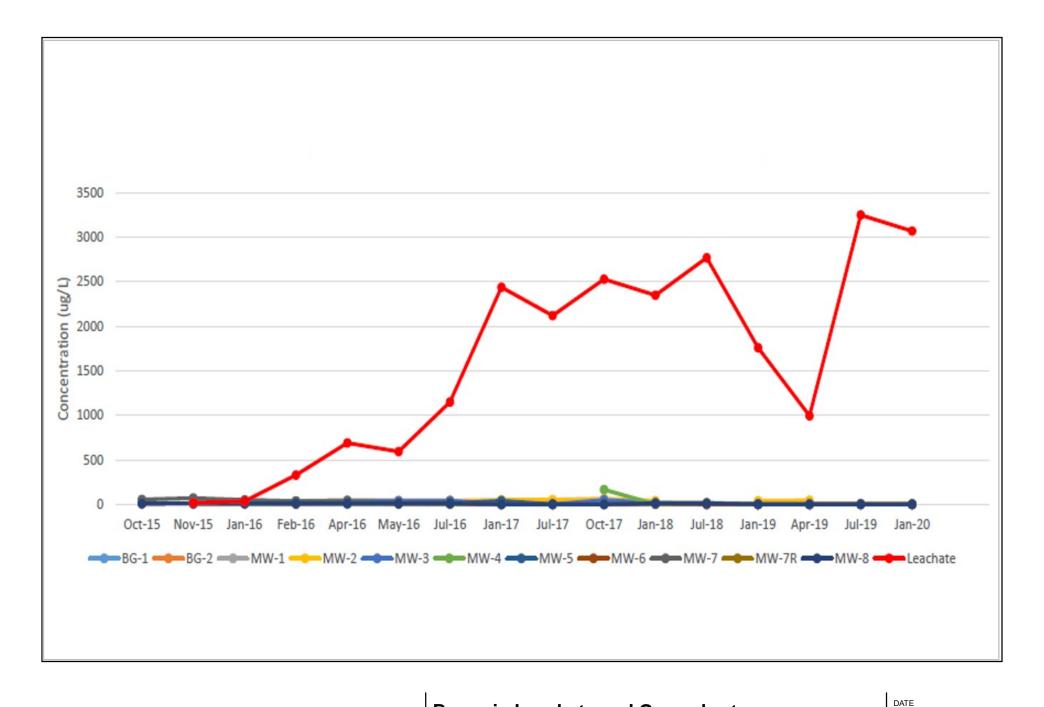
**Leachate Generation to Rainfall - 2019** CHARAH SOLUTIONS, INC.
MONCURE, NORTH CAROLINA

DATE

**FIGURE** 

3.4

**JULY 2020** 



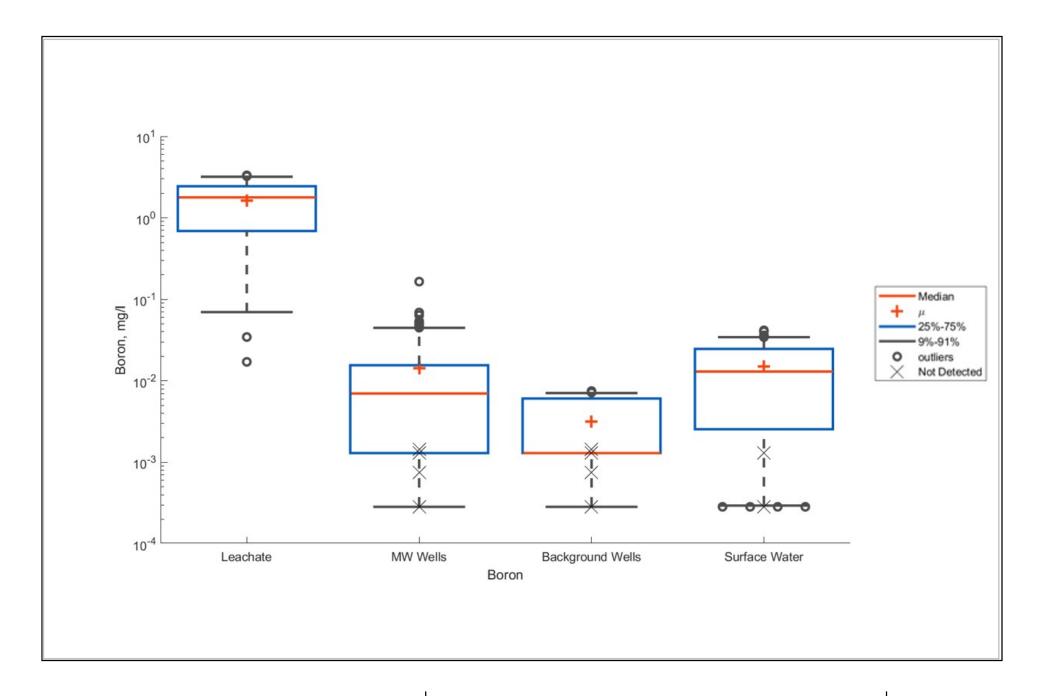


Boron in Leachate and Groundwater CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

4.1

**JULY 2020** 





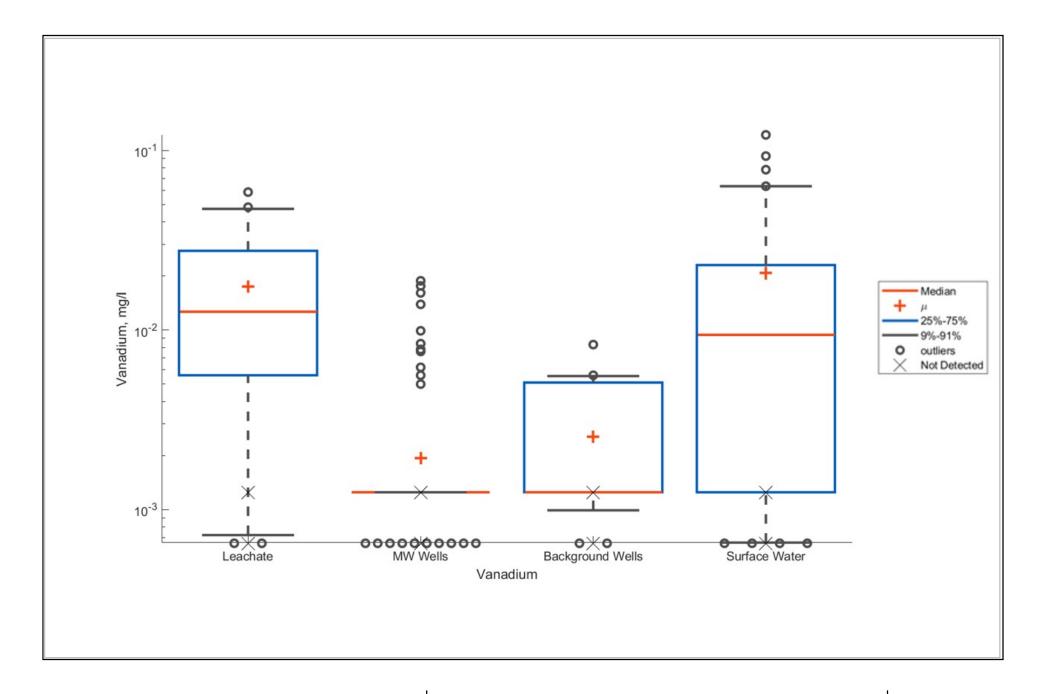
Boron Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE





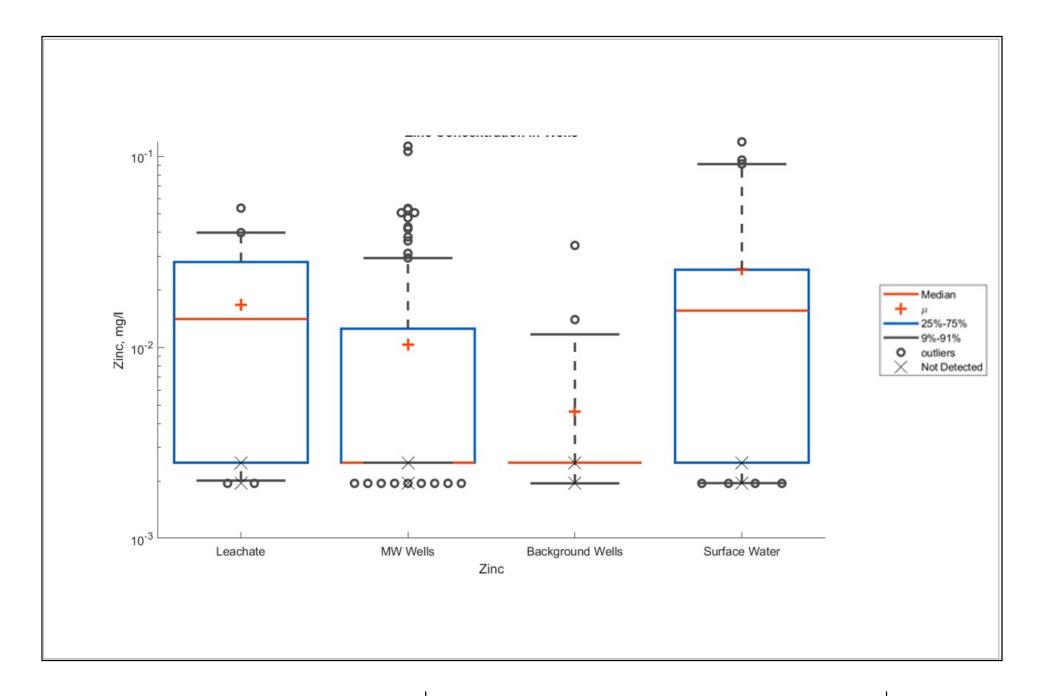
Vanadium Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

**JULY 2020** 

FIGURE





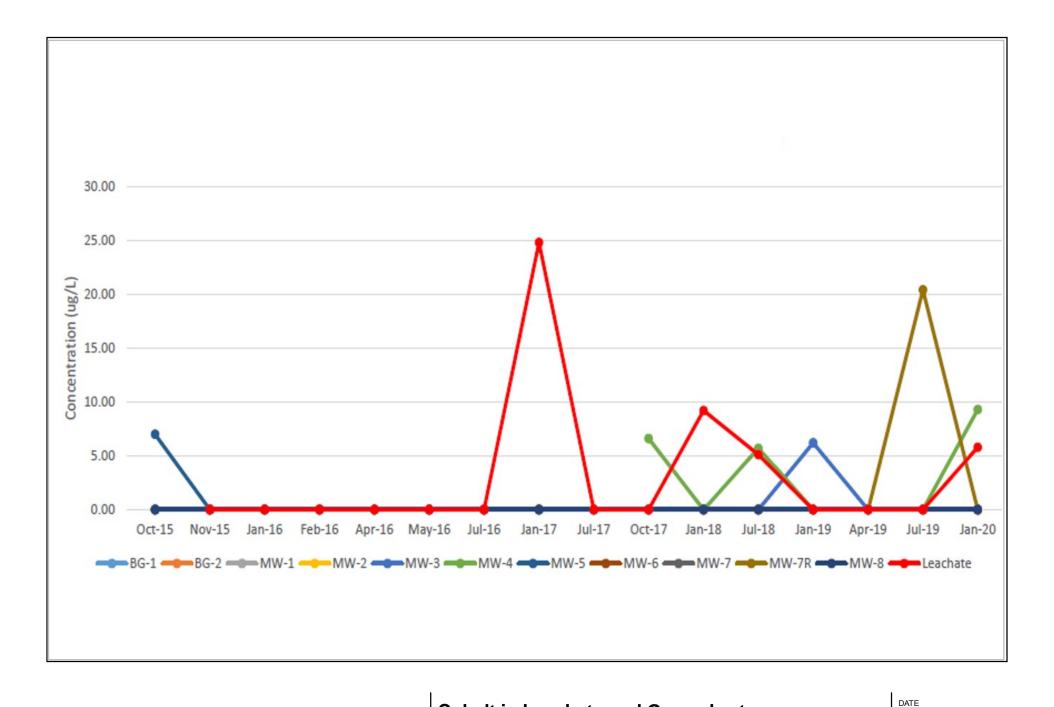
Zinc Concantrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE



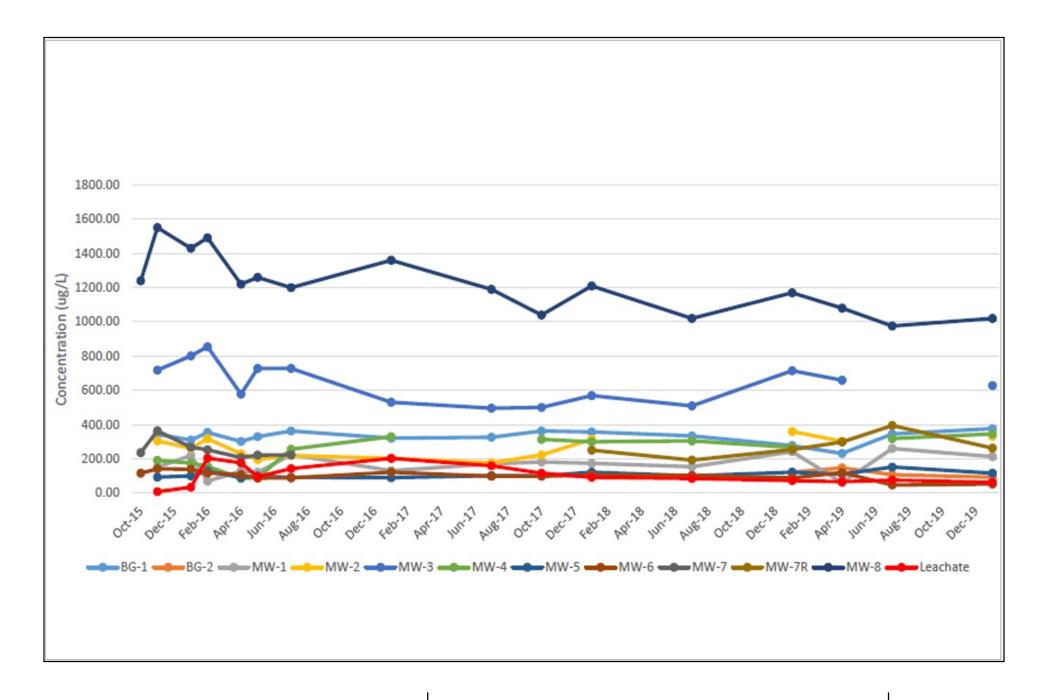


Cobalt in Leachate and Groundwater CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

4.5

**JULY 2020** 



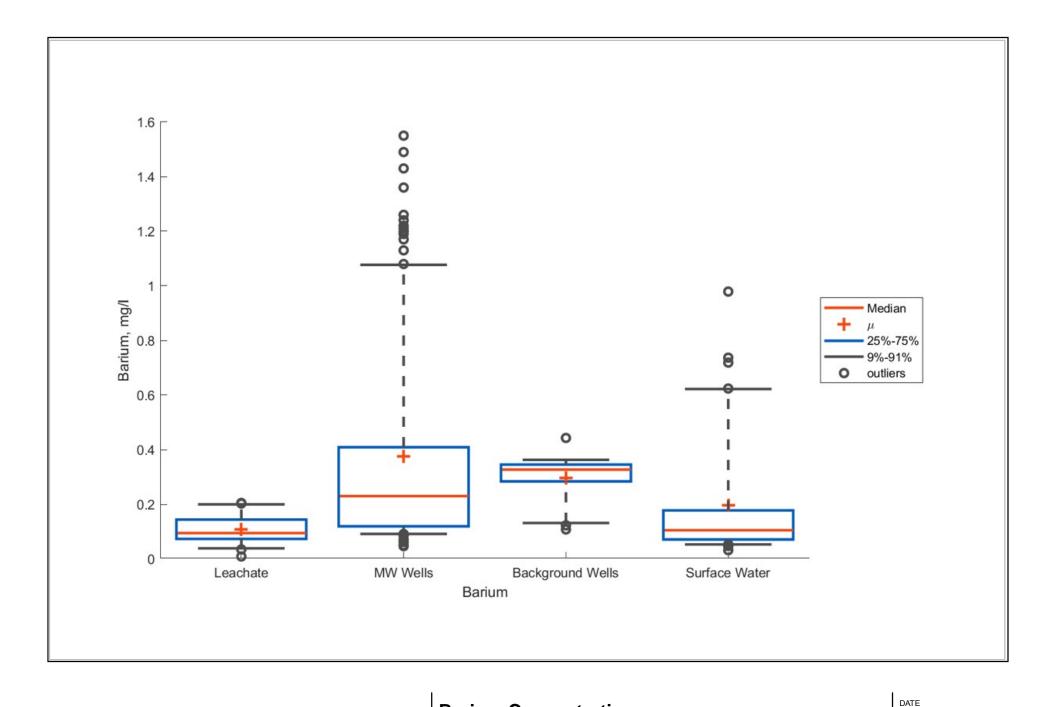


Barium in Leachate and Groundwater CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

DATE

JULY 2020

**FIGURE** 



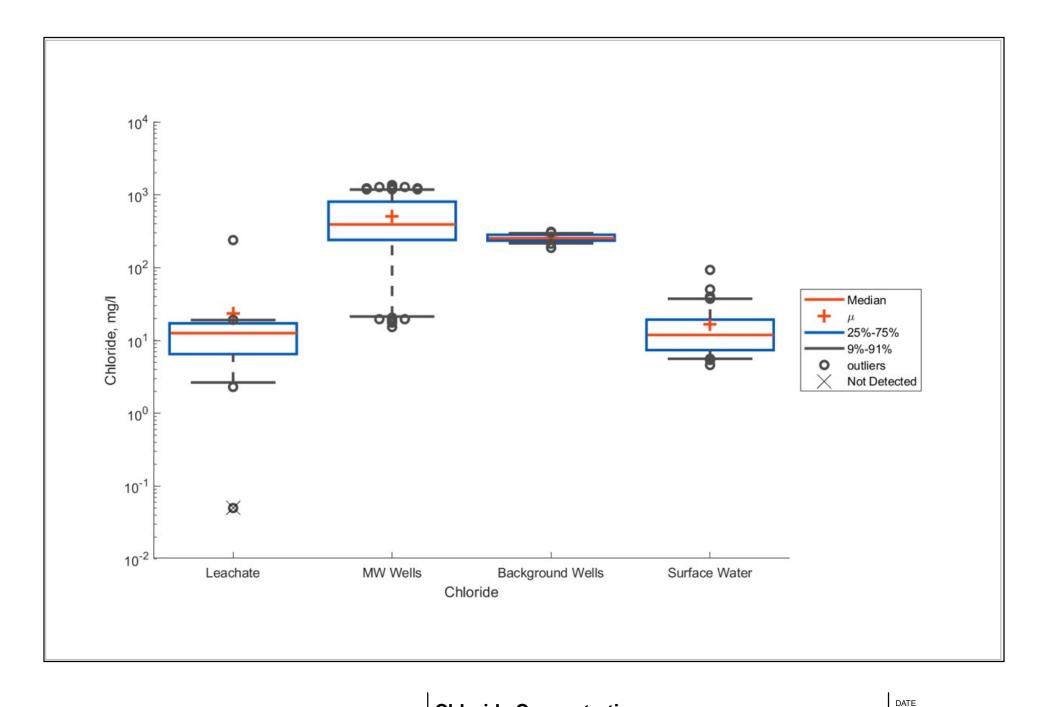


Barium Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

4.7

**JULY 2020** 



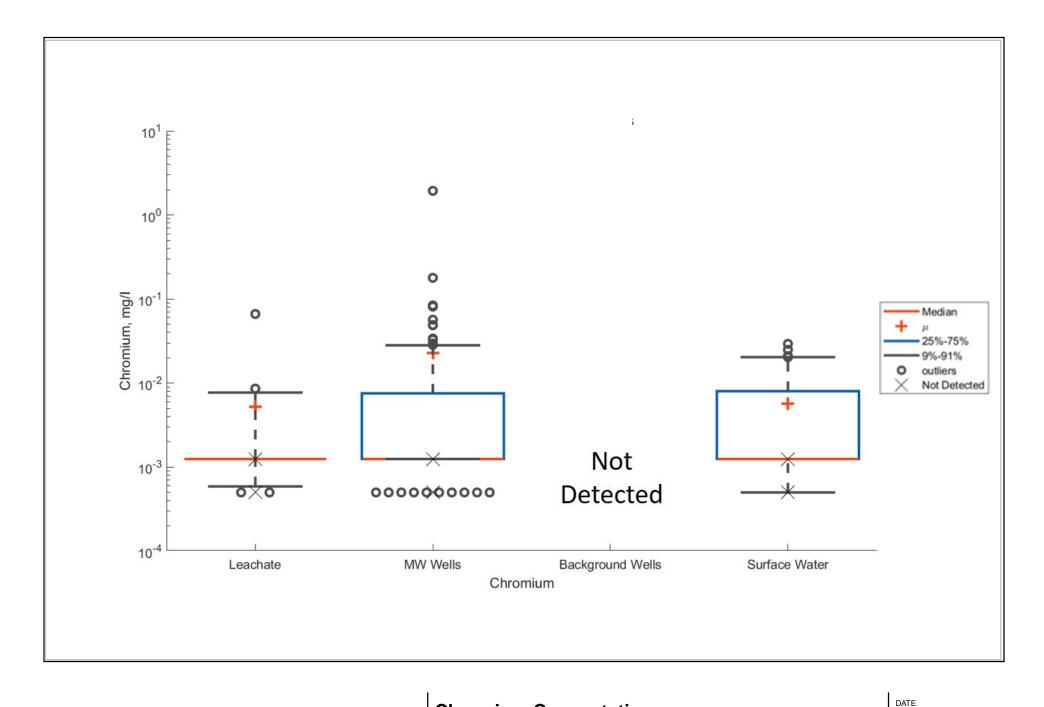


Chloride Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

4.8

**JULY 2020** 





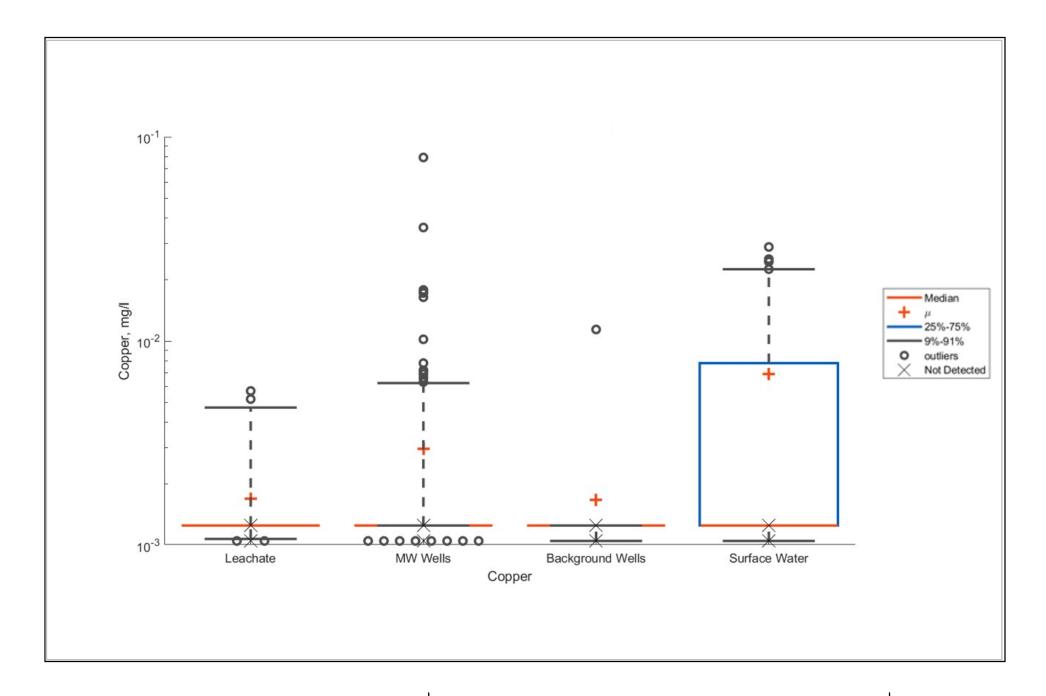
Chromium Concentations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

4.9

**JULY 2020** 

BRICKHAVEN NO. 2 MINE "A"





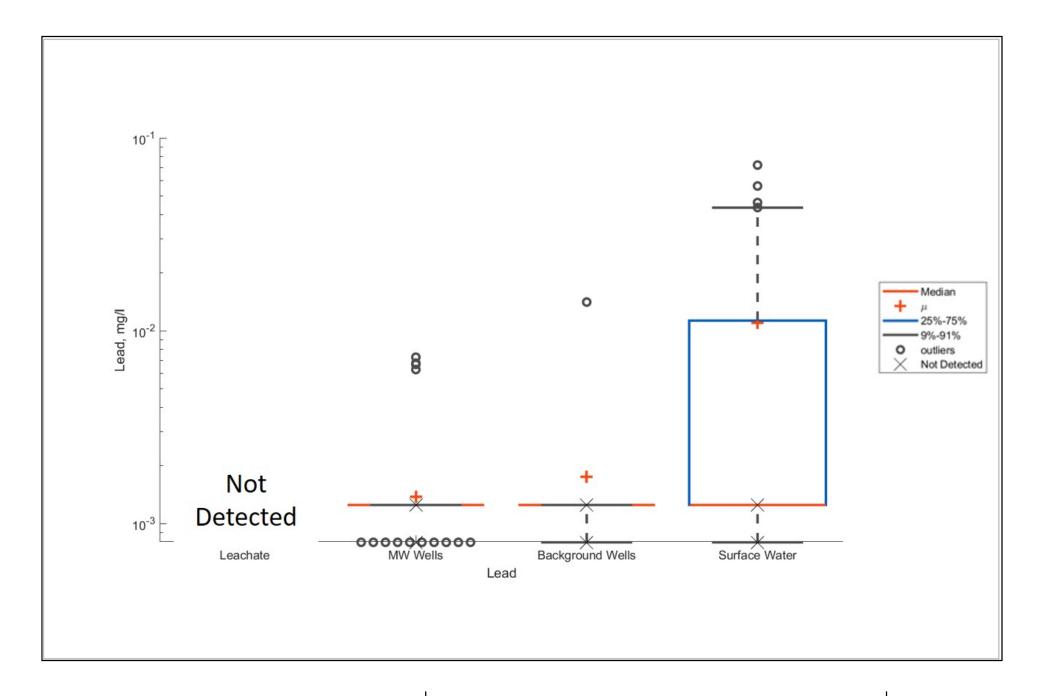
Copper Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE





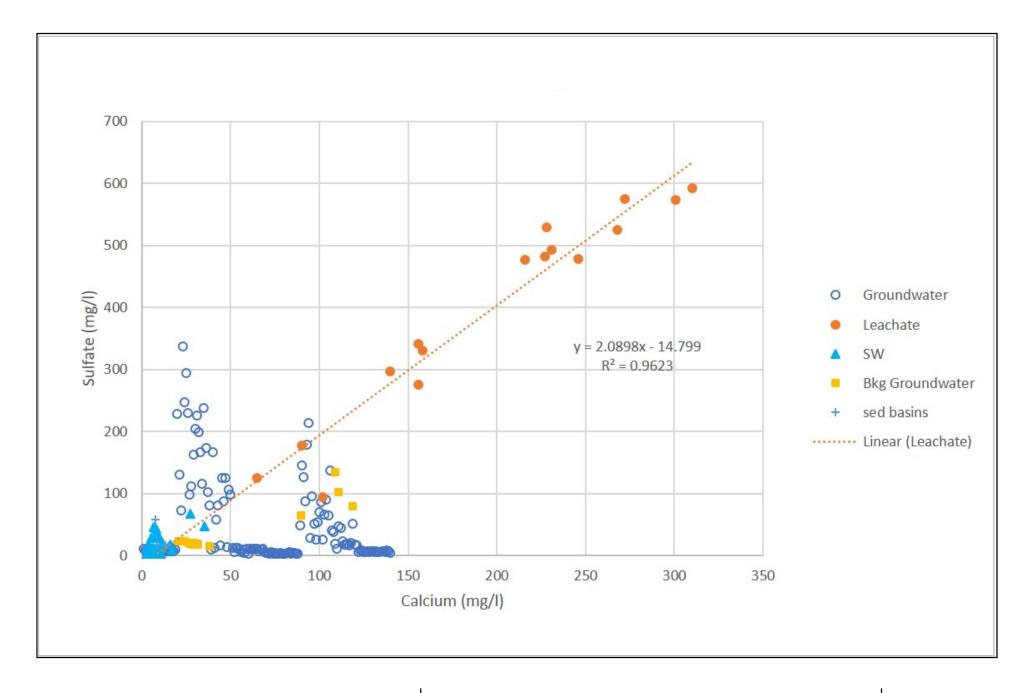
Lead Concentrations CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE





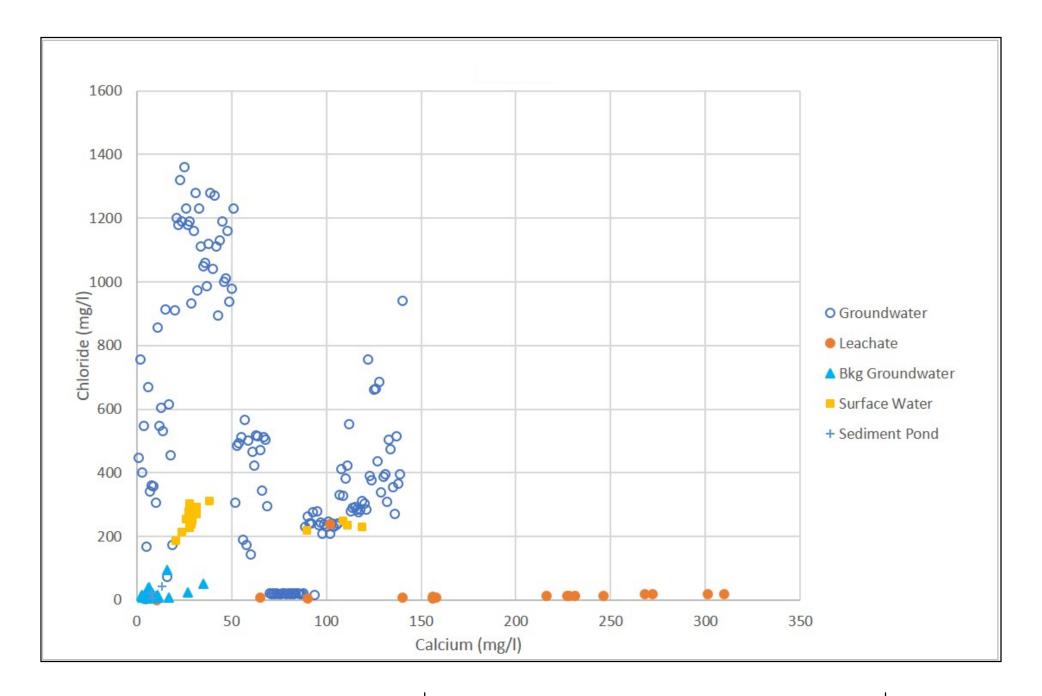
Ca to SO4 CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE





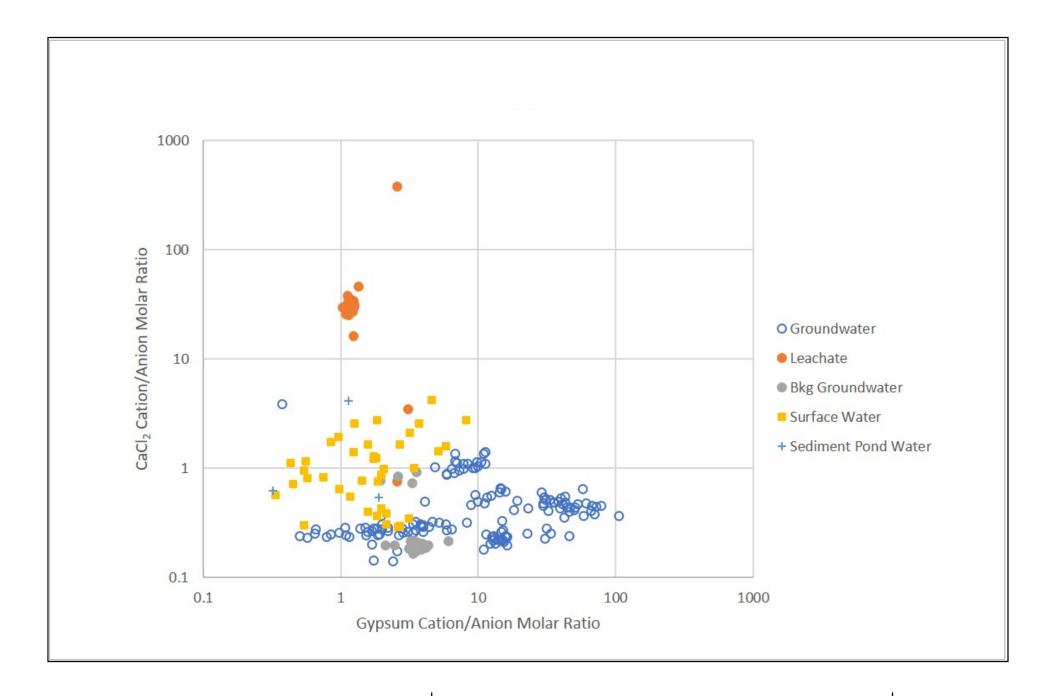
Ca to CI-CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

BRICKHAVEN NO. 2 MINE "A"

DATE

**JULY 2020** 

FIGURE





CaCl2 to Gypsum Cation/Anion Molar Ratios CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

DATE

JULY 2020

**FIGURE** 

4.14

BRICKHAVEN NO. 2 MINE "A"



Appendix A – Correspondence with NCDEQ This page intentionally left blank.



ROY COOPER Governor MICHAEL S. REGAN Secretary MICHAEL SCOTT Director

June 21, 2019

Mr. Norman Divers
Environmental Manager
Charah, Inc.
PO Box 287
Belmont, North Carolina 28012

Re: Surface Water and Groundwater Assessment

Brickhaven No. 2 Mine Track A Structural Fill

1910-STRUC-2015 Chatham County FID 1322564

Dear Mr. Divers,

It has come to the attention of the Division of Waste Management, Solid Waste Section (Section) that there are exceedances of groundwater standards established in 15A NCAC 2L .0202 (2L Standards) and surface water standards established in 15A NCAC 2B .0211 and .0216 (2B Standards) at the Brickhaven No. 2 Mine Structural Fill.

A review of the groundwater analytical data indicates exceedances of the 2L Standards since water quality monitoring began in August 2015 through the most recent sampling event in January 2019. Barium, chloride, chromium, cobalt, total dissolved solids and vanadium were reported at concentrations greater than their respective 2L Standards in various monitoring wells. In addition, a review of surface water analytical data indicates exceedances of the 2B Standards during the July 17, 2017 and July 16, 2018 monitoring events. Arsenic, cobalt, copper, lead, total dissolved solids and zinc were reported at concentrations greater than their respective 2B Standards in sample location SW-1.

The facility shall acquire the services of a North Carolina licensed professional geologist and submit a groundwater and surface water assessment work plan to the Section outlining how the reported constituents contamination in the relevant monitoring wells and SW-1 will be delineated. The assessment work plan shall be in accordance with 15A NCAC 2L .0106 and 15A NCAC 2B .0211 and .0216 where the facility will conduct an assessment investigation and may require corrective action based on the findings of the assessment. The Section will review the



submitted work plan, approve, or request additional information or amendments before implementation.

Please submit this work plan within **60 days** of receiving this letter. The work plan may include, but not limited to, an alternate source demonstration of the exceedances.

Also, explain the low levels of boron concentrations in the groundwater monitoring wells and the disappearance of antimony after the eight background sampling events.

Please contact me at (919) 707-8253 or via email (<u>elizabeth.werner@ncdenr.gov</u>) if you have any questions or concerns. Thank you for your anticipated cooperation in this matter.

Sincerely,

Elizabeth S. Werner Hydrogeologist Solid Waste Section

Cc: Tom Flannagan - Charah
Mike Plummer, P.E. – HDR
Ed Mussler, P.E. – Section Chief, SWS
Ben Jackson, E.I. – Permitting Engineer, SWS
Larry Frost – Permitting Engineer, SWS
David Giachini, P.E. – Permitting Engineer, SWS
Sarah Rice – Environmental Program Consultant, SWS





ROY COOPER Governor MICHAEL S. REGAN Secretary MICHAEL SCOTT Director

September 16, 2019

Mr. Norman Divers
Environmental Manager
Charah, Inc.
PO Box 287
Belmont, North Carolina 28012

Re: Approval of Groundwater and Surface Water Assessment Work Plan Brickhaven No. 2 Mine Track "A" Structural Fill 1910-STRUC-2015 Chatham County FID 1358186

Dear Mr. Divers,

The Solid Waste Section (Section) has reviewed the *Groundwater and Surface Water Assessment Work Plan* for the Brickhaven No. 2 Mine Track "A" Structural Fill (FID 1357320) submitted on your behalf by HDR on August 20, 2019. The proposed work plan consists of the following assessment actions:

- Collect 10 soil samples at strategic locations between the former mining operation boundary and the structural fill waste boundary.
- Install three (3) regolith groundwater monitoring wells (MW-9, MW-10, MW-11) and one (1) bedrock groundwater monitoring well (MW-2D) and perform slug tests on the four (4) newly installed monitoring wells.
- Collect surface water samples from existing (SW-1, SW-2) and proposed (SW-3, SW-4) surface water locations, on-site sediment basins (Basin #6, Basin #7, Mine Pond) and perform stream flow measurements.
- Create a groundwater model in two parts: 1) groundwater flow and 2) fate and transport of constituents.

The Section approves the assessment work plan and the facility may immediately implement the plan. Prior to implementation, the facility shall submit a work schedule within two weeks of receipt of this letter.



Please contact me at (919) 707-8253 or via email (<u>elizabeth.werner@ncdenr.gov</u>) if you have any questions or concerns.

## Sincerely,

Digitally signed by Elizabeth S.
Werner
Date: 2019.09.16
16:35:17-04'00'

Elizabeth S. Werner Hydrogeologist Solid Waste Section

Cc: Tom Flannagan - Charah
Mark P. Filardi, P.G. – HDR
Ed Mussler, P.E. – Section Chief, SWS
Ben Jackson, E.I. – Permitting Engineer, SWS
Larry Frost – Permitting Engineer, SWS
David Giachini, P.E. – Permitting Engineer, SWS
Sarah Rice – Environmental Program Consultant, SWS





September 30, 2019

Ms. Elizabeth S. Werner, P.G. Via email <a href="mailto:elizabeth.werner@ncdenr.gov">elizabeth.werner@ncdenr.gov</a>
Hydrogeologist
North Carolina Department of Environmental Quality
Division of Waste Management – Solid Waste Section
217 West Jones Street
Raleigh, North Carolina 27699

Re: Assessment Work Plan Implementation Schedule Brickhaven No. 2 Mine Tract "A" Structural Fill

1910-STRUC-2015 Chatham County FID 1358186

Dear Ms. Werner,

On behalf of Green Meadow, LLC (Owner), HDR Engineering, Inc. of the Carolinas (HDR) is pleased to provide the schedule for implementation of work proposed in the Groundwater and Surface Water Assessment Work Plan (Work Plan) prepared for the above-referenced site, dated August 16, 2019. The Work Plan was approved in correspondence from the North Carolina Department of Environmental Quality (NCDEQ) addressed to Mr. Norman Divers of Charah Solutions, Inc. on September 16, 2019. Per the approval letter, the Owner respectfully submits this schedule to satisfy the two week work schedule requirement.

Please do not hesitate to contact us at (704) 338-6700 or <a href="Mark.Filardi@hdrinc.com">Mark.Filardi@hdrinc.com</a>, if you have questions regarding this submittal.

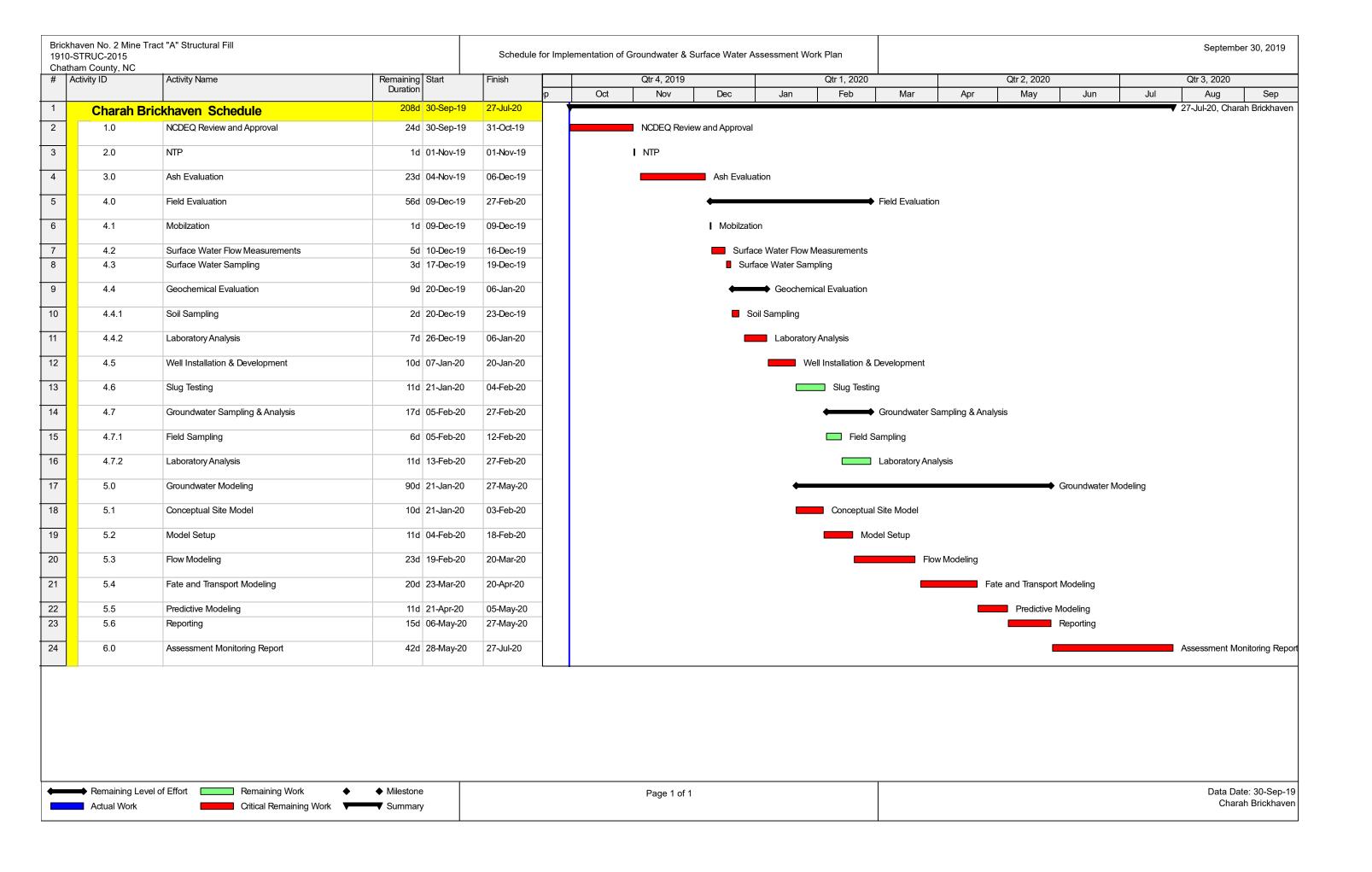
Sincerely,

HDR Engineering, Inc. of the Carolinas

Mark Filardi, PG Senior Geologist

cc: Norman Divers, Charah Solutions, Inc.

Michael Plummer, PE *Project Manager* 





ROY COOPER Governor MICHAEL S. REGAN Secretary MICHAEL SCOTT Director

October 4, 2019

## <u>Sent via email – ndivers@charah.com</u>

Mr. Norman Divers
Environmental Manager
Charah, Inc.
PO Box 287
Belmont, North Carolina 28012

Re: Concurrence of Assessment Work Plan Implementation Schedule

Brickhaven No. 2 Mine Track "A" Structural Fill

1910-STRUC-2015 Chatham County FID 1358917

Dear Mr. Divers,

The Solid Waste Section (Section) has reviewed the *Assessment Work Plan Implementation Schedule* for the Brickhaven No. 2 Mine Track "A" Structural Fill (FID 1358787) submitted on your behalf by HDR on September 30, 2019. The Section concurs with the schedule outlined in the implementation document with the final assessment report due July 27, 2020. The Section requires progress reports to be submitted by January 15, 2020 and April 15, 2020 in the interim. These progress reports shall include a brief description of actions to date as well as any analytical results generated prior to each report date.

Please contact me at (919) 707-8253 or via email (<u>elizabeth.werner@ncdenr.gov</u>) if you have any questions or concerns.

Sincerely,

Digitally signed by Elizabeth S. Wemer Date: 2019.10.04 1626:08-04'00'

Elizabeth S. Werner Hydrogeologist Solid Waste Section



Cc: Tom Flannagan - Charah
Mark P. Filardi, P.G. – HDR
Ed Mussler, P.E. – Section Chief, SWS
Ben Jackson, E.I. – Permitting Engineer, SWS
Larry Frost – Permitting Engineer, SWS
David Giachini, P.E. – Permitting Engineer, SWS
Sarah Rice – Environmental Program Consultant, SWS





January 15, 2020

Ms. Elizabeth S. Werner
Permitting Hydrogeologist
North Carolina Department of Environmental Quality
Division of Waste Management – Solid Waste Section
217 W Jones Street
Raleigh, NC 27603

Via email elizabeth.werner@ncdenr.gov

Subject: Assessment Work Plan Progress Report

Brickhaven No. 2 Mine Tract "A" Structural Fill

Moncure, Chatham County, NC

Dear Ms. Werner,

The purpose of this correspondence is to provide the North Carolina Department of Environmental Quality (NCDEQ) with a progress report of Assessment Work Plan (Work Plan) implementation at the Brickhaven No. 2 Mine Tract "A" Structural Fill site (Site) in Moncure, Chatham County, North Carolina. The Work Plan was submitted by HDR Engineering, Inc. of the Carolinas, on behalf of Charah Solutions, Inc. (Charah), on August 20, 2019 and was approved by the NCDEQ in correspondence dated September 16, 2019. Subsequent to Work Plan approval, Charah submitted an Assessment Work Plan Implementation Schedule on September 30, 2019 that was approved by NCDEQ on October 4, 2019. This progress report was prepared to comply with NCDEQ requirements stipulated in the October 4<sup>th</sup> approval letter.

As of the date of this progress report, Charah has completed the following activities, in accordance with the approved Work Plan:

- Commenced review of laboratory testing of ash from sources shipped to the Structural Fill and results of in-place ash samples;
- Initiated surface water sampling at seven locations, as specified in the Work Plan; and,
- Initiated soil sample collection within the permitted boundary, but beyond the area of CCP placement by Charah.

Additional field activities including streamflow measurements; monitoring well installation and sampling; and slug testing of wells are scheduled for completion during the first quarter of 2020. As required, analytical results from soil, surface water, and/or groundwater obtained during implementation of the Work Plan, and available prior to submittal of the Assessment Monitoring Report, will be provided in the next progress report, scheduled for April 15, 2020.



HDR appreciates the opportunity to continue to work collaboratively with NCDEQ at the Brickhaven site. If you have questions, please do not hesitate to contact us at (704) 338-6700 or <a href="Mark.Filardi@hdrinc.com">Mark.Filardi@hdrinc.com</a>.

Sincerely,

HDR Engineering, Inc. of the Carolinas

Mark Filardi, L.G. Senior Geologist

Cc: Norman Divers – Charah Solutions, Inc.

Mike Plummer, PE – HDR



April 15, 2020

Ms. Elizabeth S. Werner
Permitting Hydrogeologist
North Carolina Department of Environmental Quality
Division of Waste Management, Solid Waste Section
217 W Jones Street
Raleigh, NC 27603

Via email elizabeth.werner@ncdenr.gov

Subject: Assessment Work Plan Progress Report

Brickhaven No. 2 Mine Tract "A" Structural Fill

Moncure, Chatham County, NC

Dear Ms. Werner,

The purpose of this correspondence is to provide the North Carolina Department of Environmental Quality (NCDEQ) with a progress report of Assessment Work Plan (Work Plan) implementation at the Brickhaven No. 2 Mine Tract "A" Structural Fill site (Site) in Moncure, Chatham County, North Carolina. The Work Plan was submitted by HDR Engineering, Inc. of the Carolinas, on behalf of Charah Solutions, Inc. (Charah), on August 20, 2019 and was approved by the NCDEQ in correspondence dated September 16, 2019. Subsequent to Work Plan approval, Charah submitted an Assessment Work Plan Implementation Schedule on September 30, 2019 that was approved by NCDEQ on October 4, 2019. This progress report was prepared to comply with NCDEQ requirements stipulated in the October 4th approval letter.

As of the date of this progress report, Charah has completed the following activities, in accordance with the approved Work Plan:

- Commenced review of laboratory testing of ash from sources shipped to the Structural Fill and results of in-place ash samples;
- Collected samples from five surface water locations;
- Collected samples from three free water locations;
- Collected surficial soil samples from 10 locations;
- Measured surface water flow at three locations;
- Attempted well installation at four locations, three regolith wells and one bedrock well;
- Initiated geochemical comparison of groundwater versus leachate water samples; and,
- Calibrated a 3-dimensional groundwater flow and transport model using existing and newly acquired site-specific and regional data.

E. Werner, NCDEQ April 15, 2020 Page 2

Surface water flow measurements were taken on January 16, 2020 at locations SW-1 through SW-3. Flow measurements were attempted at SW-4; however, no discharge was coming from Sediment Basin #6. Another attempt for flow measurements was attempted upstream from the confluence of Sediment Basin #6 and the stream adjacent to the basin. Low flow conditions were also encountered upstream of SW-4 and a location for accurate measurements was not encountered. Surface water flow measurement locations are shown on the Site Detail Map in Attachment 1.

Surface water samples were collected from locations SW-1 through SW-5. Additional samples were collected from on-site ponds at locations FW-1 through FW-3. Sample locations are shown on the Site Detail Map included as Attachment 1.

Soil samples were collected from locations SB1 through SB10 at a depth of approximately 1 foot below ground surface (ft bgs). SB1 and SB10 were collected from south and north, respectively, of the compliance boundary. SB1 and SB10 locations were chosen to be outside of mining and structural fill activity. SB2 through SB9 locations were chosen to be within an area of mining activity, but outside of structural fill activity. Sample locations are shown on the Site Detail Map in Attachment 1.

Installation of monitoring wells MW-9, MW-10, MW-11, and MW-2D was attempted in March 2020; however, only well MW-11 was installed. Wells MW-9 and MW-10 were to be installed within regolith, but auger refusal and partially weathered rock were encountered before groundwater. Temporary monitoring wells were installed at 31 ft bgs and 30 ft bgs, respectively, and left overnight to monitor groundwater recharge. Groundwater was not encountered after 24 hours and the wells were abandoned. Well MW-2D was to be installed as a bedrock well cased approximately 10 feet below the bottom of the adjacent well, MW-2, and screened a minimum of 10 feet below the casing. An outer casing was installed into bedrock at a depth of 55 ft bgs. After the outer casing grout set for 24 hours, the boring was advanced 35 ft past the outer casing to a total depth of 90 ft bgs. No water-bearing fractures were encountered below the outer casing during drilling and groundwater did not recharge; thus, the deep boring was abandoned. The installation location for MW-11 was moved from the southern boundary to northwest of Sediment Basin #6 due to access issues. Well MW-11 was successfully installed to a total depth of 40 ft bgs. Well locations are shown on the Site Detail Map in Attachment 1.

Geochemical comparison between historical groundwater and leachate water results is ongoing. By comparing specific constituents from leachate samples against groundwater samples, HDR should be able to evaluate whether the presence of CCP in the structural fill is affecting the quality of groundwater (i.e., are the same constituents in leachate also in groundwater).

The groundwater model is being developed using the groundwater modeling pre- and post-processing software Groundwater Modeling System 10.4.8 as well as ArcMap 10.4.1. The domain is approximately 165.5 mi<sup>2</sup> with the site located in the western portion of the domain. The model has five layers with varying thicknesses to capture the variations seen the boring logs. The model domain consists of the Triassic Basin, Coastal Plain and Metamorphic Rock. The Triassic Basin is found directly over the site with the Coastal Plain and Metamorphic Rock found to the south. The grid size will be 500 ft by 500 ft that refines down to 50 ft by 50 ft. Once

E. Werner, NCDEQ April 15, 2020 Page 3

the flow model is calibrated MT3D will be used to simulate the constituent movement through the flow system.

Additional field activities scheduled for April 2020 include slug testing and sampling of well MW-11, and evaluation of leaching potential of surficial soils (via SPLP testing) at borings SB5, SB6, and SB7.

Data collection and analysis for this assessment is ongoing. Laboratory analytical results, additional data obtained during implementation of the Work Plan, conclusions, and recommendations will be provided in the Assessment Monitoring Report, scheduled for delivery on July 15, 2020.

HDR appreciates the opportunity to continue to work collaboratively with NCDEQ at the Brickhaven site. If you have questions, please do not hesitate to contact us at 704.338.6700 or Mark.Filardi@hdrinc.com.

Sincerely,

HDR Engineering, Inc. of the Carolinas

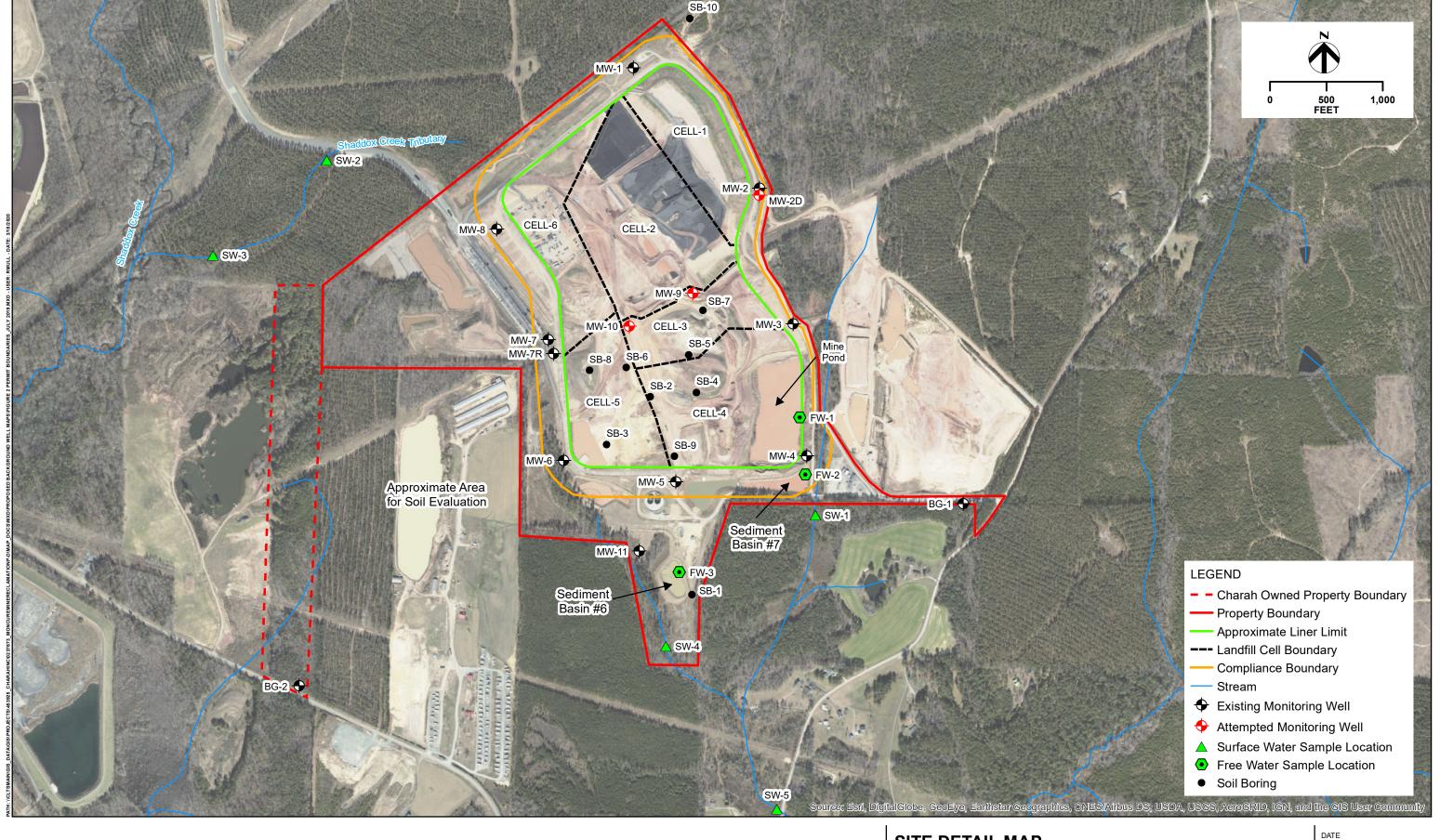
Mark Filardi, L.G. Senior Geologist

Attachments:

Attachment 1 - Site Detail Map

Cc: Norman Divers - Charah Solutions, Inc.

Mike Plummer, PE - HDR





SITE DETAIL MAP CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

FIGURE

APRIL 2020

ATTACHMENT 1

В

Appendix B – Ash and Soil Laboratory Reports

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ANALYTICAL & CONSULTING CHEMISTS

## **Environmental Chemists, Inc.**

6602 Windmill Way • Wilmington, NC 28405 (910) 392-0223 (Lab) • (910) 392-4424 (Fax)

710 Bowsertown Road • Manteo, NC 27954 (252) 473-5702

NCDENR: DWQ CERTIFICATE #94. DLS CERTIFICATE #37729

**Progress Energy - L.V. Sutton Plant** 

28401

801 Sutton Plant Road

Wilmington NC

Attention: R. Kent Tyndall

Date of Report: Jun 28, 2012

Customer PO #:

Report #:

2012-06128

Report to:

R. Kent Tyndall

**Project ID:** 

		Project ID:					
Lab ID	Sample ID:	Collect D	Matrix		Sampled by		
12-14940	Site: Ash Sample	6/8/2012	2:00 PM	Solid/Sludge	е	Greg Brown	
Test		Method		Resu	lts	D	ate Analyzed
Total Soli	ds (%)	SM 2540 B		61.2	%	- Control	06/12/2012
Chlordane	е	SW 846 Method 8081B/3510		<0.0005		_	06/21/2012
Endrin		SW 846 Method 8081B/3510		<0.00015			06/21/2012
Heptachlor		SW 846 Method 8081B/3510		<0.00015	_		06/21/2012
Heptachlo	or epoxide	SW 846 Method 8081B/3510		<0.00015	-		06/21/2012
Lindane		SW 846 Method 8081B/3510	<0.00015 mg/L			06/21/2012	
Methoxycl	hlor	SW 846 Method 8081B/3510	<0.00015 mg/L			06/21/2012	
Toxaphen	е	SW 846 Method 8081B/3510		<0.0005 mg/L			06/21/2012
1,4-Dichlo	robenzene (TCLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
2,4,5-Trich	nlorophenol (TCLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
2,4,6-Trich	nlorophenol (TCLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
2,4-Dinitro	toluene (TCLP)	SW 846 method 8270/3510		<0.005			06/11/2012
Cresol (TC	CLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
Hexachlor	o-1,3-butadiene (TCLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
Hexachlor	obenzene (TCLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
Hexachloroethane (TCLP)		SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
m + p-Cresol (TCLP)		SW 846 method 8270/3510		<0.005			06/11/2012
Nitrobenze	ne (TCLP)	SW 846 method 8270/3510		<0.005	_		06/11/2012
o-Cresol (TCLP)		SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
Pentachlorophenol (TCLP)		SW 846 method 8270/3510		<0.025			06/11/2012
Pyridine (T	CLP)	SW 846 method 8270/3510		<0.005	mg/L		06/11/2012
2,4,5-TP		SW846 Method 8151A		<0.00333 1			06/25/2012
2,4-D		SW846 Method 8151A		<0.0133 r			06/25/2012
1,1-Dichloroethylene		SW846 Method 8260/5030		< 0.01 r	mg/L		6/19/2012
1,2-Dichloroethane		SW846 Method 8260/5030		< 0.01 r	_		6/19/2012
Benzene		SW846 Method 8260/5030		< 0.01 r			6/19/2012
Carbon Tetrachloride		SW846 Method 8260/5030		< 0.01 r			6/19/2012

Report #:: 2012-06128



**ANALYTICAL & CONSULTING CHEMISTS** 

# **Environmental Chemists, Inc.**

6602 Windmill Way • Wilmington, NC 28405 (910) 392-0223 (Lab) • (910) 392-4424 (Fax)

710 Bowsertown Road • Manteo, NC 27954 (252) 473-5702

NCDENR: DWQ CERTIFICATE #94. DLS CERTIFICATE #37729

**Progress Energy - L.V. Sutton Plant** 

801 Sutton Plant Road

Wilmington

NC 28401

lin Paice

Attention: R. Kent Tyndall

Date of Report: Jun 28, 2012

**Customer PO #:** 

2012-06128

Report #: Report to:

R. Kent Tyndall

**Project ID:** 

		i roject ib.	
Chlorobenzene	SW846 Method 8260/5030	< 0.01 mg/L	6/19/2012
Chloroform	SW846 Method 8260/5030	< 0.01 mg/L	6/19/2012
Methyl ethyl ketone	SW846 Method 8260/5030	< 0.05 mg/L	6/19/2012
Tetrachloroethylene	SW846 Method 8260/5030	< 0.01 mg/L	6/19/2012
Trichloroethylene	SW846 Method 8260/5030	< 0.01 mg/L	6/19/2012
Vinyl Chloride	SW846 Method 8260/5030	< 0.01 mg/L	6/19/2012
TCLP Metals			
Arsenic	EPA 200.7	<0.100 mg/L	06/14/2012
Barium	EPA 200.7	3.00 mg/L	06/14/2012
Cadmium	EPA 200.7	<0.100 mg/L	06/14/2012
Chromium	EPA 200.7	<0.100 mg/L	06/14/2012
Lead	EPA 200.7	<0.100 mg/L	06/14/2012
Selenium	EPA 200.7	<0.100 mg/L	06/14/2012
Silver	EPA 200.7	<0.100 mg/L	06/14/2012
Mercury	EPA 245.1	<0.002 mg/L	06/28/2012

Comment:

Reviewed by:

Report #:: 2012-06128

VITACH PGN USINESS 282

ERE)

ENVIRONMENTAL CIJEMISTS, INC

Sample Collection and Chain of Custody. NCDENIC DWQ Certificate #94, DLS Certificate #37729

28401

801 Sutton Steam Plant Rd, Wilmington, NC

ST =Stream,

went, B = Effluent, W = Well,

(Tignt: Progress Energy-Sutton Plant,

GRA BRANK

Sample Type: 1 = 1

Collected By:

Analytical & Consulting Chemists

0128 Wilmington, NC 28405 Email: Echem, V@aud, com Phone: (910) 392-0223 Pax: (910) 392-4424 6602 Windmill Way Report No:

See state comi ANALYSIS REQUESTED RCRA Metal TCLP 70.7 d'IDL 8 RCRA Metal 8 RCRA Metal 8 RCRA Metal 8 RCRA Metal (\*\* RUSH \*\*) (\*\* RUSH \*\*) (\*\* RUSH \*\*) (\*\* RUSH \*\*) NOTICE - DECHLORINATION: Samples for Ammonia, TKN, Cyanide, Phenol, and Bacteria must be dechlorinated 00 AGELO OIHL PRESERVATION HOEN HAO2 SO =Soil, SL= Sludge Other: 'ostH (0.2 ppm or less) in the field at the time of collection. See reverse side for instructions. HCF NONE KLMBER TYB ID Пŷш Chlorine Container (P or G ) 10 Composite Sample Type TEMP Collection TIME DATE Sample Identification Pransfer C sy

Date/lime Resample Requested Received By: Rejected: Date/Time Accepted: Relinquished By: Rent Tyndan l'emperature wi

Comments: 45.5 Delivered By:

Received By:





### **Analytical Laboratory**

13339 Hagers Ferry Road Huntersville, NC 28078-7929 McGuire Nuclear Complex - MG03A2 Phone: 980-875-5245 Fax: 980-875-4349

### **Order Summary Report**

Order Number:	J14090369				
Project Name:					
Customer Name(s):	Robert Wylie, Sean DeNeald	e, Andy Tinsley			
Customer Address:	175 Steam Plant Rd				
	Mail Code: Riverbend Stear	m Station			
	Mt Holly, NC 28120				
Lab Contact:	Jason C Perkins	Phone:	980-875-5348		
Report Authorized By: (Signature)		Dat	e:	9/30/2014	
(3	Jason C Perkins				

#### **Program Comments:**

Please contact the Program Manager (Jason C Perkins) with any questions regarding this report.

#### **Data Flags & Calculations:**

Any analytical tests or individual analytes within a test flagged with a Qualifier indicate a deviation from the method quality system or quality control requirement. The qualifier description is found at the end of the Certificate of Analysis (sample results) under the qualifiers heading. All results are reported on a dry weight basis unless otherwise noted. Subcontracted data included on the Duke Certificate of Analysis is to be used as information only. Certified vendor results can be found in the subcontracted lab final report. Duke Energy Analytical Laboratory subcontracts analyses to other vendor laboratories that have been qualified by Duke Energy to perform these analyses except where noted.

#### Data Package:

This data package includes analytical results that are applicable only to the samples described in this narrative. An estimation of the uncertainty of measurement for the results in the report is available upon request. This report shall not be reproduced, except in full, without the written consent of the Analytical Laboratory. Please contact the Analytical laboratory with any questions. The order of individual sections within this report is as follows:

Job Summary Report, Sample Identification, Technical Validation of Data Package, Analytical Laboratory Certificate of Analysis, Analytical Laboratory QC Reports, Sub-contracted Laboratory Results, Customer Specific Data Sheets, Reports & Documentation, Customer Database Entries, Test Case Narratives, Chain of Custody (COC)

#### Certification:

The Analytical Laboratory holds the following State Certifications: North Carolina (DENR) Certificate #248, South Carolina (DHEC) Laboratory ID # 99005. Contact the Analytical Laboratory for definitive information about the certification status of specific methods.

Sample ID	Plant/Station	Collection Date and Time	Collected By	Sample Description
2014027417	RIVERBEND	05-Aug-14	ILLEGIBLE	B-101 (17-27, 27-37)
2014027418	RIVERBEND	06-Aug-14	ILLEGIBLE	B-101 (43.5, 47-57)
2014027419	RIVERBEND	07-Aug-14	ILLEGIBLE	B-102 (3.5-7)
2014027420	RIVERBEND	07-Aug-14	ILLEGIBLE	B-102 (14-17, 17-27)
2014027421	RIVERBEND	07-Aug-14	ILLEGIBLE	B-102 (39)
2014027422	RIVERBEND	07-Aug-14	ILLEGIBLE	B-116 (3.5-7)
2014027423	RIVERBEND	07-Aug-14	ILLEGIBLE	B-116 (7-17)
2014027424	RIVERBEND	07-Aug-14	ILLEGIBLE	B-117 (6-7, 7-17)
2014027425	RIVERBEND	07-Aug-14	ILLEGIBLE	B-117 (24.6)
2014027426	RIVERBEND	08-Aug-14	ILLEGIBLE	B-119 (7-17)
2014027427	RIVERBEND	08-Aug-14	ILLEGIBLE	B-119 (17-27)

### **Technical Validation Review**

### **Checklist:**

COC and .pdf report are in agreement with sample totals and analyses (compliance programs and procedures).

All Results are less than the laboratory reporting limits.

☐ Yes ☐ No

All laboratory QA/QC requirements are acceptable.

☐ Yes ☐ No

### **Report Sections Included:**

✓ Job Summary Report	✓ Sub-contracted Laboratory Results
<b>☑</b> Sample Identification	☐ Customer Specific Data Sheets, Reports, & Documentation
✓ Technical Validation of Data Package	☐ Customer Database Entries
✓ Analytical Laboratory Certificate of Analysis	✓ Chain of Custody
☐ Analytical Laboratory QC Report	✓ Electronic Data Deliverable (EDD) Sent Separately

Reviewed By: DBA Account Date: 9/30/2014

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-101 (17-27, 27-37) Sample #: 2014027417

Collection Date: 05-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-101 (43.5, 47-57) Sample #: 2014027418

Collection Date: 06-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-102 (3.5-7) Sample #: 2014027419

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-102 (14-17, 17-27) Sample #: 2014027420

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRA TCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-102 (39) Sample #: 2014027421

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRA TCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-116 (3.5-7) Sample #: 2014027422

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-116 (7-17) Sample #: 2014027423

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRA TCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-117 (6-7, 7-17) Sample #: 2014027424

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-117 (24.6) Sample #: 2014027425

Collection Date: 07-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-119 (7-17) Sample #: 2014027426

Collection Date: 08-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

This report shall not be reproduced, except in full.

### Order # J14090369

Site: B-119 (17-27) Sample #: 2014027427

Collection Date: 08-Aug-14 Matrix: RCRA

Analyte Result Units Qualifiers RDL DF Method Analysis Date/Time Analyst

Miscellaneous Tests by a Vendor Laboratory - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

METALS ANALYSIS BY VENDOR LAB - (Analysis Performed by Test America)

Vendor Parameter Complete V\_T. America

PCBS - (Analysis Performed by Test America)

PCB Complete V\_T. America

RCRATCLP Metals by Vendor - (Analysis Performed by Test America)

# ANALYTICAL REPORT

TestAmerica Laboratories, Inc.

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

TestAmerica Job ID: 490-61841-1

Client Project/Site: Riverbend Dry Stack Ash J14090369

For:

Duke Energy Corporation 13339 Hagers Ferry Road Huntersville, North Carolina 28078

Attn: Lab Customer

( Fieldman

Authorized for release by: 9/30/2014 11:04:23 AM

Shali Brown, Project Manager II (615)301-5031

shali.brown@testamericainc.com

.....LINKS .....

Review your project results through

Total Access

**Have a Question?** 



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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Client: Duke Energy Corporation Project/Site: Riverbend Dry Stack Ash J14090369

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### **Sample Summary**

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
490-61841-1	B-101 (17-27, 27-37)	Solid	08/05/14 01:01	09/19/14 08:30
490-61841-2	B-101 (43.5, 47-57)	Solid	08/06/14 01:01	09/19/14 08:30
490-61841-3	B-102 (3.5-7)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-4	B-102 (14-17, 17-27)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-5	B-102 (3a)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-6	B-116 (3.5-7)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-7	B-116 (7-17)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-8	B-117 (6-7, 7-17)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-9	B-117 (24.6)	Solid	08/07/14 01:01	09/19/14 08:30
490-61841-10	B-119 (7-17)	Solid	08/08/14 01:01	09/19/14 08:30
490-61841-11	B-119 (17-27)	Solid	08/08/14 01:01	09/19/14 08:30

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Page 18 of 62

TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Job ID: 490-61841-1

Laboratory: TestAmerica Nashville

Narrative

#### **CASE NARRATIVE**

**Client: Duke Energy Corporation** 

Project: Riverbend Dry Stack Ash J14090369

Report Number: 490-61841-1

With the exceptions noted as flags or footnotes, standard analytical protocols were followed in the analysis of the samples and no problems were encountered or anomalies observed. In addition all laboratory quality control samples were within established control limits, with any exceptions noted below. Each sample was analyzed to achieve the lowest possible reporting limit within the constraints of the method. In some cases, due to interference or analytes present at high concentrations, samples were diluted. For diluted samples, the reporting limits are adjusted relative to the dilution required.

TestAmerica Nashville attests to the validity of the laboratory data generated by TestAmerica facilities reported herein. All analyses performed by TestAmerica facilities were done using established laboratory SOPs that incorporate QA/QC procedures described in the application methods. TestAmerica's operations groups have reviewed the data for compliance with the laboratory QA/QC plan, and data have been found to be compliant with laboratory protocols unless otherwise noted below.

The test results in this report meet all NELAP requirements for parameters for which accreditation is required or available. Any exceptions to NELAP requirements are noted in this report. Pursuant to NELAP, this report may not be reproduced, except in full, without the written approval of the laboratory.

Calculations are performed before rounding to avoid round-off errors in calculated results.

All holding times were met and proper preservation noted for the methods performed on these samples, unless otherwise detailed in the individual sections below.

All solid sample results are reported on an "as received" basis unless otherwise indicated by the presence of a % solids value in the method header.

This laboratory report is confidential and is intended for the sole use of TestAmerica and its client.

#### RECEIPT

The samples were received on 09/19/2014; the samples arrived in good condition, properly preserved and on ice. The temperature of the coolers at receipt was 21.5 C.

### Except:

The following sample(s) was received outside of holding time for Mercury: B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (14-17, 17-27) (490-61841-4), B-102 (3.5-7) (490-61841-3), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (24.6) (490-61841-9), B-117 (6-7, 7-17) (490-61841-8), B-119 (17-27) (490-61841-11), B-119 (7-17) (490-61841-10).

The following sample(s) was received at the laboratory outside the required temperature criteria for Mercury and Anions: B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (14-17, 17-27) (490-61841-4), B-102 (3.5-7) (490-61841-3), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (24.6) (490-61841-9), B-117 (6-7, 7-17) (490-61841-8), B-119 (17-27) (490-61841-11), B-119 (7-17) (490-61841-10). The client was contacted regarding this issue, and the laboratory was instructed to <<CHOOSE ONE>> proceed with/cancel analysis.

#### **POLYCHLORINATED BIPHENYLS (PCBS)**

Samples B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (3.5-7) (490-61841-3), B-102 (14-17, 17-27)

#### **Case Narrative**

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### Job ID: 490-61841-1 (Continued)

#### Laboratory: TestAmerica Nashville (Continued)

(490-61841-4), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (6-7, 7-17) (490-61841-8), B-117 (24.6) (490-61841-9), B-119 (7-17) (490-61841-10) and B-119 (17-27) (490-61841-11) were analyzed for polychlorinated biphenyls (PCBs) in accordance with EPA SW-846 Method 8082. The samples were prepared on 09/23/2014 and analyzed on 09/25/2014.

Surrogates are added during the extraction process prior to dilution. When the sample dilution is 5X or greater, surrogate recoveries are diluted out and no corrective action is required.

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

#### **TCLP METALS (ICP)**

Samples B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (3.5-7) (490-61841-3), B-102 (14-17, 17-27) (490-61841-4), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (6-7, 7-17) (490-61841-8), B-117 (24.6) (490-61841-9), B-119 (7-17) (490-61841-10) and B-119 (17-27) (490-61841-11) were analyzed for TCLP metals (ICP) in accordance with EPA SW-846 Method 1311/6010C. The samples were leached on 09/23/2014 and 09/24/2014, prepared on 09/24/2014 and 09/25/2014 and analyzed on 09/24/2014, 09/25/2014 and 09/26/2014.

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

#### **TCLP MERCURY**

Samples B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (3.5-7) (490-61841-3), B-102 (14-17, 17-27) (490-61841-4), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (6-7, 7-17) (490-61841-8), B-117 (24.6) (490-61841-9) and B-119 (7-17) (490-61841-10) were analyzed for TCLP mercury in accordance with EPA SW-846 Methods 1311/7470A. The samples were leached on 09/23/2014, prepared on 09/24/2014 and analyzed on 09/25/2014.

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

#### **ANIONS**

Samples B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (3.5-7) (490-61841-3), B-102 (14-17, 17-27) (490-61841-4), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (6-7, 7-17) (490-61841-8), B-117 (24.6) (490-61841-9), B-119 (7-17) (490-61841-10) and B-119 (17-27) (490-61841-11) were analyzed for anions in accordance with EPA SW-846 Method 9056A. The samples were leached on 09/23/2014 and analyzed on 09/25/2014 and 09/26/2014.

Sample B-117 (24.6) (490-61841-9)[100X] required dilution prior to analysis. The reporting limits have been adjusted accordingly.

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

#### PERCENT SOLIDS

Samples B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (3.5-7) (490-61841-3), B-102 (14-17, 17-27) (490-61841-4), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (6-7, 7-17) (490-61841-8), B-117 (24.6) (490-61841-9), B-119 (7-17) (490-61841-10) and B-119 (17-27) (490-61841-11) were analyzed for percent solids in accordance with EPA Method 160.3 MOD. The samples were analyzed on 09/22/2014.

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

#### **ORGANIC PREP**

Method(s) 1311: Insufficient sample was provided to perform the leaching procedure with the required 100g for the following sample(s): B-101 (17-27, 27-37) (490-61841-1), B-101 (43.5, 47-57) (490-61841-2), B-102 (14-17, 17-27) (490-61841-4), B-102 (3.5-7) (490-61841-3), B-102 (3a) (490-61841-5), B-116 (3.5-7) (490-61841-6), B-116 (7-17) (490-61841-7), B-117 (24.6) (490-61841-9), B-117 (6-7, 7-17) (490-61841-8), B-119 (7-17) (490-61841-10). The volume of leaching fluid was adjusted proportionally to maintain a 20:1 ratio of leaching fluid to weight of sample. Reporting limits (RLs) are not affected.

Method(s) 1311: Insufficient sample was provided to perform the leaching procedure with the required 100g for the following sample(s): B-119 (17-27) (490-61841-11). The volume of leaching fluid was adjusted proportionally to maintain a 20:1 ratio of leaching fluid to weight of sample. Reporting limits (RLs) are not affected.

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### **Case Narrative**

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Client: Duke Energy Corporation TestAmerica Job ID: 490-61841-1

Project/Site: Riverbend Dry Stack Ash J14090369

Job ID: 490-61841-1 (Continued)

Laboratory: TestAmerica Nashville (Continued)

### **SUBCONTRACT WORK - ASBESTOS**

Method Asbestos: This method was subcontracted to EMLab P&K Fort Lauderdale. The subcontract laboratory certification is different from that of the facility issuing the final report.

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### **Definitions/Glossary**

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Reporting Limit or Requested Limit (Radiochemistry)

Toxicity Equivalent Factor (Dioxin)

Toxicity Equivalent Quotient (Dioxin)

Relative Percent Difference, a measure of the relative difference between two points

### **Qualifiers**

### Metals

Qualifier	Qualifier Description
Н	Sample was prepped or analyzed beyond the specified holding time

### **Glossary**

RL

RPD

TEF

TEQ

Abbreviation	These commonly used abbreviations may or may not be present in this report.
n	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

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-101 (17-27, 27-37)

Date Collected: 08/05/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-1

Matrix: Solid
Percent Solids: 78.1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0333	mg/Kg	₩	09/23/14 16:56	09/25/14 12:50	1
PCB-1221	ND		0.0333	mg/Kg	₩	09/23/14 16:56	09/25/14 12:50	1
PCB-1232	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 12:50	1
PCB-1242	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 12:50	1
PCB-1248	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 12:50	•
PCB-1254	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 12:50	1
PCB-1260	ND		0.0333	mg/Kg	\$	09/23/14 16:56	09/25/14 12:50	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	65		20 - 150			09/23/14 16:56	09/25/14 12:50	1
Tetrachloro-m-xylene	51		19 - 147			09/23/14 16:56	09/25/14 12:50	1
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) -	296		12.9	mg/Kg	<u> </u>		09/25/14 01:11	
Method: 6010C - Metals (ICP) - Analyte	TCLP Result	Qualifier	RL	Unit	ф Д	Prepared	Analyzed	
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		Prepared 09/24/14 09:51		Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result	Qualifier	RL	Unit			Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	<b>Analyzed</b> 09/24/14 22:05	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	TCLP Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:05 09/24/14 22:05	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	TCLP  Result  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100	<b>Unit</b> mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	TCLP  Result  ND  ND  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100 0.500	Unit mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	Unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/25/14 13:03	Dil Fac 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/25/14 13:03 09/24/14 22:05	Dil Fac 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/24/14 22:05 09/25/14 13:03 09/24/14 22:05	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/25/14 13:03  09/24/14 22:05  09/25/14 13:03	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  Mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/25/14 13:03  09/24/14 22:05  09/25/14 13:03	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury General Chemistry	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  Mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/25/14 13:03  09/24/14 22:05  09/25/14 13:03	Dil Fac  1 1 1 1 1 1 1 1 1 Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier H	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/24/14 22:05  09/25/14 13:03  09/24/14 22:05  09/25/14 13:03  Analyzed  09/25/14 10:28	Dil Fac  Dil Fac  Dil Fac  1  Dil Fac

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-101 (43.5, 47-57)

Date Collected: 08/06/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-2

Matrix: Solid
Percent Solids: 75.2

Method: 8082A - Polychlorinate Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0331	mg/Kg	<u></u>	09/23/14 16:56	09/25/14 13:59	
PCB-1221	ND		0.0331	mg/Kg	☼	09/23/14 16:56	09/25/14 13:59	
PCB-1232	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 13:59	
PCB-1242	ND		0.0331	mg/Kg		09/23/14 16:56	09/25/14 13:59	
PCB-1248	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 13:59	
PCB-1254	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 13:59	
PCB-1260	ND		0.0331	mg/Kg		09/23/14 16:56	09/25/14 13:59	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fa
DCB Decachlorobiphenyl (Surr)	77		20 - 150			09/23/14 16:56	09/25/14 13:59	
Tetrachloro-m-xylene	57		19 - 147			09/23/14 16:56	09/25/14 13:59	
Method: 9056A - Anions, Ion C	hromatography -	Soluble						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
• •					_			
Sulfate  Method: 6010C - Metals (ICP) -	539		13.1	mg/Kg	<u>-</u>		09/25/14 01:31	
Sulfate  Method: 6010C - Metals (ICP) -  Analyte	TCLP Result	Qualifier	13.1	mg/Kg		Prepared	09/25/14 01:31  Analyzed	Dil Fa
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic	TCLP Result ND	<u> </u>	13.1 RL 0.500	mg/Kg  Unit  mg/L	<del>\</del>	Prepared 09/24/14 09:51	09/25/14 01:31  Analyzed  09/24/14 22:28	Dil Fa
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium	TCLP Result ND ND	<u> </u>	13.1  RL  0.500  10.0	mg/Kg  Unit  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51	09/25/14 01:31  Analyzed 09/24/14 22:28 09/24/14 22:28	Dil Fa
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium	TCLP Result ND	<u> </u>	13.1  RL  0.500  10.0  0.100	mg/Kg  Unit  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51	09/25/14 01:31  Analyzed  09/24/14 22:28	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	TCLP  Result  ND  ND  ND	<u> </u>	13.1  RL  0.500  10.0	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	09/25/14 01:31  Analyzed  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	TCLP  Result  ND  ND  ND  ND  ND	<u> </u>	RL 0.500 10.0 0.100 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28	Dil Fa
Sulfate	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND	<u> </u>	RL 0.500 10.0 0.100 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 13:25	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	<u> </u>	13.1  RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 13:25 09/24/14 22:28	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	<u> </u>	13.1  RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del>\</del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 13:25 09/24/14 22:28	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA Analyte	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	13.1  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 13:25  09/24/14 13:25	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	13.1  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100  RL	mg/Kg  Unit  mg/L   <u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/25/14 13:25  09/25/14 13:25  Analyzed	Dil Fa	
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury  General Chemistry	Result	Qualifier	13.1  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100  RL	mg/Kg  Unit  mg/L   <u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/24/14 22:28  09/25/14 13:25  09/25/14 13:25  Analyzed	Dil Fac	
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead	Result	Qualifier  Qualifier  H	13.1  RL  0.500  10.0  0.100  0.500  0.500  0.500  0.100  RL  0.00200	mg/Kg  Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L		Prepared  09/24/14 09:51  09/24/14 09:51  09/24/14 09:51  09/24/14 09:51  09/24/14 09:51  09/24/14 09:51  Prepared  09/24/14 09:17	Analyzed 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/24/14 22:28 09/25/14 13:25 09/25/14 13:25  Analyzed  09/25/14 10:29	Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-102 (3.5-7)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-3

Matrix: Solid

Percent Solids: 78.0

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0333	mg/Kg	₩	09/23/14 16:56	09/25/14 14:22	1
PCB-1221	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 14:22	1
PCB-1232	ND		0.0333	mg/Kg	₩	09/23/14 16:56	09/25/14 14:22	1
PCB-1242	ND		0.0333	mg/Kg	\$	09/23/14 16:56	09/25/14 14:22	1
PCB-1248	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 14:22	1
PCB-1254	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 14:22	1
PCB-1260	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 14:22	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	70		20 - 150			09/23/14 16:56	09/25/14 14:22	1
Tetrachloro-m-xylene	62		19 - 147			09/23/14 16:56	09/25/14 14:22	1
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate Method: 6010C - Metals (ICP) -			12.6	mg/Kg	<del>\</del>		09/25/14 01:51	·
Method: 6010C - Metals (ICP) - Analyte	TCLP	Qualifier	RL	Unit		Prepared	Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	Analyzed 09/24/14 22:31	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:31 09/24/14 22:31	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	Result ND ND ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31	Dil Fac 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31	Dil Fac 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/25/14 13:28	Dil Fac 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/25/14 13:28 09/24/14 22:31	Dil Fac 1 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/24/14 22:31 09/25/14 13:28	Dil Fac 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/24/14 22:31  09/25/14 13:28	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/25/14 13:28  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/24/14 22:31  09/25/14 13:28	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/25/14 13:28  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	ND N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/25/14 13:28  Analyzed  Analyzed  Analyzed	Dil Fac 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury  General Chemistry		<b>Qualifier</b> H	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/24/14 22:31  09/25/14 13:28  09/25/14 13:28  Analyzed  09/25/14 10:34	Dil Fac  1 1 1 1 1 1 1 Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-102 (14-17, 17-27)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-4

Matrix: Solid Percent Solids: 76.9

Method: 8082A - Polychlorinate Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0326	mg/Kg	☼	09/23/14 16:56	09/25/14 14:45	1
PCB-1221	ND		0.0326	mg/Kg	☼	09/23/14 16:56	09/25/14 14:45	1
PCB-1232	ND		0.0326	mg/Kg	₽	09/23/14 16:56	09/25/14 14:45	
PCB-1242	ND		0.0326	mg/Kg	φ.	09/23/14 16:56	09/25/14 14:45	1
PCB-1248	ND		0.0326	mg/Kg	☼	09/23/14 16:56	09/25/14 14:45	1
PCB-1254	ND		0.0326	mg/Kg	☼	09/23/14 16:56	09/25/14 14:45	
PCB-1260	ND		0.0326	mg/Kg		09/23/14 16:56	09/25/14 14:45	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	78		20 - 150			09/23/14 16:56	09/25/14 14:45	1
Tetrachloro-m-xylene	60		19 - 147			09/23/14 16:56	09/25/14 14:45	1
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Allalyte		Quannon		Onit		ricparca	,u.,u	
Sulfate	315	<u>quamor</u>	12.9	mg/Kg	<u> </u>		09/25/14 02:51	1
Sulfate  Method: 6010C - Metals (ICP) - Analyte	315 TCLP Result	Qualifier	12.9	mg/Kg Unit		Prepared	09/25/14 02:51  Analyzed	
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic	315 TCLP  Result  ND	<u> </u>	12.9  RL 0.500	mg/Kg  Unit  mg/L	<del></del>	<u> </u>	09/25/14 02:51  Analyzed  09/24/14 22:35	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic	315 TCLP  Result  ND  ND	<u> </u>	12.9  RL  0.500  10.0	mg/Kg  Unit  mg/L  mg/L	<del></del>	Prepared	09/25/14 02:51  Analyzed 09/24/14 22:35 09/24/14 22:35	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium	315 TCLP  Result  ND	<u> </u>	12.9  RL 0.500	mg/Kg  Unit  mg/L	<del></del>	Prepared 09/24/14 09:51	09/25/14 02:51  Analyzed  09/24/14 22:35	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	315 TCLP  Result  ND  ND  ND  ND  ND  ND	<u> </u>	12.9  RL  0.500  10.0  0.100  0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	O9/25/14 02:51  Analyzed  O9/24/14 22:35  O9/24/14 22:35  O9/24/14 22:35  O9/24/14 22:35	Dil Fac 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	<u> </u>	RL 0.500 10.0 0.100 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	O9/25/14 02:51  Analyzed  O9/24/14 22:35  O9/24/14 22:35  O9/24/14 22:35	Dil Fac 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	315 TCLP  Result  ND  ND  ND  ND  ND  ND	<u> </u>	12.9  RL  0.500  10.0  0.100  0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	O9/25/14 02:51  Analyzed  O9/24/14 22:35  O9/24/14 22:35  O9/24/14 22:35  O9/24/14 22:35	Dil Fac 1 1 1 1
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	<u> </u>	RL 0.500 10.0 0.100 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/24/14 13:32	Dil Fac 1 1 1 1 1 1 1
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	315  TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	12.9  RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/25/14 13:32 09/24/14 22:35	Dil Fac 1 1 1 1 1
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	TCLP   Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier	12.9  RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<del></del>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/25/14 13:32 09/24/14 22:35	Dil Face 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	TCLP   Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier	12.9  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.500 0.100	mg/Kg  Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/25/14 13:32  09/25/14 13:32	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	TCLP   Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier	12.9  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100  RL	mg/Kg  Unit  mg/L   <u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/25/14 13:32  09/25/14 13:32  Analyzed	Dil Fac	
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA	TCLP   Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier	12.9  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100  RL  0.00200	mg/Kg  Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/24/14 22:35  09/25/14 13:32  09/25/14 13:32  Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury  General Chemistry	TCLP   Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier  Qualifier  H	12.9  RL  0.500 10.0 0.100 0.500 0.500 0.500 0.100  RL  0.00200	mg/Kg  Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L		Prepared 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51  Prepared 09/24/14 09:17	Analyzed 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/24/14 22:35 09/25/14 13:32 09/25/14 13:32  Analyzed  09/25/14 10:36	Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-102 (3a)

Date Collected: 08/07/14 01:01

Lab Sample ID: 490-61841-5

Matrix: Solid

Date Received: 09/19/14 08:30 Percent Solids: 76.2

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 15:55	
PCB-1221	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 15:55	
PCB-1232	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 15:55	
PCB-1242	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 15:55	
PCB-1248	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 15:55	
PCB-1254	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 15:55	
PCB-1260	ND		0.0331	mg/Kg	\$	09/23/14 16:56	09/25/14 15:55	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	84		20 - 150			09/23/14 16:56	09/25/14 15:55	
Tetrachloro-m-xylene	64		19 - 147			09/23/14 16:56	09/25/14 15:55	•
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
	255 TCLP		13.1	mg/Kg	<del>\</del>	·	09/25/14 03:11	
Method: 6010C - Metals (ICP) - Analyte	TCLP Result	Qualifier	RL	Unit	<u>\bar{\pi}</u>	Prepared	Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	<b>Analyzed</b> 09/24/14 22:38	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:38 09/24/14 22:38	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	Result ND ND ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/25/14 13:35	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/25/14 13:35 09/24/14 22:38	Dil Fa
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/24/14 22:38 09/25/14 13:35 09/24/14 22:38	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/25/14 13:35  09/24/14 22:38  09/25/14 13:35	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/25/14 13:35  09/25/14 13:35  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury	ND N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/25/14 13:35  09/25/14 13:35  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury  General Chemistry Analyte Percent Moisture	ND N	Qualifier H	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/24/14 22:38  09/25/14 13:35  09/25/14 13:35  Analyzed  09/25/14 10:37	Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-116 (3.5-7)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-6

Matrix: Solid	
Percent Solids: 77.4	

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0332	mg/Kg	\$	09/23/14 16:56	09/25/14 16:18	
PCB-1221	ND		0.0332	mg/Kg	₽	09/23/14 16:56	09/25/14 16:18	
PCB-1232	ND		0.0332	mg/Kg	₩	09/23/14 16:56	09/25/14 16:18	
PCB-1242	ND		0.0332	mg/Kg	₩.	09/23/14 16:56	09/25/14 16:18	
PCB-1248	ND		0.0332	mg/Kg	₽	09/23/14 16:56	09/25/14 16:18	
PCB-1254	ND		0.0332	mg/Kg	₩	09/23/14 16:56	09/25/14 16:18	
PCB-1260	ND		0.0332	mg/Kg		09/23/14 16:56	09/25/14 16:18	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fa
DCB Decachlorobiphenyl (Surr)	82		20 - 150			09/23/14 16:56	09/25/14 16:18	
Tetrachloro-m-xylene	68		19 - 147			09/23/14 16:56	09/25/14 16:18	:
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
Sulfate	105	· <del></del>	13.1	mg/Kg	☼		09/25/14 03:31	1
Analyte Arsenic	Result ND	Qualifier	RL 0.500	Unit ma/l	D	Prepared 09/24/14 09:51	Analyzed 09/24/14 22:42	Dil Fa
				mg/L				•
Barium Cadmium	ND ND		10.0 0.100	mg/L		09/24/14 09:51	09/24/14 22:42 09/24/14 22:42	
				mg/L		09/24/14 09:51		
Chromium	ND ND		0.500	mg/L		09/24/14 09:51	09/24/14 22:42	•
Silver			0.500	mg/L		09/24/14 09:51	09/25/14 13:39	•
Lead	ND		0.500	mg/L		09/24/14 09:51	09/24/14 22:42	
Selenium	ND		0.100	mg/L		09/24/14 09:51	09/25/14 13:39	,
Method: 7470A - Mercury (CVA	•	0 110			_			5.1.5
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
Mercury	ND	Н	0.00200	mg/L		09/24/14 09:17	09/25/14 10:38	•
General Chemistry	D14	Qualifier	RL	11-14	_	Dan and	Anabasal	D:: F-
		GUAIMER	KL.	Unit	D	Prepared	Analyzed	Dil Fac
Analyte					— <u> </u>			
Percent Moisture	23		0.10	% %			09/22/14 18:28 09/22/14 18:28	

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

**Client Sample ID: B-116 (7-17)** 

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30

Lab Sample ID: 490-61841-7

Matrix: Solid	
Percent Solids: 74.8	

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0330	mg/Kg	<u> </u>	09/23/14 16:56	09/25/14 16:41	1
PCB-1221	ND		0.0330	mg/Kg	₩	09/23/14 16:56	09/25/14 16:41	1
PCB-1232	ND		0.0330	mg/Kg	₩	09/23/14 16:56	09/25/14 16:41	1
PCB-1242	ND		0.0330	mg/Kg		09/23/14 16:56	09/25/14 16:41	1
PCB-1248	ND		0.0330	mg/Kg	₽	09/23/14 16:56	09/25/14 16:41	1
PCB-1254	ND		0.0330	mg/Kg	₽	09/23/14 16:56	09/25/14 16:41	1
PCB-1260	ND		0.0330	mg/Kg		09/23/14 16:56	09/25/14 16:41	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	85		20 - 150			09/23/14 16:56	09/25/14 16:41	1
Tetrachloro-m-xylene	71		19 - 147			09/23/14 16:56	09/25/14 16:41	1
Method: 9056A - Anions, Ion (	Chromatography	- Soluble						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate	198		13.3	mg/Kg	<del></del>		09/25/14 03:51	1
Analyte  Arsenic		Qualifier	RL 0.500	Unit	D	Prepared 09/24/14 09:51	Analyzed	Dil Fac
Arsenic	ND		0.500	mg/L		09/24/14 09:51	09/24/14 22:45	1
Barium	ND		10.0	mg/L		09/24/14 09:51	09/24/14 22:45	1
Cadmium	ND		0.100	mg/L		09/24/14 09:51	09/24/14 22:45	1
Chromium	ND		0.500	mg/L		09/24/14 09:51	09/24/14 22:45	1
Silver	ND		0.500	mg/L		09/24/14 09:51	09/25/14 13:42	1
Lead	ND		0.500	mg/L		09/24/14 09:51	09/24/14 22:45	1
Selenium	ND		0.100	mg/L		09/24/14 09:51	09/25/14 13:42	1
Method: 7470A - Mercury (CV	AA) - TCLP							
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Mercury	ND	Н	0.00200	mg/L		09/24/14 09:17	09/25/14 10:40	1
General Chemistry								
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	25		0.10	%			09/22/14 18:28	1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-117 (6-7, 7-17)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-8

Matrix: Solid
Percent Solids: 74.1

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:04	
PCB-1221	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:04	
PCB-1232	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:04	
PCB-1242	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:04	
PCB-1248	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:04	
PCB-1254	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:04	
PCB-1260	ND		0.0331	mg/Kg	\$	09/23/14 16:56	09/25/14 17:04	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	82		20 - 150			09/23/14 16:56	09/25/14 17:04	
Tetrachloro-m-xylene	68		19 - 147			09/23/14 16:56	09/25/14 17:04	
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
Sulfate	89.6 TCLP		13.3	mg/Kg	<del></del>	·	09/25/14 04:11	
Sulfate  Method: 6010C - Metals (ICP) - Analyte	TCLP Result	Qualifier	RL	Unit	<b>D</b>	Prepared	Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	<b>Analyzed</b> 09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium	Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:49 09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium  Cadmium	Result ND ND ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium  Cadmium  Chromium  Silver	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/25/14 13:46	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead Selenium	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/25/14 13:46 09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/24/14 22:49 09/25/14 13:46 09/24/14 22:49	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte  Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/25/14 13:46  09/24/14 22:49  09/25/14 13:46	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/25/14 13:46  09/25/14 13:46  Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury	ND N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/25/14 13:46  09/25/14 13:46  Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	ND N	Qualifier H	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:49  09/24/14 22:49  09/24/14 22:49  09/25/14 13:46  09/25/14 13:46  Analyzed  09/25/14 10:41	Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Client Sample ID: B-117 (24.6)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-9

Matrix: Solid
Percent Solids: 86.2

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0333	mg/Kg	\$	09/23/14 16:56	09/25/14 17:27	1
PCB-1221	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 17:27	1
PCB-1232	ND		0.0333	mg/Kg	₩	09/23/14 16:56	09/25/14 17:27	1
PCB-1242	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 17:27	1
PCB-1248	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 17:27	1
PCB-1254	ND		0.0333	mg/Kg	₽	09/23/14 16:56	09/25/14 17:27	1
PCB-1260	ND		0.0333	mg/Kg	\$	09/23/14 16:56	09/25/14 17:27	1
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	80		20 - 150			09/23/14 16:56	09/25/14 17:27	1
Tetrachloro-m-xylene	65		19 - 147			09/23/14 16:56	09/25/14 17:27	1
Method: 9056A - Anions, Ion C	hromatography	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate  Method: 6010C - Metals (ICP) -	15700		1170	mg/Kg	<del>*</del>		09/26/14 17:29	100
: Method: 6010C - Metals (ICP) -	TCLP	Qualifier	1170	mg/Kg Unit	<u> </u>	Prepared	09/26/14 17:29  Analyzed	
Method: 6010C - Metals (ICP) - Analyte	TCLP	Qualifier				Prepared 09/24/14 09:51		
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result	Qualifier	RL	Unit			Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	<b>Analyzed</b> 09/24/14 22:52	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:52 09/24/14 22:52	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	Result ND ND ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52	<b>Dil Fac</b> 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	Unit mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52	Dil Fac 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	Unit mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/25/14 13:49	Dil Fac 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/25/14 13:49 09/24/14 22:52	Dil Fac 1 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	Result ND	Qualifier  Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/24/14 22:52 09/25/14 13:49 09/24/14 22:52	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/25/14 13:49  09/25/14 13:49	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/25/14 13:49  09/25/14 13:49  Analyzed	1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury	ND N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/25/14 13:49  09/25/14 13:49  Analyzed	Dil Fac  1 1 1 1 1 1 1 1 Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	ND N	Qualifier H	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/24/14 22:52  09/25/14 13:49  09/25/14 13:49  Analyzed  09/25/14 10:43	Dil Fac  1 1 1 1 1 1 1 Dil Fac

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

**Client Sample ID: B-119 (7-17)** 

Date Collected: 08/08/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-10

Matrix: Solid
Percent Solids: 75.3

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:50	
PCB-1221	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:50	
PCB-1232	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:50	•
PCB-1242	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 17:50	1
PCB-1248	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:50	•
PCB-1254	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 17:50	•
PCB-1260	ND		0.0331	mg/Kg	\$	09/23/14 16:56	09/25/14 17:50	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	90		20 - 150			09/23/14 16:56	09/25/14 17:50	1
Tetrachloro-m-xylene	77		19 - 147			09/23/14 16:56	09/25/14 17:50	1
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfate Method: 6010C - Metals (ICP) -	570 TCLP		13.1	mg/Kg	<del></del>	· · ·	09/25/14 04:51	1
Method: 6010C - Metals (ICP) - Analyte	TCLP	Qualifier	RL	Unit	— ≅ 	Prepared	Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	Result ND	Qualifier	RL 0.500	Unit mg/L		09/24/14 09:51	<b>Analyzed</b> 09/24/14 22:56	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:56 09/24/14 22:56	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	Result ND ND ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:56 09/24/14 22:56 09/24/14 22:56	<b>Dil Fac</b>
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	Result ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56	Dil Fac 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04	Dil Fac 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04  09/24/14 22:56	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	Result ND ND ND ND ND ND ND ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04	Dil Fac 1 1 1 1 1
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:56 09/24/14 22:56 09/24/14 22:56 09/24/14 22:56 09/25/14 14:04 09/24/14 22:56	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L mg/L		09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed 09/24/14 22:56 09/24/14 22:56 09/24/14 22:56 09/24/14 22:56 09/25/14 14:04 09/24/14 22:56	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	Result ND		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04  09/25/14 14:04	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	Result ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04  09/25/14 14:04  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	ND N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04  09/25/14 14:04  Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury	ND N	<b>Qualifier</b> H	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 09/24/14 09:51 Prepared	Analyzed  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/24/14 22:56  09/25/14 14:04  09/25/14 14:04  Analyzed  09/25/14 10:44	Dil Fac  1 1 1 1 1 1 1 1 1 Dil Fac

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

**Client Sample ID: B-119 (17-27)** 

Date Collected: 08/08/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-11

Matrix: Solid	ı
Parcent Solids: 71 0	١

Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0331	mg/Kg	<del>*</del>	09/23/14 16:56	09/25/14 18:13	
PCB-1221	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 18:13	
PCB-1232	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 18:13	
PCB-1242	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 18:13	
PCB-1248	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 18:13	
PCB-1254	ND		0.0331	mg/Kg	₽	09/23/14 16:56	09/25/14 18:13	
PCB-1260	ND		0.0331	mg/Kg	₩	09/23/14 16:56	09/25/14 18:13	
Surrogate	%Recovery	Qualifier	Limits			Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	95		20 - 150			09/23/14 16:56	09/25/14 18:13	
Tetrachloro-m-xylene	78		19 - 147			09/23/14 16:56	09/25/14 18:13	
Method: 9056A - Anions, Ion C	hromatography -	- Soluble						
Analyte		Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fa
	TCLP 415		14.1	mg/Kg	<del>*</del>		09/25/14 05:11	
Method: 6010C - Metals (ICP) - Analyte	TCLP Result	Qualifier	RL	Unit		Prepared	Analyzed	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic	TCLP Result ND	Qualifier	RL 0.500	Unit mg/L		09/25/14 10:31	<b>Analyzed</b> 09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium	TCLP Result ND ND	Qualifier	RL 0.500 10.0	Unit mg/L mg/L		09/25/14 10:31 09/25/14 10:31	Analyzed 09/25/14 21:20 09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium	TCLP  Result  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100	Unit mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium	TCLP  Result  ND  ND  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead	TCLP  Result  ND  ND  ND  ND  ND	Qualifier	RL 0.500 10.0 0.100 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500	unit mg/L mg/L mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium Method: 7470A - Mercury (CVA	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N		RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier  Qualifier  H	RL 0.500 10.0 0.100 0.500 0.500 0.500	mg/L mg/L mg/L mg/L mg/L mg/L		09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20 09/25/14 21:20	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte  Mercury	TCLP  Result  ND  ND  ND  ND  ND  ND  ND  ND  ND  N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/26/14 13:54	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury	Result   ND   ND   ND   ND   ND   ND   ND   N	Qualifier	RL 0.500 10.0 0.100 0.500 0.500 0.500 0.100	Unit  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L  mg/L	<u>D</u>	09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/26/14 13:54	Dil Fac
Method: 6010C - Metals (ICP) - Analyte Arsenic Barium Cadmium Chromium Silver Lead Selenium  Method: 7470A - Mercury (CVA Analyte Mercury  General Chemistry Analyte Percent Moisture	Result   ND   ND   ND   ND   ND   ND   ND   N	<b>Qualifier</b> H	RL 0.500 10.0 0.100 0.500 0.500 0.100 RL 0.00200	Unit mg/L mg/L mg/L mg/L mg/L mg/L mg/L mg/L	<u>D</u>	09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 09/25/14 10:31 Prepared	Analyzed  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/25/14 21:20  09/26/14 13:54  Analyzed  09/25/14 11:23	Dil Fac

### **QC Sample Results**

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### Method: 8082A - Polychlorinated Biphenyls (PCBs) by Gas Chromatography

Lab Sample ID: MB 490-192666/1-A

Matrix: Solid

Analysis Batch: 193067

Client Sample ID: Method Blank

Prep Type: Total/NA	
Pron Batch: 192666	

	IVID	IVID						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
PCB-1016	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1221	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1232	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1242	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1248	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1254	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1
PCB-1260	ND		0.0333	mg/Kg		09/23/14 16:56	09/25/14 10:54	1

MB MB

Surrogate	%Recovery Qualifier	Limits	Prepared	Analyzed	Dil Fac
DCB Decachlorobiphenyl (Surr)	87	20 - 150	09/23/14 16:56	09/25/14 10:54	1
Tetrachloro-m-xylene	94	19 - 147	09/23/14 16:56	09/25/14 10:54	1

Lab Sample ID: LCS 490-192666/2-A

**Matrix: Solid** 

Analysis Batch: 193067

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

**Prep Batch: 192666** 

	<b>Бріке</b>	LCS LCS				%Rec.	
Analyte	Added	Result Qualifier	Unit	D	%Rec	Limits	
PCB-1016	 0.167	0.1524	mg/Kg	_	91	65 - 125	
PCB-1260	0.167	0.1535	mg/Kg		92	52 - 150	

LCS LCS

Surrogate	%Recovery	Qualifier	Limits
DCB Decachlorobiphenyl (Surr)	86		20 - 150
Tetrachloro-m-xylene	66		19 - 147

Lab Sample ID: 490-61841-1 MS

Matrix: Solid

Analysis Batch: 193067

Client Sample ID: B-101 (17-27, 27-37)

Prep Type: Total/NA

**Prep Batch: 192666** 

	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
PCB-1016	ND		0.210	0.1755		mg/Kg	☼	83	42 - 140	
PCB-1260	ND		0.210	0.1746		mg/Kg	₩	83	37 - 159	

	MS	MS	
Surrogate	%Recovery	Qualifier	Limits
DCB Decachlorobiphenyl (Surr)	73		20 - 150
Tetrachloro-m-xylene	60		19 - 147

Lab Sample ID: 490-61841-1 MSD

**Matrix: Solid** 

Analysis Batch: 193067

Client Sample ID: B-101 (17-27, 27-37)

Prep Type: Total/NA

**Prep Batch: 192666** 

-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
PCB-1016	ND		0.211	0.1784		mg/Kg	*	84	42 - 140	2	50	
PCB-1260	ND		0.211	0.1694		mg/Kg	₩	80	37 - 159	3	50	

	MSD	MSD	
Surrogate	%Recovery	Qualifier	Limits
DCB Decachlorobiphenyl (Surr)	73		20 - 150
Tetrachloro-m-xvlene	49		19 - 147

TestAmerica Nashville

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9/30/2014

Client: Duke Energy Corporation

Lab Sample ID: MB 490-192629/1-A

Project/Site: Riverbend Dry Stack Ash J14090369

Method: 9056A - Anions, Ion Chromatography

Client Sample ID: Method Blank

**Prep Type: Soluble** 

мв мв

Result Qualifier RL Unit D Analyzed Dil Fac Analyte Prepared 10.1 09/24/14 21:10 Sulfate ND mg/Kg

Lab Sample ID: LCS 490-192629/2-A Client Sample ID: Lab Control Sample **Matrix: Solid Prep Type: Soluble** 

Analysis Batch: 192913

Analysis Batch: 192913

**Matrix: Solid** 

LCS LCS Spike %Rec. Added Analyte Result Qualifier Unit %Rec Limits Sulfate 493 576.1 mg/Kg 117 80 - 120

Lab Sample ID: LCSD 490-192629/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Solid Prep Type: Soluble** 

Analysis Batch: 192913

Spike LCSD LCSD %Rec. RPD Analyte Added Result Qualifier Unit D %Rec Limits RPD Limit Sulfate 499 568.4 mg/Kg

Lab Sample ID: 490-61390-A-1-B MS Client Sample ID: Matrix Spike

**Matrix: Solid Prep Type: Soluble** 

Analysis Batch: 192913

Sample Sample Spike MS MS %Rec. Result Qualifier Added Analyte Result Qualifier Unit %Rec Limits Sulfate 13.3 624 720 1 mg/Kg 113 80 - 120

Lab Sample ID: 490-61390-A-1-C MSD Client Sample ID: Matrix Spike Duplicate **Matrix: Solid Prep Type: Soluble** 

Analysis Batch: 192913

Sample Sample Spike MSD MSD %Rec. RPD Added RPD Analyte Result Qualifier Result Qualifier Unit D Limits Limit %Rec Sulfate 606 80 - 120 13.3 705.0 mg/Kg 114 20

Lab Sample ID: MB 490-192629/1-A Client Sample ID: Method Blank **Prep Type: Soluble** 

Matrix: Solid

Analysis Batch: 193424

MB MB RL Unit Analyte Result Qualifier D Prepared Analyzed Dil Fac 10 1 Sulfate ND mg/Kg 09/26/14 16:28

Lab Sample ID: LCS 490-192629/2-A **Client Sample ID: Lab Control Sample Prep Type: Soluble** 

**Matrix: Solid** 

Analysis Batch: 193424

LCS LCS Spike %Rec. Added Analyte Result Qualifier Unit %Rec Limits Sulfate 493 536.8 mg/Kg 109 80 - 120

Lab Sample ID: LCSD 490-192629/3-A Client Sample ID: Lab Control Sample Dup **Matrix: Solid Prep Type: Soluble** 

Analysis Batch: 193424

Spike LCSD LCSD %Rec. RPD Analyte Added Result Qualifier Unit %Rec Limits RPD Limit Sulfate 499 527.2 mg/Kg 106

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Client Sample ID: Method Blank

Prep Type: Total/NA

**Prep Batch: 192760** 

**Prep Batch: 192760** 

Method: 6010C - Metals (ICP)

Lab Sample ID: MB 490-192760/1-A **Matrix: Solid** 

Analysis Batch: 193047

Client Sample ID: Method Blank Prep Type: Total/NA **Prep Batch: 192760** 

	MB	MB						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.500	mg/L		09/24/14 09:51	09/24/14 21:55	1
Barium	ND		10.0	mg/L		09/24/14 09:51	09/24/14 21:55	1
Cadmium	ND		0.100	mg/L		09/24/14 09:51	09/24/14 21:55	1
Chromium	ND		0.500	mg/L		09/24/14 09:51	09/24/14 21:55	1
Lead	ND		0.500	mg/L		09/24/14 09:51	09/24/14 21:55	1

Lab Sample ID: MB 490-192760/1-A Matrix: Solid

Analysis Batch: 193262

	MB	MB						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.500	mg/L		09/24/14 09:51	09/25/14 12:53	1
Selenium	ND		0.100	mg/L		09/24/14 09:51	09/25/14 12:53	1

Lab Sample ID: MB 490-192760/1-A Client Sample ID: Method Blank Prep Type: Total/NA

**Matrix: Solid** 

Analysis Batch: 193309

	МВ	МВ						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.500	mg/L		09/24/14 09:51	09/25/14 16:29	1
Selenium	ND		0.100	mg/L		09/24/14 09:51	09/25/14 16:29	1

Lab Sample ID: LCS 490-192760/3-A **Client Sample ID: Lab Control Sample Matrix: Solid** Prep Type: Total/NA Analysis Batch: 193047 **Prep Batch: 192760** 

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	2.00	2.011		mg/L		101	80 - 120	
Barium	20.0	20.11		mg/L		101	80 - 120	
Cadmium	2.00	1.969		mg/L		98	80 - 120	
Chromium	10.0	9.734		mg/L		97	80 - 120	
Lead	10.0	10.66		mg/L		107	80 - 120	

Lab Sample ID: LCS 490-192760/3-A **Client Sample ID: Lab Control Sample Matrix: Solid** Prep Type: Total/NA Analysis Batch: 193262 **Prep Batch: 192760** 

	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Silver	2.00	1.921		mg/L		96	80 - 120	
Selenium	2.00	2.049		mg/L		102	80 - 120	

Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Silver	2.00	1.921		mg/L		96	80 - 120	 
Selenium	2.00	2.049		mg/L		102	80 - 120	
_								

Lab Sample ID: LCS 490-192760/3-A **Client Sample ID: Lab Control Sample** Matrix: Solid Prep Type: Total/NA Analysis Batch: 193309 **Prep Batch: 192760** 

ı	7 maryolo Batom 100000								
		Spike	LCS	LCS				%Rec.	
	Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
	Silver	 2.00	1.988		mg/L		99	80 - 120	
	Selenium	2.00	2.239		mg/L		112	80 - 120	

### **QC Sample Results**

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: MB 490-193131/1-A

**Matrix: Solid** 

Analysis Batch: 193350

Client Sample ID: Method Blank Prep Type: Total/NA

**Prep Batch: 193131** 

	MB	MB						
Analyte	Result	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND		0.500	mg/L		09/25/14 10:30	09/25/14 20:16	1
Barium	ND		10.0	mg/L		09/25/14 10:30	09/25/14 20:16	1
Cadmium	ND		0.100	mg/L		09/25/14 10:30	09/25/14 20:16	1
Chromium	ND		0.500	mg/L		09/25/14 10:30	09/25/14 20:16	1
Silver	ND		0.500	mg/L		09/25/14 10:30	09/25/14 20:16	1
Lead	ND		0.500	mg/L		09/25/14 10:30	09/25/14 20:16	1

Lab Sample ID: MB 490-193131/1-A

**Matrix: Solid** 

Analysis Batch: 193538

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Client Sample ID: Method Blank

Prep Type: Total/NA **Prep Batch: 193131** 

Analyte	Result	Qualifier	RL	ι	Unit	D	Prepared	Analyzed	Dil Fac
Selenium	ND		0.100	r	mg/L		09/25/14 10:30	09/26/14 13:00	1

Lab Sample ID: LCS 490-193131/4-A **Client Sample ID: Lab Control Sample** 

**Matrix: Solid** 

Analysis Batch: 193350

Prep Type: Total/NA

**Prep Batch: 193131** 

Analysis Baton: 100000							1 Top Date	100101
	Spike	LCS	LCS				%Rec.	
Analyte	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	2.00	2.063		mg/L		103	80 - 120	
Barium	20.0	20.30		mg/L		102	80 - 120	
Cadmium	2.00	2.047		mg/L		102	80 - 120	
Chromium	10.0	10.33		mg/L		103	80 - 120	
Silver	2.00	1.892		mg/L		95	80 - 120	
Lead	10.0	11.02		mg/L		110	80 - 120	

Lab Sample ID: LCS 490-193131/4-A

**Matrix: Solid** 

Analysis Batch: 193538

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

**Prep Batch: 193131** 

%Rec.

Analyte	Added	Result	Qualifier Unit	D	%Rec	Limits
Selenium	2.00	2.058	mg/L		103	80 - 120

Spike

Lab Sample ID: LB 490-192582/1-C

**Matrix: Solid** 

Analysis Batch: 193047

Client Sample ID: Method Blank **Prep Type: TCLP** 

**Prep Batch: 192760** 

-	LB LB					-	
Analyte	Result Qualifi	ier RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND	0.500	mg/L		09/24/14 09:51	09/24/14 21:59	1
Barium	ND	10.0	mg/L		09/24/14 09:51	09/24/14 21:59	1
Cadmium	ND	0.100	mg/L		09/24/14 09:51	09/24/14 21:59	1
Chromium	ND	0.500	mg/L		09/24/14 09:51	09/24/14 21:59	1
Lead	ND	0.500	ma/l		09/24/14 09:51	09/24/14 21:59	1

LCS LCS

### **QC Sample Results**

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LB 490-192582/1-C

**Matrix: Solid** 

Analysis Batch: 193262

Client Sample ID: Method Blank

**Prep Type: TCLP** 

**Prep Batch: 192760** 

Analyte	Result (	Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Silver	ND		0.500	mg/L		09/24/14 09:51	09/25/14 12:56	1
Selenium	ND		0.100	mg/L		09/24/14 09:51	09/25/14 12:56	1

LB LB

ND

Lab Sample ID: 490-61841-1 MS Client Sample ID: B-101 (17-27, 27-37)

Matrix: Solid

Analysis Batch: 193047

**Prep Type: TCLP** 

**Prep Batch: 192760** 

/ maryoro Datom 1000 m									op =a	
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Arsenic	ND		2.00	2.087		mg/L		99	75 - 125	
Barium	ND		20.0	20.58		mg/L		93	75 <sub>-</sub> 125	
Cadmium	ND		2.00	1.929		mg/L		96	75 - 125	
Chromium	ND		10.0	9.160		mg/L		92	75 <sub>-</sub> 125	
Lead	ND		10.0	10.27		mg/L		103	75 - 125	
_										

Lab Sample ID: 490-61841-1 MS Client Sample ID: B-101 (17-27, 27-37)

MS MS

mg/L

2.087

**Matrix: Solid** 

Analysis Batch: 193262

**Prep Type: TCLP** 

75 - 125

102

Prep Batch: 192760 %Rec.

Sample Sample Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits Silver ND 2.00 1.885 94 mg/L 75 - 125

2.00

Spike

Lab Sample ID: 490-61841-1 MSD Client Sample ID: B-101 (17-27, 27-37)

**Matrix: Solid** 

Selenium

Analysis Batch: 193047

**Prep Type: TCLP Prep Batch: 192760** 

i many cio Datomi roccini											
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		2.00	2.293		mg/L		110	75 - 125	9	20
Barium	ND		20.0	22.66		mg/L		103	75 - 125	10	20
Cadmium	ND		2.00	2.107		mg/L		105	75 - 125	9	20
Chromium	ND		10.0	10.22		mg/L		102	75 - 125	11	20
Lead	ND		10.0	11.28		mg/L		113	75 - 125	9	20

Lab Sample ID: 490-61841-1 MSD Client Sample ID: B-101 (17-27, 27-37)

**Matrix: Solid** 

Analysis Batch: 193262

**Prep Type: TCLP** 

**Prep Batch: 192760** 

-	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Silver	ND		2.00	2.013		mg/L		101	75 - 125	7	20
Selenium	ND		2.00	2.253		mg/L		110	75 - 125	8	20

Lab Sample ID: LB 490-192854/1-B Client Sample ID: Method Blank **Matrix: Solid** 

Analysis Batch: 193350 LB LB

**Prep Type: TCLP Prep Batch: 193131** 

Analyte	Result Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Arsenic	ND ND	0.500	mg/L		09/25/14 10:31	09/25/14 20:23	1
Barium	ND	10.0	mg/L		09/25/14 10:31	09/25/14 20:23	1
Cadmium	ND	0.100	ma/l		09/25/14 10:31	09/25/14 20:23	1

TestAmerica Nashville

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9/30/2014

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Method: 6010C - Metals (ICP) (Continued)

Lab Sample ID: LB 490-192854/1-B Matrix: Solid

Analysis Batch: 193350

LB LB

Client Sample ID: Method Blank

Client Sample ID: Method Blank

**Prep Type: TCLP** 

**Prep Batch: 193131** 

**Prep Type: TCLP** 

**Prep Batch: 193131** 

**Prep Batch: 193131** 

Analyte	Result Qualifier	RL	Unit	D	Prepared	Analyzed	Dil Fac
Chromium	ND	0.500	mg/L		09/25/14 10:31	09/25/14 20:23	1
Silver	ND	0.500	mg/L		09/25/14 10:31	09/25/14 20:23	1
Lead	ND	0.500	mg/L		09/25/14 10:31	09/25/14 20:23	1

Lab Sample ID: LB 490-192854/1-B

Matrix: Solid

Analysis Batch: 193538

LB LB

Analyte Result Qualifier RL Unit Prepared Analyzed Dil Fac 09/25/14 10:31 09/26/14 13:07 Selenium 0.100 mg/L ND

Lab Sample ID: 490-62081-A-1-C MS Client Sample ID: Matrix Spike Matrix: Solid **Prep Type: TCLP** 

Analysis Batch: 193350

•	Sample	Sample	Spike	MS	MS				%Rec.
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits
Arsenic	ND		2.00	2.407		mg/L		120	75 - 125
Barium	ND		20.0	21.60		mg/L		107	75 - 125
Cadmium	0.249		2.00	2.564		mg/L		116	75 - 125
Chromium	ND		10.0	10.79		mg/L		108	75 - 125
Silver	ND		2.00	2.054		mg/L		103	75 - 125
Lead	ND		10.0	12.30		mg/L		120	75 <sub>-</sub> 125

Lab Sample ID: 490-62081-A-1-C MS

**Matrix: Solid** 

Analysis Batch: 193538

Analysis Batch: 193538									Prep	Batch: 193131
	Sample	Sample	Spike	MS	MS				%Rec.	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	
Selenium	ND		2.00	2.344		mg/L		117	75 - 125	

Lab Sample ID: 490-62081-A-1-D MSD

**Matrix: Solid** 

Analysis Batch: 193350									Prep I	3atch: 1	93131
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit
Arsenic	ND		2.00	2.260		mg/L		113	75 - 125	6	20
Barium	ND		20.0	20.12		mg/L		99	75 - 125	7	20
Cadmium	0.249		2.00	2.375		mg/L		106	75 - 125	8	20
Chromium	ND		10.0	10.04		mg/L		100	75 - 125	7	20
Silver	ND		2.00	1.919		mg/L		96	75 - 125	7	20
Lead	ND		10.0	11.38		mg/L		111	75 - 125	8	20

Lab Sample ID: 490-62081-A-1-D MSD

**Matrix: Solid** 

Analysis Batch: 193538									Batch: 1	Batch: 193131		
	Sample	Sample	Spike	MSD	MSD				%Rec.		RPD	
Analyte	Result	Qualifier	Added	Result	Qualifier	Unit	D	%Rec	Limits	RPD	Limit	
Selenium	ND		2.00	2.210		mg/L		111	75 - 125	6	20	

TestAmerica Nashville

Client Sample ID: Matrix Spike Duplicate

Client Sample ID: Matrix Spike Duplicate

**Prep Type: TCLP** 

**Prep Type: TCLP** 

Client Sample ID: Matrix Spike

**Prep Type: TCLP** 

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Method: 7470A - Mercury (CVAA)

Lab Sample ID: MB 490-192746/1-A Client Sample ID: Method Blank Prep Type: Total/NA

**Matrix: Solid** 

Analysis Batch: 193183

мв мв

мв мв

IR IR Result Qualifier

ND

Sample Sample

Sample Sample

Qualifier

Result

ND

ND

Result Qualifier

Qualifier

Result

ND

Result Qualifier RLUnit D Prepared Dil Fac Analyte Analyzed 0.00200 09/24/14 09:17 09/25/14 09:44 Mercury ND mg/L

RL

RL

0.00200

0.00200

Spike

Added

0.0200

Spike

Added

0.0200

Spike

Added

0.0200

Spike

Added

0.0200

LCS LCS

LCS LCS

MS MS

MSD MSD

Qualifier

Result

0.01998

0.02073

Result Qualifier

0.01971

Result Qualifier

0.02046

Result Qualifier

Unit

mg/L

Unit

ma/L

Unit

mg/L

Unit

mg/L

D

D

Unit

mg/L

Unit

mg/L

Lab Sample ID: LCS 490-192746/4-A

**Matrix: Solid** 

Analysis Batch: 193183 Analyte

Mercury

Lab Sample ID: MB 490-192747/1-A

**Matrix: Solid** Analysis Batch: 193183

Analyte

Mercury

Lab Sample ID: LCS 490-192747/3-A

Matrix: Solid

Analysis Batch: 193183

Analyte

Mercury

Lab Sample ID: LB 490-192343/1-C **Matrix: Solid** 

Analysis Batch: 193183

Analyte Mercury

Analyte

Lab Sample ID: 490-61889-B-1-H MS

**Matrix: Solid** 

Analysis Batch: 193183

Analyte

Mercury

Lab Sample ID: 490-61889-B-1-I MSD

**Matrix: Solid** Analysis Batch: 193183

Mercury Lab Sample ID: LB 490-192582/1-B

**Matrix: Solid** 

Analysis Batch: 193183

LB LB Analyte

Result Qualifier Mercury ND

0.00200

Unit mg/L

Prepared 09/24/14 09:20

09/25/14 09:32

Client Sample ID: Method Blank

TestAmerica Nashville

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

80 - 120

%Rec

%Rec

Prepared

09/24/14 09:17

%Rec

%Rec

100

104

D

102

Prep Batch: 192746 Limits

Prep Batch: 192746

Client Sample ID: Method Blank Prep Type: Total/NA

Prep Batch: 192747

Prepared Analyzed Dil Fac 09/24/14 09:20 09/25/14 09:31

Client Sample ID: Lab Control Sample

Prep Type: Total/NA Prep Batch: 192747

%Rec.

Limits 99 80 120

Client Sample ID: Method Blank

**Prep Type: TCLP** Prep Batch: 192746

Dil Fac Analyzed 09/25/14 09:46

Client Sample ID: Matrix Spike **Prep Type: TCLP** 

Prep Batch: 192746 %Rec.

Limits

Client Sample ID: Matrix Spike Duplicate **Prep Type: TCLP** 

75 - 125

Prep Batch: 192746 %Rec. RPD

Limits RPD Limit 75 - 125

**Prep Type: TCLP** 

Prep Batch: 192747

### **QC Sample Results**

Spike

Added

0.0200

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Client: Duke Energy Corporation Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Lab Sample ID: 490-62014-B-2-E MS

**Matrix: Solid** 

Analyte

Mercury

Analysis Batch: 193183

Client Sample ID: Matrix Spike

Prep Type: TCLP

Prep Type: Total/NA

		i ich Type. Toel	
		Prep Batch: 192747	
		%Rec.	
D	%Rec	Limits	

75 - 125

98

Lab Sample ID: 490-62014-B-2-F MSD

Sample Sample

ND

Result Qualifier

**Matrix: Solid** 

Analysis Batch: 193183

Client Sample ID: Matrix Spike Duplicate **Prep Type: TCLP** Prep Batch: 192747

Unit

mg/L

MS MS

0.01950

Result Qualifier

Sample Sample Spike MSD MSD %Rec. RPD Analyte Result Qualifier Added Result Qualifier Unit %Rec Limits RPD Limit D Mercury ND 0.0200 0.01910 mg/L 95 75 - 125 2

**Method: Moisture - Percent Moisture** 

Lab Sample ID: 490-61841-1 DU Client Sample ID: B-101 (17-27, 27-37)

**Matrix: Solid** 

Analysis Batch: 192382

	Sample	Sample	DU	DU					RPD
Analyte	Result	Qualifier	Result	Qualifier	Unit	D		RPD	Limit
Percent Moisture	22		 22		%			0.8	20
Percent Solids	78		78		%			0.2	20

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### GC Semi VOA

### **Prep Batch: 192666**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	Total/NA	Solid	3550C	_
490-61841-1 MS	B-101 (17-27, 27-37)	Total/NA	Solid	3550C	
490-61841-1 MSD	B-101 (17-27, 27-37)	Total/NA	Solid	3550C	
490-61841-2	B-101 (43.5, 47-57)	Total/NA	Solid	3550C	
490-61841-3	B-102 (3.5-7)	Total/NA	Solid	3550C	
490-61841-4	B-102 (14-17, 17-27)	Total/NA	Solid	3550C	
490-61841-5	B-102 (3a)	Total/NA	Solid	3550C	
490-61841-6	B-116 (3.5-7)	Total/NA	Solid	3550C	
490-61841-7	B-116 (7-17)	Total/NA	Solid	3550C	
490-61841-8	B-117 (6-7, 7-17)	Total/NA	Solid	3550C	
490-61841-9	B-117 (24.6)	Total/NA	Solid	3550C	
490-61841-10	B-119 (7-17)	Total/NA	Solid	3550C	
490-61841-11	B-119 (17-27)	Total/NA	Solid	3550C	
LCS 490-192666/2-A	Lab Control Sample	Total/NA	Solid	3550C	
MB 490-192666/1-A	Method Blank	Total/NA	Solid	3550C	

### Analysis Batch: 193067

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	Total/NA	Solid	8082A	192666
490-61841-1 MS	B-101 (17-27, 27-37)	Total/NA	Solid	8082A	192666
490-61841-1 MSD	B-101 (17-27, 27-37)	Total/NA	Solid	8082A	192666
490-61841-2	B-101 (43.5, 47-57)	Total/NA	Solid	8082A	192666
490-61841-3	B-102 (3.5-7)	Total/NA	Solid	8082A	192666
490-61841-4	B-102 (14-17, 17-27)	Total/NA	Solid	8082A	192666
490-61841-5	B-102 (3a)	Total/NA	Solid	8082A	192666
490-61841-6	B-116 (3.5-7)	Total/NA	Solid	8082A	192666
490-61841-7	B-116 (7-17)	Total/NA	Solid	8082A	192666
490-61841-8	B-117 (6-7, 7-17)	Total/NA	Solid	8082A	192666
490-61841-9	B-117 (24.6)	Total/NA	Solid	8082A	192666
490-61841-10	B-119 (7-17)	Total/NA	Solid	8082A	192666
490-61841-11	B-119 (17-27)	Total/NA	Solid	8082A	192666
LCS 490-192666/2-A	Lab Control Sample	Total/NA	Solid	8082A	192666
MB 490-192666/1-A	Method Blank	Total/NA	Solid	8082A	192666

### **HPLC/IC**

### Leach Batch: 192629

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batcl
490-61390-A-1-B MS	Matrix Spike	Soluble	Solid	DI Leach	
490-61390-A-1-C MSD	Matrix Spike Duplicate	Soluble	Solid	DI Leach	
490-61841-1	B-101 (17-27, 27-37)	Soluble	Solid	DI Leach	
490-61841-2	B-101 (43.5, 47-57)	Soluble	Solid	DI Leach	
490-61841-3	B-102 (3.5-7)	Soluble	Solid	DI Leach	
490-61841-4	B-102 (14-17, 17-27)	Soluble	Solid	DI Leach	
490-61841-5	B-102 (3a)	Soluble	Solid	DI Leach	
490-61841-6	B-116 (3.5-7)	Soluble	Solid	DI Leach	
490-61841-7	B-116 (7-17)	Soluble	Solid	DI Leach	
490-61841-8	B-117 (6-7, 7-17)	Soluble	Solid	DI Leach	
190-61841-9	B-117 (24.6)	Soluble	Solid	DI Leach	
490-61841-10	B-119 (7-17)	Soluble	Solid	DI Leach	

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Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### **HPLC/IC (Continued)**

### Leach Batch: 192629 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-11	B-119 (17-27)	Soluble	Solid	DI Leach	
LCS 490-192629/2-A	Lab Control Sample	Soluble	Solid	DI Leach	
LCSD 490-192629/3-A	Lab Control Sample Dup	Soluble	Solid	DI Leach	
MB 490-192629/1-A	Method Blank	Soluble	Solid	DI Leach	

### Analysis Batch: 192913

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61390-A-1-B MS	Matrix Spike	Soluble	Solid	9056A	192629
490-61390-A-1-C MSD	Matrix Spike Duplicate	Soluble	Solid	9056A	192629
490-61841-1	B-101 (17-27, 27-37)	Soluble	Solid	9056A	192629
490-61841-2	B-101 (43.5, 47-57)	Soluble	Solid	9056A	192629
490-61841-3	B-102 (3.5-7)	Soluble	Solid	9056A	192629
490-61841-4	B-102 (14-17, 17-27)	Soluble	Solid	9056A	192629
490-61841-5	B-102 (3a)	Soluble	Solid	9056A	192629
490-61841-6	B-116 (3.5-7)	Soluble	Solid	9056A	192629
490-61841-7	B-116 (7-17)	Soluble	Solid	9056A	192629
490-61841-8	B-117 (6-7, 7-17)	Soluble	Solid	9056A	192629
490-61841-10	B-119 (7-17)	Soluble	Solid	9056A	192629
490-61841-11	B-119 (17-27)	Soluble	Solid	9056A	192629
LCS 490-192629/2-A	Lab Control Sample	Soluble	Solid	9056A	192629
LCSD 490-192629/3-A	Lab Control Sample Dup	Soluble	Solid	9056A	192629
MB 490-192629/1-A	Method Blank	Soluble	Solid	9056A	192629

### Analysis Batch: 193424

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-9	B-117 (24.6)	Soluble	Solid	9056A	192629
LCS 490-192629/2-A	Lab Control Sample	Soluble	Solid	9056A	192629
LCSD 490-192629/3-A	Lab Control Sample Dup	Soluble	Solid	9056A	192629
MB 490-192629/1-A	Method Blank	Soluble	Solid	9056A	192629

### **Metals**

### Leach Batch: 192343

Lab Sample ID 490-61889-B-1-H MS	Client Sample ID  Matrix Spike	Prep Type  TCLP	Matrix Solid	Method 1311	Prep Batch
490-61889-B-1-I MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
LB 490-192343/1-C	Method Blank	TCLP	Solid	1311	

### Leach Batch: 192582

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	1311	_
490-61841-1 MS	B-101 (17-27, 27-37)	TCLP	Solid	1311	
490-61841-1 MSD	B-101 (17-27, 27-37)	TCLP	Solid	1311	
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	1311	
490-61841-3	B-102 (3.5-7)	TCLP	Solid	1311	
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	1311	
490-61841-5	B-102 (3a)	TCLP	Solid	1311	
490-61841-6	B-116 (3.5-7)	TCLP	Solid	1311	
490-61841-7	B-116 (7-17)	TCLP	Solid	1311	
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	1311	

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Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### **Metals (Continued)**

### Leach Batch: 192582 (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-9	B-117 (24.6)	TCLP	Solid	1311	
490-61841-10	B-119 (7-17)	TCLP	Solid	1311	
490-62014-B-2-E MS	Matrix Spike	TCLP	Solid	1311	
490-62014-B-2-F MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
LB 490-192582/1-B	Method Blank	TCLP	Solid	1311	
LB 490-192582/1-C	Method Blank	TCLP	Solid	1311	

### **Prep Batch: 192746**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	7470A	192582
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	7470A	192582
490-61841-3	B-102 (3.5-7)	TCLP	Solid	7470A	192582
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	7470A	192582
490-61841-5	B-102 (3a)	TCLP	Solid	7470A	192582
490-61841-6	B-116 (3.5-7)	TCLP	Solid	7470A	192582
490-61841-7	B-116 (7-17)	TCLP	Solid	7470A	192582
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	7470A	192582
490-61841-9	B-117 (24.6)	TCLP	Solid	7470A	192582
490-61841-10	B-119 (7-17)	TCLP	Solid	7470A	192582
490-61889-B-1-H MS	Matrix Spike	TCLP	Solid	7470A	192343
490-61889-B-1-I MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	192343
LB 490-192343/1-C	Method Blank	TCLP	Solid	7470A	192343
LCS 490-192746/4-A	Lab Control Sample	Total/NA	Solid	7470A	
MB 490-192746/1-A	Method Blank	Total/NA	Solid	7470A	

### **Prep Batch: 192747**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-11	B-119 (17-27)	TCLP	Solid	7470A	192854
490-62014-B-2-E MS	Matrix Spike	TCLP	Solid	7470A	192582
490-62014-B-2-F MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	192582
LB 490-192582/1-B	Method Blank	TCLP	Solid	7470A	192582
LCS 490-192747/3-A	Lab Control Sample	Total/NA	Solid	7470A	
MB 490-192747/1-A	Method Blank	Total/NA	Solid	7470A	

### **Prep Batch: 192760**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	3010A	192582
490-61841-1 MS	B-101 (17-27, 27-37)	TCLP	Solid	3010A	192582
490-61841-1 MSD	B-101 (17-27, 27-37)	TCLP	Solid	3010A	192582
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	3010A	192582
490-61841-3	B-102 (3.5-7)	TCLP	Solid	3010A	192582
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	3010A	192582
490-61841-5	B-102 (3a)	TCLP	Solid	3010A	192582
490-61841-6	B-116 (3.5-7)	TCLP	Solid	3010A	192582
490-61841-7	B-116 (7-17)	TCLP	Solid	3010A	192582
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	3010A	192582
490-61841-9	B-117 (24.6)	TCLP	Solid	3010A	192582
490-61841-10	B-119 (7-17)	TCLP	Solid	3010A	192582
LB 490-192582/1-C	Method Blank	TCLP	Solid	3010A	192582
LCS 490-192760/3-A	Lab Control Sample	Total/NA	Solid	3010A	
MB 490-192760/1-A	Method Blank	Total/NA	Solid	3010A	

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Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

### **Metals (Continued)**

### Leach Batch: 192854

Lab Sample ID	Client Sample ID	nt Sample ID Prep Type Matrix		Method	Prep Batch
490-61841-11	B-119 (17-27)	TCLP	Solid	1311	
490-62081-A-1-C MS	Matrix Spike	TCLP	Solid	1311	
490-62081-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	1311	
LB 490-192854/1-B	Method Blank	TCLP	Solid	1311	

### Analysis Batch: 193047

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-1 MS	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-1 MSD	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	6010C	192760
490-61841-3	B-102 (3.5-7)	TCLP	Solid	6010C	192760
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	6010C	192760
490-61841-5	B-102 (3a)	TCLP	Solid	6010C	192760
490-61841-6	B-116 (3.5-7)	TCLP	Solid	6010C	192760
490-61841-7	B-116 (7-17)	TCLP	Solid	6010C	192760
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	6010C	192760
490-61841-9	B-117 (24.6)	TCLP	Solid	6010C	192760
490-61841-10	B-119 (7-17)	TCLP	Solid	6010C	192760
LB 490-192582/1-C	Method Blank	TCLP	Solid	6010C	192760
LCS 490-192760/3-A	Lab Control Sample	Total/NA	Solid	6010C	192760
MB 490-192760/1-A	Method Blank	Total/NA	Solid	6010C	192760

### **Prep Batch: 193131**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-11	B-119 (17-27)	TCLP	Solid	3010A	192854
490-62081-A-1-C MS	Matrix Spike	TCLP	Solid	3010A	192854
490-62081-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	3010A	192854
LB 490-192854/1-B	Method Blank	TCLP	Solid	3010A	192854
LCS 490-193131/4-A	Lab Control Sample	Total/NA	Solid	3010A	
MB 490-193131/1-A	Method Blank	Total/NA	Solid	3010A	

### Analysis Batch: 193183

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	7470A	192746
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	7470A	192746
490-61841-3	B-102 (3.5-7)	TCLP	Solid	7470A	192746
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	7470A	192746
490-61841-5	B-102 (3a)	TCLP	Solid	7470A	192746
490-61841-6	B-116 (3.5-7)	TCLP	Solid	7470A	192746
490-61841-7	B-116 (7-17)	TCLP	Solid	7470A	192746
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	7470A	192746
490-61841-9	B-117 (24.6)	TCLP	Solid	7470A	192746
490-61841-10	B-119 (7-17)	TCLP	Solid	7470A	192746
490-61841-11	B-119 (17-27)	TCLP	Solid	7470A	192747
490-61889-B-1-H MS	Matrix Spike	TCLP	Solid	7470A	192746
490-61889-B-1-I MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	192746
490-62014-B-2-E MS	Matrix Spike	TCLP	Solid	7470A	192747
490-62014-B-2-F MSD	Matrix Spike Duplicate	TCLP	Solid	7470A	192747
LB 490-192343/1-C	Method Blank	TCLP	Solid	7470A	192746
LB 490-192582/1-B	Method Blank	TCLP	Solid	7470A	192747

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

### **Metals (Continued)**

### **Analysis Batch: 193183 (Continued)**

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-192746/4-A	Lab Control Sample	Total/NA	Solid	7470A	192746
LCS 490-192747/3-A	Lab Control Sample	Total/NA	Solid	7470A	192747
MB 490-192746/1-A	Method Blank	Total/NA	Solid	7470A	192746
MB 490-192747/1-A	Method Blank	Total/NA	Solid	7470A	192747

### Analysis Batch: 193262

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-1 MS	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-1 MSD	B-101 (17-27, 27-37)	TCLP	Solid	6010C	192760
490-61841-2	B-101 (43.5, 47-57)	TCLP	Solid	6010C	192760
490-61841-3	B-102 (3.5-7)	TCLP	Solid	6010C	192760
490-61841-4	B-102 (14-17, 17-27)	TCLP	Solid	6010C	192760
490-61841-5	B-102 (3a)	TCLP	Solid	6010C	192760
490-61841-6	B-116 (3.5-7)	TCLP	Solid	6010C	192760
490-61841-7	B-116 (7-17)	TCLP	Solid	6010C	192760
490-61841-8	B-117 (6-7, 7-17)	TCLP	Solid	6010C	192760
490-61841-9	B-117 (24.6)	TCLP	Solid	6010C	192760
490-61841-10	B-119 (7-17)	TCLP	Solid	6010C	192760
LB 490-192582/1-C	Method Blank	TCLP	Solid	6010C	192760
LCS 490-192760/3-A	Lab Control Sample	Total/NA	Solid	6010C	192760
MB 490-192760/1-A	Method Blank	Total/NA	Solid	6010C	192760

### Analysis Batch: 193309

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
LCS 490-192760/3-A	Lab Control Sample	Total/NA	Solid	6010C	192760
MB 490-192760/1-A	Method Blank	Total/NA	Solid	6010C	192760

### Analysis Batch: 193350

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch 193131	
490-61841-11	B-119 (17-27)	TCLP	Solid	6010C		
490-62081-A-1-C MS	Matrix Spike	TCLP	Solid	6010C	193131	
490-62081-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	6010C	193131	
LB 490-192854/1-B	Method Blank	TCLP	Solid	6010C	193131	
LCS 490-193131/4-A	Lab Control Sample	Total/NA	Solid	6010C	193131	
MB 490-193131/1-A	Method Blank	Total/NA	Solid	6010C	193131	

### Analysis Batch: 193538

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-11	B-119 (17-27)	TCLP	Solid	6010C	193131
490-62081-A-1-C MS	Matrix Spike	TCLP	Solid	6010C	193131
490-62081-A-1-D MSD	Matrix Spike Duplicate	TCLP	Solid	6010C	193131
LB 490-192854/1-B	Method Blank	TCLP	Solid	6010C	193131
LCS 490-193131/4-A	Lab Control Sample	Total/NA	Solid	6010C	193131
MB 490-193131/1-A	Method Blank	Total/NA	Solid	6010C	193131

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

### **General Chemistry**

### Analysis Batch: 192382

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
490-61841-1	B-101 (17-27, 27-37)	Total/NA	Solid	Moisture	
490-61841-1 DU	B-101 (17-27, 27-37)	Total/NA	Solid	Moisture	
490-61841-2	B-101 (43.5, 47-57)	Total/NA	Solid	Moisture	
490-61841-3	B-102 (3.5-7)	Total/NA	Solid	Moisture	
490-61841-4	B-102 (14-17, 17-27)	Total/NA	Solid	Moisture	
490-61841-5	B-102 (3a)	Total/NA	Solid	Moisture	
490-61841-6	B-116 (3.5-7)	Total/NA	Solid	Moisture	
490-61841-7	B-116 (7-17)	Total/NA	Solid	Moisture	
490-61841-8	B-117 (6-7, 7-17)	Total/NA	Solid	Moisture	
490-61841-9	B-117 (24.6)	Total/NA	Solid	Moisture	
490-61841-10	B-119 (7-17)	Total/NA	Solid	Moisture	
490-61841-11	B-119 (17-27)	Total/NA	Solid	Moisture	

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### Lab Chronicle

Client: Duke Energy Corporation

Date Received: 09/19/14 08:30

Project/Site: Riverbend Dry Stack Ash J14090369

TestAmerica Job ID: 490-61841-1

Matrix: Solid Percent Solids: 78.1

Client Sample ID: B-101 (17-27, 27-37) Lab Sample ID: 490-61841-1 Date Collected: 08/05/14 01:01

Dilution Batch Batch Batch Prepared Prep Type Type Method Run Factor Number or Analyzed Analyst Lab Total/NA Prep 3550C 192666 09/23/14 16:56 LDC TAL NSH Total/NA Analysis 8082A 1 193067 09/25/14 12:50 HMT TAL NSH TAL NSH Soluble Leach DI Leach 192629 09/23/14 15:43 CLN Soluble 9056A TAL NSH Analysis 1 192913 09/25/14 01:11 CLN **TCLP** SJM TAL NSH Leach 1311 192582 09/23/14 13:08 **TCLP** Prep 3010A 09/24/14 09:51 TDP TAL NSH 192760 **TCLP** 6010C TAL NSH Analysis 1 193047 09/24/14 22:05 LTB TCLP TAL NSH Leach 1311 192582 09/23/14 13:08 SJM **TCLP** 09/24/14 09:51 TAL NSH Prep 3010A 192760 TDP **TCLP** 09/25/14 13:03 NLI TAL NSH Analysis 6010C 1 193262 **TCLP** 192582 09/23/14 13:08 SJM TAL NSH Leach 1311 **TCLP** TAL NSH Prep 7470A 192746 09/24/14 09:17 AAS **TCLP** TAL NSH Analysis 7470A 193183 09/25/14 10:28 AAS TAL NSH Total/NA Analysis 192382 09/22/14 18:28 AJK Moisture 1

Client Sample ID: B-101 (43.5, 47-57)

Date Collected: 08/06/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-2

**Matrix: Solid** Percent Solids: 75.2

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NS
Total/NA	Analysis	8082A		1	193067	09/25/14 13:59	HMT	TAL NSI
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSI
Soluble	Analysis	9056A		1	192913	09/25/14 01:31	CLN	TAL NSI
ГСLР	Leach	1311			192582	09/23/14 13:08	SJM	TAL NS
ГCLР	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NS
TCLP	Analysis	6010C		1	193047	09/24/14 22:28	LTB	TAL NS
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NS
ΓCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NS
TCLP	Analysis	6010C		1	193262	09/25/14 13:25	NLI	TAL NS
ГCLР	Leach	1311			192582	09/23/14 13:08	SJM	TAL NS
ГCLР	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NS
ГCLР	Analysis	7470A		1	193183	09/25/14 10:29	AAS	TAL NS
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NS

Client Sample ID: B-102 (3.5-7)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30

Lab Sample ID: 490-61841-3 Matrix: Solid

Percent Solids: 78.0

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 14:22	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 01:51	CLN	TAL NSH

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Lab Sample ID: 490-61841-3

Matrix: Solid

Client Sample ID: B-102 (3.5-7)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:31	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:28	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:34	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

**Lab Chronicle** 

Client Sample ID: B-102 (14-17, 17-27)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30 Lab Sample ID: 490-61841-4

Matrix: Solid Percent Solids: 76.9

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 14:45	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 02:51	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:35	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:32	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:36	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

Client Sample ID: B-102 (3a)

Date Collected: 08/07/14 01:01

Date Received: 09/19/14 08:30

Lab Sample ID: 490-61841-5
Matrix: Solid
D (0 !!! =00

Percent Solids: 76.2

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 15:55	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 03:11	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:38	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH

TestAmerica Nashville

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Lab Sample ID: 490-61841-5

Matrix: Solid

Client Sample ID: B-102 (3a)

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:35	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:37	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

Client Sample ID: B-116 (3.5-7) Lab Sample ID: 490-61841-6

Date Collected: 08/07/14 01:01

**Matrix: Solid** Date Received: 09/19/14 08:30 Percent Solids: 77.4

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C	<del></del>		192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 16:18	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 03:31	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:42	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:39	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:38	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

**Client Sample ID: B-116 (7-17)** Lab Sample ID: 490-61841-7

Date Collected: 08/07/14 01:01 **Matrix: Solid** Date Received: 09/19/14 08:30 Percent Solids: 74.8

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 16:41	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 03:51	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:45	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:42	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH

TestAmerica Nashville

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9/30/2014

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Lab Sample ID: 490-61841-7

Matrix: Solid

**Client Sample ID: B-116 (7-17)** 

Date Collected: 08/07/14 01:01 Date Received: 09/19/14 08:30

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
TCLP	Analysis	7470A		1	193183	09/25/14 10:40	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

Client Sample ID: B-117 (6-7, 7-17) Lab Sample ID: 490-61841-8

Date Collected: 08/07/14 01:01 **Matrix: Solid** Date Received: 09/19/14 08:30 Percent Solids: 74.1

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 17:04	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 04:11	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:49	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:46	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:41	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

Client Sample ID: B-117 (24.6)

Client Sar	nple ID: B-117	(24.6)					Lab Sample ID: 490-61841-9
Date Collec	ted: 08/07/14 01:0	01					Matrix: Solid
Date Receiv	red: 09/19/14 08:3	30					Percent Solids: 86.2
_	Batch	Batch	Dil	ution	Batch	Prepared	

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 17:27	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		100	193424	09/26/14 17:29	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:52	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 13:49	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:43	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

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Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

**Client Sample ID: B-119 (7-17)** 

Date Collected: 08/08/14 01:01 Date Received: 09/19/14 08:30

Lab Sample ID: 490-61841-10

Matrix: Solid Percent Solids: 75.3

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C	<del></del>		192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 17:50	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 04:51	CLN	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193047	09/24/14 22:56	LTB	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	3010A			192760	09/24/14 09:51	TDP	TAL NSH
TCLP	Analysis	6010C		1	193262	09/25/14 14:04	NLI	TAL NSH
TCLP	Leach	1311			192582	09/23/14 13:08	SJM	TAL NSH
TCLP	Prep	7470A			192746	09/24/14 09:17	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 10:44	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

**Client Sample ID: B-119 (17-27)** 

Date Collected: 08/08/14 01:01 Date Received: 09/19/14 08:30

Lab Sample ID: 490-61841-11

Matrix: Solid

Percent Solids: 71.0

	Batch	Batch		Dilution	Batch	Prepared		
Prep Type	Type	Method	Run	Factor	Number	or Analyzed	Analyst	Lab
Total/NA	Prep	3550C			192666	09/23/14 16:56	LDC	TAL NSH
Total/NA	Analysis	8082A		1	193067	09/25/14 18:13	HMT	TAL NSH
Soluble	Leach	DI Leach			192629	09/23/14 15:43	CLN	TAL NSH
Soluble	Analysis	9056A		1	192913	09/25/14 05:11	CLN	TAL NSH
TCLP	Leach	1311			192854	09/24/14 12:55	SJM	TAL NSH
TCLP	Prep	3010A			193131	09/25/14 10:31	ADN	TAL NSH
TCLP	Analysis	6010C		1	193350	09/25/14 21:20	LTB	TAL NSH
TCLP	Leach	1311			192854	09/24/14 12:55	SJM	TAL NSH
TCLP	Prep	3010A			193131	09/25/14 10:31	ADN	TAL NSH
TCLP	Analysis	6010C		1	193538	09/26/14 13:54	LTB	TAL NSH
TCLP	Leach	1311			192854	09/24/14 12:55	SJM	TAL NSH
TCLP	Prep	7470A			192747	09/25/14 11:11	AAS	TAL NSH
TCLP	Analysis	7470A		1	193183	09/25/14 11:23	AAS	TAL NSH
Total/NA	Analysis	Moisture		1	192382	09/22/14 18:28	AJK	TAL NSH

### Laboratory References:

EMLab Fort = EMLab P&K Fort Lauderdale, 6301 NW 5th Way, Suite 2850, Fort Lauderdale, FL 33309, TEL (954)776-8400 TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

### **Method Summary**

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TestAmerica Job ID: 490-61841-1

Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

Method	Method Description	Protocol	Laboratory
8082A	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	SW846	TAL NSH
9056A	Anions, Ion Chromatography	SW846	TAL NSH
6010C	Metals (ICP)	SW846	TAL NSH
7470A	Mercury (CVAA)	SW846	TAL NSH
Moisture	Percent Moisture	EPA	TAL NSH
Asbestos	Asbestos in Soils	NONE	EMLab Fort

### **Protocol References:**

EPA = US Environmental Protection Agency

NONE = NONE

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

### Laboratory References:

EMLab Fort = EMLab P&K Fort Lauderdale, 6301 NW 5th Way, Suite 2850, Fort Lauderdale, FL 33309, TEL (954)776-8400 TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Drive, Nashville, TN 37204, TEL (615)726-0177

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TestAmerica Job ID: 490-61841-1

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Client: Duke Energy Corporation

Project/Site: Riverbend Dry Stack Ash J14090369

### 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	<b>Expiration Date</b>	
A2LA	A2LA		NA: NELAP & A2LA	12-31-15	
A2LA	ISO/IEC 17025		0453.07	12-31-15	
Alaska (UST)	State Program	10	UST-087	10-31-14	
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	
Ilinois	NELAP	5	200010	12-09-14	
owa	State Program	7	131	04-01-16	
Kansas	NELAP	7	E-10229	10-31-14 *	
Kentucky (UST)	State Program	4	19	06-30-15	
₋ouisiana	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	12-31-14	
Mississippi	State Program	4	N/A	06-30-15	
Montana (UST)	State Program	8	NA	02-24-20	
levada	State Program	9	TN00032	07-31-15	
New Hampshire	NELAP	1	2963	10-09-14 *	
New Jersey	NELAP	2	TN965	06-30-15	
New York	NELAP	2	11342	03-31-15	
North Carolina (WW/SW)	State Program	4	387	12-31-14	
North Dakota	State Program	8	R-146	06-30-14 *	
Ohio VAP	State Program	5	CL0033	10-16-15	
Oklahoma	State Program	6	9412	08-31-15	
Dregon	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	
· exas	NELAP	6	T104704077	08-31-15	
JSDA	Federal		S-48469	10-30-16	
Itah	NELAP	8	TN00032	07-31-15	
/irginia	NELAP	3	460152	06-14-15	
Vashington	State Program	10	C789	07-19-15	
West Virginia DEP	State Program	3	219	02-28-15	
Visconsin	State Program	5	998020430	08-31-15	
Wyoming (UST)	A2LA	8	453.07	12-31-15	

<sup>\*</sup> Certification renewal pending - certification considered valid.



Report for:

Ms. Shali Brown TestAmerica-Nashville, TN 2960 Foster Creighton Drive Nashville, TN 37204

Regarding: Project: 49002157; Riverbend Dry Stack Ash J14090369

EMĹ ID: 1265721

Approved by:

Approved Signatory

Baluswamy Krishnan

Service SOPs: Asbestos PLM (EPA Methods 600/R-93/116 & 600/M4-82-020, SOP EM-AS-S-1267)

All samples were received in acceptable condition unless noted in the Report Comments portion in the body of the report. The results relate only to the items tested. The results include an inherent uncertainty of measurement associated with estimating percentages by polarized light microscopy. Measurement uncertainty data for sample results with >1% asbestos concentration can be provided when requested.

Dates of Analysis: Asbestos PLM: 09-26-2014

EMLab P&K ("the Company") shall have no liability to the client or the client's customer with respect to decisions or recommendations made, actions taken or courses of conduct implemented by either the client or the client's customer as a result of or based upon the Test Results. In no event shall the Company be liable to the client with respect to the Test Results except for the Company's own willful misconduct or gross negligence nor shall the Company be liable for incidental or consequential damages or lost profits or revenues to the fullest extent such liability may be disclaimed by law, even if the Company has been advised of the possibility of such damages, lost profits or lost revenues. In no event shall the Company's liability with respect to the Test Results exceed the amount paid to the Company by the client therefor.

EMLab P&K

6301 NW 5th Way, Suite 2850, Ft. Lauderdale, FL 33309 (877) 711-8400 Fax (954) 776-8485 www.emlab.com

Client: TestAmerica-Nashville, TN
C/O: Ms. Shali Brown
Re: 49002157; Riverbend Dry Stack Ash J14090369
Date of Receipt: 09-23-2014
Date of Report: 09-26-2014

### ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

Total Samples Submitted: 11
Total Samples Analysed: 11

Total Samples with Layer Asbestos Content > 1%: 0

**Location: B-101 (17-27, 27-37)**Lab ID-Version‡: 5760539-1

Sample Layers	Asbestos Content		
Dark Gray Non-Fibrous Material	ND		
Sample Composite Homogeneity: Moderate			

**Location: B-101 (43.5, 47-57)**Lab ID-Version‡: 5760540-1

Sample Layers	Asbestos Content	
Dark Gray Non-Fibrous Material	ND	
Sample Composite Homogeneity:	Good	

**Location: B-102 (3.5-7)**Lab ID-Version‡: 5760541-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

**Location: B-102 (14-17, 17-27)**Lab ID-Version‡: 5760542-1

Sample Layers	Asbestos Content	
Dark Gray Non-Fibrous Material	ND	
Sample Composite Homogeneity:	Good	

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Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K, LLC EMLab ID: 1265721, Page 2 of 4

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EMLab P&K

6301 NW 5th Way, Suite 2850, Ft. Lauderdale, FL 33309 (877) 711-8400 Fax (954) 776-8485 www.emlab.com

Client: TestAmerica-Nashville, TN

C/O: Ms. Shali Brown

Re: 49002157; Riverbend Dry Stack Ash J14090369

Date of Sampling: 08-05-2014

Date of Receipt: 09-23-2014

Date of Report: 09-26-2014

### ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

**Location: B-102 (3a)**Lab ID-Version‡: 5760543-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Moderate

**Location: B-116 (3.5-7)**Lab ID-Version‡: 5760544-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

**Location: B-116 (7-17)**Lab ID-Version‡: 5760545-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

**Location: B-117 (6-7, 7-17)**Lab ID-Version‡: 5760546-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

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Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K, LLC EMLab ID: 1265721, Page 3 of 4

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**EMLab P&K** 

6301 NW 5th Way, Suite 2850, Ft. Lauderdale, FL 33309 (877) 711-8400 Fax (954) 776-8485 www.emlab.com

Client: TestAmerica-Nashville, TN
C/O: Ms. Shali Brown
Re: 49002157; Riverbend Dry Stack Ash J14090369
Date of Sampling: 08-05-2014
Date of Receipt: 09-23-2014
Date of Report: 09-26-2014

### ASBESTOS PLM REPORT: EPA-600/M4-82-020 & EPA METHOD 600/R-93-116

**Location: B-117 (24.6)**Lab ID-Version‡: 5760547-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

**Location: B-119 (7-17)**Lab ID-Version‡: 5760548-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

**Location: B-119 (17-27)**Lab ID-Version‡: 5760549-1

Sample Layers	Asbestos Content
Dark Gray Non-Fibrous Material	ND
Sample Composite Homogeneity:	Good

The test report shall not be reproduced except in full, without written approval of the laboratory. The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. EMLab P&K reserves the right to dispose of all samples after a period of thirty (30) days, according to all state and federal guidelines, unless otherwise specified.

Inhomogeneous samples are separated into homogeneous subsamples and analyzed individually. ND means no fibers were detected. When detected, the minimum detection and reporting limit is less than 1% unless point counting is performed. Floor tile samples may contain large amounts of interference material and it is recommended that the sample be analyzed by gravimetric point count analysis to lower the detection limit and to aid in asbestos identification.

‡ A "Version" indicated by -"x" after the Lab ID# with a value greater than 1 indicates a sample with amended data. The revision number is reflected by the value of "x".

EMLab P&K, LLC EMLab ID: 1265721, Page 4 of 4

Page 43 of 47

9/30/2014

2

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### **COOLER RECEIPT FORM**

Cooler Received/Opened On9/19/2014 @ _0830	
1. Tracking #(last 4 digits, FedEx)	
Courier:Fed Ex IR Gun ID17960358	
2. Temperature of rep. sample or temp blank when opened: 21.5 Degrees Celsius	·
3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen?	YES NO
4. Were custody seals on outside of cooler?	ESNONA
If yes, how many and where:	
5. Were the seals intact, signed, and dated correctly?	YESNONA
6. Were custody papers inside cooler?	FESNONA
I certify that I opened the cooler and answered questions 1-6 (intial)	
7. Were custody seals on containers: YES (N) and Intact	YESNO. (NA)
Were these signed and dated correctly?	YESNO
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)?	YESNONA
11. Were all container labels complete (#, date, signed, pres., etc)?	€8NONA
12. Did all container labels and tags agree with custody papers?	ESNONA
13a. Were VOA vials received?	YES. NO. NA
b. Was there any observable headspace present in any VOA vial?	YESNO(NA
14. Was there a Trip Blank in this cooler? YESNO(A) If multiple coolers, sequenc	:e #_ <i>UA</i>
certify that I unloaded the cooler and answered questions 7-14 (intial)	<i>V</i>
15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level?	YESNONA
b. Did the bottle labels indicate that the correct preservatives were used	YESNOIA
16. Was residual chlorine present?	YESNONA
certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial)	<u> </u>
17. Were custody papers properly filled out (ink, signed, etc)?	YESNONA
18. Did you sign the custody papers in the appropriate place?	MESNONA
19. Were correct containers used for the analysis requested?	PESNONA
20. Was sufficient amount of sample sent in each container?	YESNONA
certify that I entered this project into LIMS and answered questions 17-20 (intial)	<u> </u>
certify that I attached a label with the unique LIMS number to each container (intial)	9 3
21. Were there Non-Conformance issues at login? (ES)NO Was a NCM generated? (ES)N	140553 140553
	(40,

(S)	9/15 2/15/11/14 *********************************	\	ļ	3	1	H	1/18/11	Takes of	7 2 2	ved to	ags of transfered	in soil Jars /bags	bs collector	Samples	· Comments
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					Date/Time	Ď.	`	10 A		Accepted By		Man Man	MAR	H	elinquished
1000	14 Days		77	12	atter filme	100	is,	12		Accepted By		Date/Time	Pour	1	elinquished By
around	<sup>22</sup> Requested Turnaround	22	18/18	102	N 1	0:30		Som	By:	Accepted By:	a/18/14 /1030	Date/Time	X R	4	)Relinquished By
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		Asl	Su		<sup>18</sup> Gr	<sup>17</sup> Co		Signature	e Time	Date	<sup>13</sup> Sample Description or ID	<sup>13</sup> Sample De	Desktop No.	J ght	11Lab ID
<sup>20</sup> To		bes	lfate					n Informati	<sup>14</sup> Collection Information				<sup>12</sup> Chem	j	LAB USE ONLY
tal # of	certified		э, То	RA M							just the Operating Unit	ove. If specific accounting has not established we can work with just the Operating United Process ID. THANKS!	ounting has not estab	ic account	oove. If specifind Process ID.
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ers				ICL	$\overline{}$	alyse uired	all	r to complete	Customer to complete all	**	10)Process ID	9)Activity ID:	9)Act		Operating Unit:
l						s	_				7)Mail Code:	6)Project ID:	6)Pro		Business Unit:
	Loc: 490 <b>61841</b>	O1	ڻ ت	<u>თ</u> თ	<u>.                                    </u>	v.:1=HCl 3=HNO 5=None	15Preserv.:1=HCL 2=H <sub>3</sub> SO <sub>4</sub> 3=HNO <sub>3</sub> 4=ice5=None	_	P0 #658489	8	4)Fax No:	•	Robert Wylie, Sean DeNeale Andy Tinsley		Client
	les 9 tes 9 t	ste	Other Plant RCRA Waste	RC.		0	11	Test America	Test A	e e	2)Phone No:		Riverbend Dry Stack Ash		Project Name
JENT ,	COPY to CLIENT	SAMPLE PROGRAM Ground Water NPDES	SAMPLE PROG Ground Water_ NPDES	Gro		7	4 114	Date & Tiple	Dyes.	1 6	5245 5249	(980) 875-5245 Fax: (980) 875-4349		4	
TION TAR	DISTRIBUTION ORIGINAL to LAB	유송		Samples Originating From	T O 40		X	Matrix	140903	<u> </u>	(Building 7405) Ferry Rd	Mail Code MGO3A2 (Building 7405) 13339 Hagers Ferry Rd	) {		
2	Page			첫	Use Or	atory	I Labor	Analytical Laboratory Use Only		 	tory Services	<b>Analytical Laboratory Services</b>	n —		トフ
	!		Z	O	EST T	2	SRE	NALYS	AND A	ORD D	STODY REC	CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST FORM	<u></u>	-	

## Chain of Custody Record

Phone (615) 726-0177 Fax (615) 726-3404				3	Š						
Cilent Information (Sub Contract Lab)	Sampler		į	Brown, Shall	<u>₽</u>		Carda	Carder Tracking Notal		DOC NO.	OC NR
	Phone:			E-Mail:						490-23647.1	
Sonseny: YesiAmerica Laboratoriae, Inc				21 E	a an order to the constraint of the	13	-			Page 1 of 1	
6301 NW 5th Way, Suito 2850,	Due Date Requested: 9/24/2014	4:				Mialysi	Analysis Requested		_ 	490-51841-1 Preservation Codes:	dia
derdalo	TAT Requested (days);	gys);					_	_ <del>-</del>		P + HP	M · Hexona
Subset 20pc FL, 33309							-	-		C - Zn Assiste D - Nete Asid	P-NaZOAS
Phone: 964-776-8400(Tol) 954-xxx-xxxx(Fax)	PO #									E- MOOH	0 · Na2500 R - Na252503
Emul:	WO &			e No	-		1003			H - Assorbis Asid	o • nead4 T • TSP Dodepohydrate U • Acatone
Proper Name: Riverband Dry Stack Ash J14090369	Project 21, 4900:2157			1 (S)	os	0	00		<b>—</b>	X-EDIA	W-ph 4-5
319	SWOSE				Asbes	<u>-</u>		_	200	Other:	r - comp (appeary)
	_	_	Samplo Ma	Matrix de	bestos)		_		neser o		
Sample Identification - Client ID	Sample Date		<u> </u>	_	ոգ	_	 	-		•	
B-101 (17-27, 27-37)			ğ						X	apacia i	Special inatifications/Note:
B-101 (A3.5, 47-57)	P F CAR	Eastern 01:01	2 8		×	-	-			Asbarins; duo 8/26	
B-102 (3,5-7)	8/7/14	Eastorn 01:01	S45	Solid Co	( )	†  -	-	<del> -</del>		Alberios; que 9/26	
B-102 (14-17, 17-27)	B/7/14	01:01	Solid	ā   -	× !:	-	<u> </u>	<u> </u>		Anheaton: Aug Gios	
B-102 (9a)	8/7/14	01:01 Eastern	Solid	ā	×	+	<u> </u>	<u> </u>		Asbasias; due 9/20	
8-116 (3.5-7)	8/7/14	01:03 Easterin	Solid	<u>8</u>	×		<b>†</b>	+		Asbostor; duo sirati	
B-116 (7-17)	8/7/14	01:01 Epstern	Solid	ā	×	<u> </u>	1	<del> </del>		Adbastas; duo 9/26	
8-117 (6-7, 7-17)	87/14	01;01 Eastern	Solid	ā !	×		<del>-</del>	<u> </u>		Anbordon, due 8/28	
B-117 (24.6)	8/7/14	01:01	Solid	<u> </u>	×.	_[	<del> </del>	1		Ashophodi due 9/28	
B-119 (7-17)	9/8/14	01:01	Solid	ā	×   	<del> </del>		+		Asbestos: dua siza	,   
B-119 (17-27)	8/8/14	01:01	Solid	*	×   :	1	<b>†</b>	+		Ashenton due total	
Possible Hazard Identification Foreign Soil			-		Sample Oisposel (	4 700	be assessed	i if samples	Perieta a.	may be assessed if samples are retained langer than 1 month.	iong)
Deliverable Requested: I, III, IV, Other (specify)			ļ	Spa	Special instructions	<b>R</b> 3	Disposal By Lap Imonts:	3y Lab	Archive For	FOX	Months
empty Kit Relinquished by:		Date:		Time:		+	_	Meaned of Shingway			
Land Control of the C	11/25/16	12:03	J	Corpuny	Received by:	Ŕ	-	Day of			V.C. Ambusia
M Penenh	Determent		- 1		Rocelved by:	*		Dale/fire:	┝	Med to 200	Company / / (
ACCOUNTS (ACCOUNTS)	Dale/Time;		Company		Received by:			LangiT.ma;	<u>a</u> [		Company
			_	_				-			

### **Login Sample Receipt Checklist**

Client: Duke Energy Corporation Job Number: 490-61841-1

Login Number: 61841 List Source: TestAmerica Nashville

List Number: 1

Creator: Buckingham, Paul

<b>3</b> · , · ·		
Question	Answer	Comment
Radioactivity wasn't checked or is = background as measured by a survey meter.</td <td>True</td> <td></td>	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.	False	
Cooler Temperature is acceptable.	False	
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.	False	
Residual Chlorine Checked.	N/A	

( DU EN	IK IE	E RGY® #	Mail Code MGO3 13339 Hag Huntersville (980)	oratory Services BA2 (Building 7405) gers Ferry Rd e, N. C. 28078 875-5245 0) 875-4349	Logged by	Work Order	Analytic  ar  Bate & Time	al Labo	rato	ry Use	Sam	ples inatir n SAM Gro	IPLE und V	Vater _	GRAM		Page 62  Page 62  DISTE  ORIGIN  COPY	ge 1 c RIBUT NAL to	of 1 TION to LA	\E
I)Project Name	Spirali	Riverbend [	Dry Stack Ash	2)Phone No:	Ven	Test A	America	1	10				Plant							
3)Client			Sean DeNeale, Tinsley	4)Fax No:	PO	PO #6	658489	15Prese 2=H <sub>2</sub> SO 4=Ice	4 3=	HNOB	5	5	5	/aste_	Principal Bible				PROSECULAR PROSECULAR PROSECULAR PROSECULAR	
5)Business Unit:		6)F	Project ID:	7)Mail Code:		1 (	юк		- 40	N										
8) Operating Unit:		9),4	Activity ID:	10)Process ID	Cu	stomer	to complet priate areas		16Analyses	Required	s TCLP									
above. If specific and Process ID. 1 LAB USE ONLY	HAI	ounting has not est	<sup>13</sup> Sample	with just the Operating Uni	14 Date	Time	on Informat		17Comp.	<sup>18</sup> Grab	8 RCRA Metals	PCB		Asbestos		Method ust be S certi	SCDHE			A SACTOR OF THE PARTY OF THE PA
7 417	to rig			7-27, 27-37)	8/5/14		1	<u> </u>			X	X	K	k						
418	columns		B-101 (4	3.5 47-57)	8/6/14		1	-			p	K	K	K						
419				(3.5.7)	8/7/14		-	a			×	X	X	X						
420	priate		B-102 (	(14-17, 17-27) 39)	817)14		1	<b>*</b>			2	5	X	X						
422	appropriate		and the same of th	3.5-7)	8/7/14		X	1			Y	×	X	大						
423	ete a			7-17)	8/7/14		K	1			1	×	K							
424	ompl		B-117 (6-	7, 7-17)	8/7/14	,	1	X			k	K	X	X						
425	r to c			4.6)	8/7/14		1	R			x	X	X	X						
422	Custome			7-17) 1-27)	8/8/14		2	2			N N	x	4							
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21)Relinquished By Relinquished By Relinquished By	7	- App	Date/I	Fime 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	Accepted By: Accepted By:	(Z)	The state of the s	30	5/	Date/Time	e //	21	4/14	-	2.		nested Days _	Turn	narc	- 2/2
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11 November 2016

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, Inc. 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Toxicity Characteristic Leachate Procedure (TCLP)
Brickhaven Cell 2C

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 26 October 2016 at the Sanford, NC Brickhaven Landfill Mine Site identified as "Brickhaven Cell 2C". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

**Executive Vice President** 

Director of Laboratory Services

lidy 1. Chy

Research & Analytical Laboratories, Inc.



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 31 October 2016. The sample was analyzed without difficulties unless noted below.

Sidney L. Champion

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**Director of Laboratory Services** 

Date





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Cell 2C (A Charah, Inc. Project, collected 26 October 2016)

			Cell 2C		
EPA HW		Quantitation	Results	Characteristic	
<u>Number</u>	<u>Contaminant</u>	Limit(mg/L)	<u>(mg/L)</u>	Level(mg/L)	EPA Metho
. TCLP METALS					
D-004	Arsenic	0.010	0.015	5.00	6010
D-005	Barium	0.040	1.00	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
. TCLP VOLATILES D-018	Daniera	0.050			
D-018 D-019	Benzene Contract Towards and the	0.050	BQL	0.500	8260
D-019 D-021	Carbon Tetrachloride Chlorobenzene	0.050	BQL	0.500	8260
D-021 D-022	Chloroform	0.050	BQL	100	8260
D-022 D-028	1,2-Dichloroethane	0.100 0.050	BQL	6.00	8260
D-028 D-029	1,1-Dichloroethylene	0.050	BQL	0.500	8260
D-025 D-035			BQL	0.700	8260
D-039	Methyl Ethyl Ketone Tetrachloroethylene	0.500 0.050	BQL	200	8260
D-040	Trichloroethylene	0.050	BQL	0.700	8260 8260
D-043	Vinyl Chloride	0.050	BQL BQL	0.500 0.200	8260 8260
2 410	. my: Cmorrow	0,000	BQL	0.200	8200
I, TCLP SEMI-VOLATI	LES				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlerophenol	0.200	BQL	2.00	8270
TO DESTICIONS	EDBICINES				
TCLP PESTICIDES/H D-020	Chlordane	0.003	<b>P</b> ∩I	0.030	9091
D-020	2,4-D	1,000	BQL BQL	10.0	8081
D-010 D-012	Endrin	0.002	BQL	0.020	8151 8081
D-012	Heptachlor	0.0008	BQL	0.020	8081
D-013	Lindane	0.040	BQL		
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015	Toxaphene	0.050	BQL	0.500	8081
D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
	•				
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
i. CORROSIVITY					
D-002	рН	Std. Units	£ 99		0046
D-004	h: 1	Sto. Umts	5.88		9045
I. IGNITABILITY					
D-001	Ignitability		WNI		1010
I. TCLP MISCELLANE	OUS Paint Filter Test		NET		
	rain finer lest		NFL		
	Sample Number		26584-01		
	Sample Date		10/26/16		
	-				
	Sample Time (brs)		1400		
	Sample Matrix		Solid		





### Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Cell 2C (A Charah, Inc. Project, collected 26 October 2016)

EPA HW		Quantitation	Cell 2C Results	Characteristic	
Number	<u>Contaminant</u>	Limit(mg/L)	(mg/L)	Level(mg/L)	EDA Mothod
Number	Contaminant	<u> Limit(mg/L)</u>	(mg/L)	Level(IIIg/L)	EPA Method
I. TCLP META	LS				
D-004	Arsenic	0.010	0.015	5.00	6010
D-005	Barium	0.040	1.00	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.002	N/A	6010
N/A	Copper	0.010	0.054	N/A	6010
N/A	Iron	0.050	BQL	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.017	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.020	0.046	N/A	6010
N/A	Aluminum	0.100	0.548	N/A	6010
N/A	Strontium	0.010	0.646	N/A	6010
	Sample Number:		26584-01		
	Sample Collected Date:		10/26/16		
	Sample Collected Time:		1400		





November 11, 2016

Charah, Inc. 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Cell 2C

(A Charah, Inc. Project, collected 26 October 2016)

I. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	Cell 2C
Aluminum, Total	mg/kg	7,250
Antimony, Total	mg/kg	<1.16
Arsenic, Total	mg/kg	23.9
Barium, Total	mg/kg	168
Beryllium, Total	mg/kg	1.65
Cadmium, Total	mg/kg	< 0.116
Chromium, Total	mg/kg	12.3
Copper, Total	mg/kg	33.8
Iron, Total	mg/kg	11,100
Mercury, Total	mg/kg	0.046
Molybdenum, Total	mg/kg	2.18
Nickel, Total	mg/kg	12.6
Lead, Total	mg/kg	8.69
Selenium, Total	mg/kg	<1.16
Silver, Total	mg/kg	<1.16
Zinc, Total	mg/kg	18.7
Strontium, Total	mg/kg	112
Sample Number:		26584-01
Sample Collected Date:		10/26/16
Sample Collected Time:		1400

# RESEARCH & ANALYTICAL LABORATORIES, INC. Analytical / Process Consultations Phone (336) 996-2841

### CHAIN OF CUSTODY RECORD

MISC.					REQUESTED ANALYSIS		ASA METALS	+ Seeatlached											
WATER / WASTEWATER	100 100 100	PANJOSO.	10 \$ 10 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	1															3.4°c
		Γ		E CONTAI	_		_			+	1								RECEIP
	JOB NO.	PROJECT 8/2 LEND	SAMPLER NAME (PLEASE PRINT)	SAMPLER SIGNATURE	SAMPLE SAMPLE LOCATION / I.D.		7¢ 787											REMARKS:	SAMPLE TEMPERATURE AT RECEIPT
Phone (336) 996-2841				503555 8308	TIME COMP GRAB TEMP RES CHLORINE CI REMOVED (Y.C.N.)	4 .	00H 1500											DATECTIVE BY	- PAY/I/O COMPONING TRECEIVED BY
Phon	COMPANY	STREET ADDRESS 1971 MOREME FLATMENT	CITY, STATE, ZIP	CONTACT GCENN AMEY	SAMPLE NUMBER (LAB USE ONLY)	B4 SAIT		40 2016	71.00121	1250000								RELINQUISHED BY	RELINQUISHED BY



20 February 2017

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 1-25-17 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 25 January 2017 at the Sanford, NC Brickhaven Landfill Mine Site identified as "1-25-17 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or <a href="mailto:info@randalabs.com">info@randalabs.com</a>.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

lidy 1. Chy

Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as 1-25-17 Spilt (A Charah, LLC Project, collected 25 January 2017)

			1-25-17 Split		
EPA HW	Contominant	Quantitation	Results	Characteristic	EPA Metho
Number	<u>Contaminant</u>	<u>Limit(mg/L)</u>	(mg/L)	Level(mg/L)	EFA Metho
. TCLP METALS					
D-004	Arsenic	0.010	0.042	5.00	6010
D-005	Barium	0.040	1.26	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-009	Selenium	0.100	BQL	1.00	6010
D-010 D-011	Silver	0.010	BQL	5.00	6010
	5				
TCLP VOLATILES	_				0240
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-022	Chloroform	0.100	BQL	6.00	8260
D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
	5 1 5 Am 3 1 - 200 3 Am 3 Am 3 Am 2 Am 3 Am 3 Am 3 Am 3 Am	**************************************	100.307	1000000	(255,540)
TCLP SEMI-VOLAT		20.0	DOL	200	0000
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
		40.0		400	8270
D-041	2,4,5-Trichlorophenol		BQL		8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
TCLP PESTICIDES	HERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-031	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-013	Methoxychlor	1.000	BQL	10.0	8081
D-014	Toxaphene	0.050	BQL	0.500	8081
D-013	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
	Ministration states	2 ESTECT.	- X-	es(57).	:7:2:5:ft
REACTIVITY	Ci4-	1.0	nor		0010
D-003 D-003	Cyanide Sulfide	1.0 5.0	BQL BQL		9010 9030
D-003	Suriuc	5.0	BQL		9030
. CORROSIVITY		020 g = 500 50			5000 Feb. (2002)
D-002	pH	Std. Units	6.86		9045
. IGNITABILITY					
D-001	Ignitability		WNI		1010
, TCLP MISCELLAN	FOUS				
I, I CLI MISCELLAN	Paint Filter Test		NFL		
	Sample Number		30224-01		
	Sample Date		01/25/17		
	Sample Time (hrs)		1656		
	Sample Matrix		Solid		
mg/kg = milligrams per	kilogram = parts per million (ppm)		NFL = No Free Liquids		WNI = Will Not Ignite





### Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as 1-25-17 Split (A Charah, LLC Project, collected 25 January 2017)

				1-25-17 Split		
	EPA HW		Quantitation	Results	Characteristic	
	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I. '	TCLP METALS	S				
	D-004	Arsenic	0.010	0.042	5.00	6010
	D-005	Barium	0.040	1.26	100	6010
	D-006	Cadmium	0.005	BQL	1.00	6010
	D-007	Chromium	0.010	BQL	5.00	6010
	D-008	Lead	0.005	BQL	5.00	6010
	D-009	Mercury	0.0020	BQL	0.200	7470
	D-010	Selenium	0.100	BQL	1.00	6010
	D-011	Silver	0.010	BQL	5.00	6010
	N/A	Beryllium	0.001	0.003	N/A	6010
	N/A	Copper	0.010	0.169	N/A	6010
	N/A	Iron	0.050	BQL	N/A	6010
	N/A	Molybdenum	0.010	BQL	N/A	6010
	N/A	Nickel	0.010	0.087	N/A	6010
	N/A	Antimony	0.010	BQL	N/A	6010
	N/A	Zinc	0.020	0.135	N/A	6010
	N/A	Aluminum	0.100	1.16	N/A	6010
	N/A	Strontium	0.010	0.108	N/A	6010
		Sample Number:		30224-01		
		Sample Collected Date:		01/25/17		
		Sample Collected Time:		1656		





February 20, 2017

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as 1-25-17 Split

(A Charah, LLC Project, collected 25 January 2017)

### I. Miscellaneous

1. Miscenaneous		
<u>Parameters</u>	<u>Unit</u>	1-25-17 Split
Aluminum, Total	mg/kg	6,920
Antimony, Total	mg/kg	<1.40
Arsenic, Total		
Barium, Total	mg/kg	41.4
	mg/kg	283
Beryllium, Total	mg/kg	2.34
Cadmium, Total	mg/kg	< 0.140
Chromium, Total	mg/kg	12.6
Copper, Total	mg/kg	47.4
Iron, Total	mg/kg	11,100
Mercury, Total	mg/kg	0.070
Molybdenum, Total	mg/kg	3.52
Nickel, Total	mg/kg	16.3
Lead, Total	mg/kg	11.8
Selenium, Total	mg/kg	<1.40
Silver, Total	mg/kg	<1.40
Zinc, Total	mg/kg	21.7
Strontium, Total	mg/kg	14.3
Sample Number:		30224-01
Sample Collected Date:		01/25/17
Sample Collected Time:		1656



# **CHAIN OF CUSTODY RECORD**

Relinquished By 1-27-17   141 Section By PaterTime Received By 1238 Mon Ice			30324791 1-25-17 1656 X S 1-25-17-5plit	Company Charah  Street Address  435 South Tryon Street Swite 180 Brickhaven - Quarterly Ash Sampling City, State, Zip Charlette, NC 28202  Contact  Kyle Hower  Sample Number  Sample Number  Sample Number  Charlette, NC 28202  Contact  Charlette, NC 28202  Phone Sampler Signature  Sampler Signature  Sampler Signature  Sampler Signature  Sample Sample  Comp. Grab  CL  Yor N  Sample Location / L.D.  Charlette, NC 28202  Charlette, NC 28202  Sampler Name (Please Print)  Sampler Signature  Sample Sample  Sample Location / L.D.  (Sor W)	
Sample Temperature at receipt 3. °C			2 Full TCLP	No. of Containers  2L G (BNA, Herb. / Pest.)  2 40 ml. Vials (VOA) HCL  250 ml. G (TOX)  250 ml P (TOC) H <sub>2</sub> SO <sub>4</sub> 1L P,G (BOD, TSS, Unperserved, etc.)  1L G (Phenol, Oil&Grease) H <sub>2</sub> SO <sub>4</sub> 1L P,G (COD, N, P) H <sub>2</sub> SO <sub>4</sub> 1L P,G (Metals, Hardness) HNO <sub>3</sub> 1L P,G (Cyanide) NaOH  Sterile P,G (Coliform)	Water / Wastewater Misc.



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 27 January 2017. The sample was analyzed without difficulties unless noted below.

Sidney L. Champion

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Director of Laboratory Services

2-20-17

Date



26 April 2017

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling

4-5-17 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 05 April 2017 at the Sanford, NC Brickhaven Landfill Mine Site identified as "4-5-17 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as 4-5-17 Spilt (A Charah, LLC Project, collected 05 April 2017)

			4-5-17 Spilt		
EPA HW	6	Quantitation	Results	Characteristic	EDA M-41
Number	Contaminant	<u>Limit(mg/L)</u>	(mg/L)	Level(mg/L)	EPA Metho
TCLP METALS					
D-004	Arsenic	0.010	0.032	5.00	6010
D-005	Barium	0.040	1.90	100	6010
D-005	Cadmium	0.005	BQL	1.00	6010
					6010
D-007	Chromium	0.010	BQL	5.00	
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
TCLP VOLATILES					
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-021	Chloroform	0.100	BQL	6.00	8260
		0.050		0.500	8260
D-028	1,2-Dichloroethane		BQL		
D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLATI	II FS				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
					8270
D-026	Creosol	20.0	BQL	200	
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
E 1.15.	2, ,,,				
. TCLP PESTICIDES/I	IERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-031	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-013	Methoxychlor	1.000	BQL	10.0	8081
D-014 D-015	Toxaphene	0.050	BQL	0.500	8081
D-015 D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
Divin	2,7,5-11 (511167)	5.500	- VL	2.00	5151
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
I. CORROSIVITY					
D-002	pH	Std. Units	6.25		9045
	-				
I. IGNITABILITY	10 AV050		<u> </u>		
D-001	Ignitability		WNI		1010
I. TCLP MISCELLANE	COUS				
II. I CLI WIISCELLANE	Paint Filter Test		NFL		
	Sample Number		33184-01		
	Sample Date		04/05/17		
	Sample Time (hrs)		1325		
	Sample Matrix		Solid		
	rilogram = parts per million (ppm)		NFL = No Free Liquids		WNI = Will Not Ignite
ma/ka = milliorame per l	niogram = parte per million (ppm)		INFL = NO Free Liquids		wini = will Not lonite





### Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as 4-5-17 Split (A Charah, LLC Project, collected 05 April 2017)

				4-5-17 Split		
	EPA HW		Quantitation	Results	Characteristic	
	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I.	TCLP METALS					
	D-004	Arsenic	0.010	0.032	5.00	6010
	D-005	Barium	0.040	1.90	100	6010
	D-006	Cadmium	0.005	BQL	1.00	6010
	D-007	Chromium	0.010	BQL	5.00	6010
	D-008	Lead	0.005	BQL	5.00	6010
	D-009	Mercury	0.0020	BQL	0.200	7470
	D-010	Selenium	0.100	BQL	1.00	6010
	D-011	Silver	0.010	BQL	5.00	6010
	N/A	Beryllium	0.001	0.002	N/A	6010
	N/A	Copper	0.010	0.043	N/A	6010
	N/A	Iron	0.050	BQL	N/A	6010
	N/A	Molybdenum	0.010	0.012	N/A	6010
	N/A	Nickel	0.010	0.059	N/A	6010
	N/A	Antimony	0.010	BQL	N/A	6010
	N/A	Zinc	0.020	0.169	N/A	6010
	N/A	Aluminum	0.100	0.999	N/A	6010
	N/A	Strontium	0.010	0.824	N/A	6010
		Sample Number:		33184-01		
		Sample Collected Date:		04/05/17		
		Sample Collected Time:		1325		





April 21, 2017

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as 4-5-17 Split (A Charah, LLC Project, collected 05 April 2017)

### I. Miscellaneous

1. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	4-5-17 Split
Aluminum, Total	mg/kg	8,670
Antimony, Total	mg/kg	<1.34
Arsenic, Total	mg/kg	42.7
Barium, Total	mg/kg	302
Beryllium, Total	mg/kg	2.96
Cadmium, Total	mg/kg	< 0.134
Chromium, Total	mg/kg	24.1
Copper, Total	mg/kg	43.0
Iron, Total	mg/kg	14,000
Mercury, Total	mg/kg	0.188
Molybdenum, Total	mg/kg	3.51
Nickel, Total	mg/kg	21.2
Lead, Total	mg/kg	14.0
Selenium, Total	mg/kg	7.46
Silver, Total	mg/kg	<1.34
Zinc, Total	mg/kg	34.7
Strontium, Total	mg/kg	205
Sample Number:		33184-01
Sample Collected Date:		04/05/17
Sample Collected Time:		1325



# **CHAIN OF CUSTODY RECORD**

	Shall y 1/7/17 140	Relinquished By Date/Time													NA VII	1 15cm 15cm 15cm 15cm 15cm	(Lab Use Only)  Date Time Comp. Grab	Sample Number	Hoover 502-45-8844		Chy, State, Lip  Chadette, M. 28202			Company	
		Sec															°C CI.	Temp Res.	J 14	Sampler Signature /	Sampler Name Seremey	Brickhaver - Quarterly Ash Sampling	Project	Job No.	
	Received By	Received By	A Company													╣	Removed Y or N	Chlorine	ľ	ture /	(Please Pr	Quarterly A			
		R	7.00												╛	4	Matrix (S or W)	Sample			int)	sh Somple			
On Ice	\	Remarks													2011-3011	+175761-57	Sample Location / I.D.				•	<b>3</b> .			
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°C															I WILL I COLF	EMTMO	Requested Analysis								



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 07 April 2017. The sample was analyzed without difficulties unless noted below.

Sidney L. Champion

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**Director of Laboratory Services** 

041261

Date



03 August 2017

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 7-17-17 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 17 July 2017 at the Sanford, NC Brickhaven Landfill Mine Site identified as "7-17-17 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Quarterly Ash Samples (A Charah, LLC Project, collected 17 July 2017)

ED 4 11557		0	7-17-17 Spilt	Character's d	
EPA HW Number	Contaminant	Quantitation Limit(mg/L)	Results (mg/L)	Characteristic Level(mg/L)	EPA Method
			1		
I. TCLP METALS	Salarante san	0.040			
D-004	Arsenic	0.010	0.048	5.00	6010
D-005	Barium	0.040	3.20	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	0.023	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
. TCLP VOLATILES					
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-021	Chloroform				
		0.100	BQL	6.00	8260
D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLAT	TH FS				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-024 D-025	p-Creosol				
	1.*	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0		100	8270
D-037	•		BQL		
	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
. TCLP PESTICIDES	HERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-031					
	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015	Toxaphene	0.050	BQL	0.500	8081
D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
CORROSIVITY					
D-002	рН	Std. Units	7.55		9045
					10110F500-0 20111
D-001	Louisabilis				1010
D-001	Ignitability		WNI		1010
I. TCLP MISCELLAN					
	Paint Filter Test		NFL		
	Sample Number		37359-01		
	MARCH 1994 AND 1994 A				
	Sample Date		07/17/17		
	Sample Time (hrs)		0900		
	Sample Matrix		Solid		
	Sample transita		Sond		
mg/kg = milligrams per	kilogram = parts per million (ppm		NFL = No Free Liquids	9	WNI = Will Not Ignite





### Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Quarterly Ash Samples (A Charah, LLC Project, collected 17 July 2017)

				7-17-17 Split		
	EPA HW		Quantitation	Results	Characteristic	
	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I. '	TCLP METALS	S				
	D-004	Arsenic	0.010	0.048	5.00	6010
	D-005	Barium	0.040	3.20	100	6010
	D-006	Cadmium	0.005	BQL	1.00	6010
	D-007	Chromium	0.010	0.023	5.00	6010
	D-008	Lead	0.005	BQL	5.00	6010
	D-009	Mercury	0.0020	BQL	0.200	7470
	D-010	Selenium	0.100	BQL	1.00	6010
	D-011	Silver	0.010	BQL	5.00	6010
	N/A	Beryllium	0.001	0.005	N/A	6010
	N/A	Copper	0.010	0.157	N/A	6010
	N/A	Iron	0.050	0.260	N/A	6010
	N/A	Molybdenum	0.010	BQL	N/A	6010
	N/A	Nickel	0.010	0.026	N/A	6010
	N/A	Antimony	0.010	BQL	N/A	6010
	N/A	Zinc	0.020	0.049	N/A	6010
	N/A	Aluminum	0.100	3.85	N/A	6010
	N/A	Strontium	0.010	1.27	N/A	6010
		Sample Number:		37359-01		
		Sample Collected Date:		07/17/17		
		Sample Collected Time:		0900		





August 3, 2017

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Quarterly Ash Samples (A Charah, LLC Project, collected 17 July 2017)

### I. Miscellaneous **Parameters** Unit 7-17-17 Split Aluminum, Total mg/kg 12,000 Antimony, Total < 1.32 mg/kg Arsenic, Total mg/kg 38.6 Barium, Total mg/kg 17.6 Beryllium, Total mg/kg 2.13 Cadmium, Total < 0.132 mg/kg Chromium, Total mg/kg 32.5 Copper, Total mg/kg 14.8 Iron, Total 17,300 mg/kg Mercury, Total mg/kg 0.118 Molybdenum, Total mg/kg 2.75 Nickel, Total mg/kg 15.1 Lead, Total 6.56 mg/kg Selenium, Total mg/kg < 1.32 Silver, Total < 1.32 mg/kg Zinc, Total mg/kg 24.3 Strontium, Total mg/kg 192 Sample Number: 37359-01 Sample Collected Date: 07/17/17 Sample Collected Time: 0900



# **CHAIN OF CUSTODY RECORD**

100			П		T	T		П	i		Т		Co	<u></u>	Sti	5	
Relinquished By  Relinquished By  Relinquished By									37359-01	(Lab Use Only)	Sample Number	Kyle Hover	Contact	Charlette	Street Address 435 South Tigon Street Suite 180	Company Chach	
hed By Kish									7-17-17	Date		16.7		NC 28202	th Tipen	y ric	
7-18-									900	Lime		502-	Phone	2028	Street		
Date/Time  The first fir									X	Comp.	_	502-415-8844			Suite		
										Grab		468			180		
5,90										°C	Temp	7	Sampler Signature	Sample	Project	Job No.	
					_					CI.	Res.	XX	r Signatu	Sampler Name	20164		
Received By										Y or N	Chlorine		ire '	(Please	Quartes		
									S	(S or W)	Sample			Print)	Cristmanea - Quartedy Ash Sam		
Remarks  On Ice									7-17-17-501:+	Sample Location / L.D.				•	(mydwre)		
			$\vdash$	H	+	$\vdash$		Н	در	No.	of (	Con	tai	ners			
Samp				$\Box$			-			2L G							Γ
ple Temperature at receipt			$\vdash$	$\vdash$	+	H	+		+	250 n		_	_	) HCL			W <sub>a</sub>
npera										250 n	ıl P	(TOC	) H	2504			ter
ture	-	$\vdash$	$\vdash$	$\vdash$	+	Н	+	$\vdash$	+		_	_	_		served, o		Va.
at rec			$\vdash$	H	+	H	+			-				H <sub>2</sub> SO			stew
eipt			$\Box$							-	(S) W				HNO <sub>3</sub>		Water / Wastewater
W	-	$\vdash$	$\vdash$	+	+	H	+		-	1L P, Steril			_				-
-			$\vdash$	$\forall$	+	Н		Н	+	Stern	e 1,0	(0)	,,,,,,	,		and the second second	5
				П													Misc.
°C									Full	Ţ							Ŀ
									EUII TOUP	Requested Analysis							



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 18 July 2017. The sample was analyzed without difficulties unless noted below.

Sidney L. Champion

lidy 1. Chy

**Director of Laboratory Services** 

08/03/17

Date



14 November 2017

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 10-18-17 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 18 October 2017 at the Sanford, NC Brickhaven Landfill Mine Site identified as "10-18-17 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or <a href="mailto:info@randalabs.com">info@randalabs.com</a>.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

lichy 1. Chy

Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Quarterly Ash Sampling (A Charah, LLC Project, collected 18 October 2017)

EPA HW		0	10-18-17 Spilt		
Number	Contaminant	Quantitation <u>Limit(mg/L)</u>	Results (mg/L)	Characteristic <u>Level(mg/L)</u>	EPA Method
I. TCLP METALS					
D-004	Arsenic	0.010	0.046	5.00	6010
D-005	Barium	0.040	1.34	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007					
	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
. TCLP VOLATILES					
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-022	Chloroform	0.100	BQL	6.00	8260
D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-028 D-029					
	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLAT	TILES				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-025	-	20.0		200	8270
	Creosol		BQL		
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
D-020	HERBICIDES Chlordane	0,003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-031	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015	Toxaphene	0.050	BQL	0.500	8081
D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
CODDOCUERY					
I. CORROSIVITY D-002	pН	Std. Units	7.12		9045
	ķ	ora, orata	7.12		2012
. IGNITABILITY					1,318
D-001	Ignitability		WNI		1010
I, TCLP MISCELLAN	EOUS				
	Paint Filter Test		NFL		
	Sample Number		41710-01		
	Sample Date		10/18/17		
	Sample Time (hrs)		1150		
	Sample Matrix		Solid		
	Value of the section				
ma/ka = milliarame per	kilogram = parts per million (ppm		NEL - No Free Liquids		WMI - Will Not Ionite

mg/kg = milligrams per kilogram = parts per million (ppm mg/L = milligrams per Liter = parts per million (ppm) NFL = No Free Liquids BQL = Below Quantitation Limits WNI = Will Not Ignite FLP = Free Liquids Present





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Quarterly Ash Sampling (A Charah, LLC Project, collected 18 October 2017)

				10-18-17 Split		
E	PA HW		Quantitation	Results	Characteristic	
1	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
			7.			
I. TCLI	P METALS					
D-	-004	Arsenic	0.010	0.046	5.00	6010
D-	005	Barium	0.040	1.34	100	6010
D-	-006	Cadmium	0.005	BQL	1.00	6010
D-	007	Chromium	0.010	BQL	5.00	6010
D-	-008	Lead	0.005	BQL	5.00	6010
D-	009	Mercury	0.0020	BQL	0.200	7470
D-	010	Selenium	0.100	BQL	1.00	6010
D-	011	Silver	0.010	BQL	5.00	6010
N/	'A	Beryllium	0.001	0.004	N/A	6010
N/	'A	Copper	0.010	0.096	N/A	6010
N/	A	Iron	0.050	BQL	N/A	6010
N/	A	Molybdenum	0.010	BQL	N/A	6010
N/	'A	Nickel	0.010	0.015	N/A	6010
N/	A	Antimony	0.010	BQL	N/A	6010
N/	A	Zinc	0.020	0.042	N/A	6010
N/	A	Aluminum	0.100	1.38	N/A	6010
N/	A	Strontium	0.010	1.11	N/A	6010
		Sample Number:		41710-01		
		Sample Collected Date:		10/18/17		
		Sample Collected Time:		1150		





November 14, 2017

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Quarterly Ash Sampling (A Charah, LLC Project, collected 18 October 2017)

### I. Miscellaneous **Parameters** Unit 10-18-17 Split Aluminum, Total mg/kg 12,900 Antimony, Total mg/kg <1.23 Arsenic, Total mg/kg 51.0 Barium, Total mg/kg 309 Beryllium, Total mg/kg 2.90 Cadmium, Total mg/kg < 0.123 Chromium, Total mg/kg 17.9 Copper, Total mg/kg 51.0 Iron, Total mg/kg 16,700 Mercury, Total 0.072 mg/kg Molybdenum, Total mg/kg 3.24 Nickel, Total mg/kg 19.0 Lead, Total 13.9 mg/kg Selenium, Total <1.23 mg/kg Silver, Total mg/kg <1.23 Zinc, Total mg/kg 36.8 182 Strontium, Total mg/kg Sample Number: 41710-01 Sample Collected Date: 10/18/17 1150 Sample Collected Time:



# **CHAIN OF CUSTODY RECORD**

On Ice Sample Temperature at receipt	Relinquished By  Date/Time  Received By  Received By  Received By					41710 x) 10-18-17 1/50 X S 10-18-17-5plit 2	2 L G 2 40 m 250 m 250 m 1 L P	Temp Res. Chlorine Sample Of BN V G Ph	Con A, He ials (V (TO GOD, Conol,	one Sampler Signature (VOA X)  C) FTSS. Oild	ners Pest.) HCI Unper	Tryon Street, Shite 180 Brickhewen - Quartedy Ash Sampling	etc.)	Water / Wastewater
re at receipt 3./							1L P.	.G (C .G (M	OD, letals. Syanic	N, P , Hai de) N	H <sub>2</sub> SO rdness aOH			'astewater Misc.
"C						Full TCLP	Requested Analysis							



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 19 October 2017. The sample was analyzed without difficulties unless noted below.

lichy 1. Chy

11-14-17

Sidney L. Champion

**Director of Laboratory Services** 

Date



09 February 2018

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 01-22-18 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 22 January 2018 at the Sanford, NC Brickhaven Landfill Mine Site identified as "01-22-18 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

lidy 1. Chy

Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 22 January 2018)

EPA HW <u>Number</u>			01-22-18 Spilt		
wiimner	Contaminant	Quantitation <u>Limit(mg/L)</u>	Results (mg/L)	Characteristic <u>Level(mg/L)</u>	EPA Metho
<u>ivaniper</u>	Contaminant	Litani(mg/L)	(mg/C)	Levening/L)	EFA MEIIIO
. TCLP METALS					
D-004	Arsenic	0.010	BQL	5.00	6010
D-005	Barium	0.040	0.511	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
, TCLP VOLATILES					
D-018	Benzene	0,050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-021	Chloroform	0,100	BQL	6.00	8260
D-022 D-028			-		
	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-029	1,1-Dichloroethylene	0,050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLAT	ILES				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20,0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-032 D-033	Hexachlorobutadiene			0.500	8270 8270
		0.050	BQL		
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
/ TCLP PESTICIDES/I	HERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1,000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-012 D-031	Heptachlor	0.0008	BQL	0.008	8081
D-031	Lindane	0.040	BQL	0.400	8081
D-013 D-014		1.000	BQL BQL	10.0	8081
	Methoxychlor				
D-015 D-017	Toxaphene 2,4,5-TP(Silvex)	0.050 0.500	BQL BQL	0.500 1.00	808 i 815 i
	· · · · · ·		•		
REACTIVITY D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL BQL		9030
CODDOGNESS					
I. CORROSIVITY	рН	Std. Units	5.14		9045
D-002	•				
	November 1970		WNI		1010
I. IGNITABILITY			14171		1010
	Ignitability				
II. IGNITABILITY D-001	cous		Fine		
II. IGNITABILITY D-001			NFL		
II, IGNITABILITY D-001	cous		NFL 45478-01		
II, IGNITABILITY D-001	OUS Paint Filter Test				
II, IGNITABILITY	OUS Paint Filter Test Sample Number Sample Date		45478-01 01/22/18		
II, IGNITABILITY D-001	OUS Paint Filter Test Sample Number		45478-01		





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 22 January 2018)

			01-22-18 Split		
EPA HW		Quantitation	Results	Characteristic	
<u>Number</u>	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
I moi paremano					
I. TCLP METALS					
D-004	Arsenic	0.010	BQL	5.00	6010
D-005	Barium	0.040	0.511	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.002	N/A	6010
N/A	Copper	0.010	0.035	N/A	6010
N/A	Iron	0.050	BQL	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.033	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.020	0.029	N/A	6010
N/A	Aluminum	0.100	0.627	N/A	6010
N/A	Strontium	0.010	0.531	N/A	6010
	Sample Number:		45478-01		
	Sample Collected Date:		01/22/18		
	Sample Collected Time:		0841		





January 31, 2018

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 22 January 2018)

I. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	01-22-18 Split
Aluminum, Total	mg/kg	5,210
Antimony, Total	mg/kg	<1.19
Arsenic, Total	mg/kg	31.5
Barium, Total	mg/kg	173
Beryllium, Total	mg/kg	1.42
Cadmium, Total	mg/kg	< 0.119
Chromium, Total	mg/kg	9.90
Copper, Total	mg/kg	23.1
Iron, Total	mg/kg	25,400
Mercury, Total	mg/kg	0.136
Molybdenum, Total	mg/kg	2.85
Nickel, Total	mg/kg	10.5
Lead, Total	mg/kg	7.11
Selenium, Total	mg/kg	<1.19
Silver, Total	mg/kg	<1.19
Zinc, Total	mg/kg	13.7
Strontium, Total	mg/kg	158
Sample Number:		45478-01
Sample Collected Date:		01/22/18
Sample Collected Time:		0841



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 22 January 2018. The sample was analyzed without difficulties unless noted below (RAL Sample #45478).

Sidney L. Champion

lichy 1. Chy

**Director of Laboratory Services** 

02/09/18

Date



# **CHAIN OF CUSTODY RECORD**

	Significant 1/22/18 13/50	Sore-4 Hody / 1.22-18 / 1000					45478-01 1-22-18 841 X	(Lab Use Only) Date Time Comp. Grab		Myle Hoover 502-415-8844	Charlotte, UC 29202	435 South Tryon Street, Suite 180	Company Chain LCC	
	Received By						5	°C Cl. Removed Y or N	Temp Res. Chlorine	Sampler Signature'	Sampler Name (Please Frint)	Michbone - Quartedy Hoth Sanding	Job No.	
□On Ice		Remarks					1-22-18-5017	Sample Location / I.D.				Sampling		
Sample Temperature at receipt 3							93	2L G ( 2 40 m 250 ml 250 ml 1L P,G 1L P,G 1L P,G	BNA L Via L G P ( G (BG (Phe G (CG G (MG	TOC) I	Pest.) A) HCL A <sub>2</sub> SO <sub>4</sub> , Unper & Grease ) H <sub>2</sub> SO , rdness)	served, e e) H <sub>2</sub> SO <sub>4</sub>		Water / Wastewater
J.6							Full toup	Requested Analysis						Misc.



14 May 2018

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 04-25-18 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 25 April 2018 at the Sanford, NC Brickhaven Landfill Mine Site identified as "04-25-18 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

**Executive Vice President** 

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 25 April 2018)

Contaminant  Contaminant  Contaminant  Contaminant  Cadmium  Chromium  Lead  Mercury  Selenium  Silver	Quantitation Limit(mg/L)  0.010 0.040 0.005 0.010 0.005 0.0020	Results (mg/L) 0.016 0.985 BQL	Characteristic Level(mg/L)  5.00 100 1.00	EPA Method 6010 6010
Arsenic Barium Cadmium Chromium Lead Mercury Selenium	0.010 0.040 0.005 0.010 0.005	0.016 0.985 BQL	5.00 100	6010
Arsenic Barium Cadmium Chromium Lead Mercury Selenium	0.040 0.005 0.010 0.005	<b>0.985</b> BQL	100	
Barium Cadmium Chromium Lead Mercury Selenium	0.040 0.005 0.010 0.005	<b>0.985</b> BQL	100	
Cadmium Chromium Lead Mercury Selenium	0.005 0.010 0.005	BQL		6010
Chromium Lead Mercury Selenium	0.010 0.005		1.00	
Lead Mercury Selenium	0.005	0.020	1.00	6010
Mercury Selenium		0.020	5.00	6010
Selenium	0.0020	BQL	5.00	6010
	0.0020	BQL	0.200	7470
Silver	0.100	BQL	1.00	6010
	0.010	BQL	5.00	6010
LATILES				
Benzene	0.050	BQL	0.500	8260
Carbon Tetrachloride	0.050	BQL	0.500	8260
Chlorobenzene	0.050	BQL	100	8260
Chloroform	0.100	BQL	6.00	8260
	0.050		0.500	8260
1,2-Dichloroethane		BQL		
1,1-Dichloroethylene	0.050	BQL	0.700	8260
Methyl Ethyl Ketone	0.500	BQL	200	8260
Tetrachloroethylene	0.050	BQL	0.700	8260
Trichloroethylene	0.050	BQL	0.500	8260
Vinyl Chloride	0.050	BQL	0.200	8260
II-VOLATILES				
O-Creosol	20.0	BQL	200	8270
M-Creosol	20.0	BQL	200	8270
p-Creosol	20.0	BQL	200	8270
Creosol	20.0	BQL	200	8270
1,4-Dichlorobenzene	0.750	BQL	7.50	8270
2,4-Dinitrotoluene	0.050	BQL	0.130	8270
Hexachlorobenzene	0.050	BQL	0.130	8270
Hexachlorobutadiene	0.050	BQL	0,500	8270
Hexachloroethane	0.300	BQL	3.00	8270
Nitrobenzene	0.200	BQL	2.00	8270
Pentachlorophenol	10.0	BQL	100	8270
Pyridine	0.500	BQL	5.00	8240
2,4,5-Trichlorophenol	40.0	BQL	400	8270
2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
TICIDES/HERBICIDES				
	0.003	BOL	0.030	8081
				8151
				8081
				8081
				8081
The second secon				8081
Toxaphene	0.050		0.500	8081
2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
ITY				
Cyanide	1.0	BQL		9010
Sulfide	5.0	BQL		9030
VITY				
pH	Std. Units	6.72		9045
LITY				
Ignitability		WNI		1010
CELLANEOUS				
		NFL		
Paint Filter Test				
		49746-01		
Sample Number		49746-01		
		49746-01 04/25/18		
Sample Number				
r V	2,4,6-Trichlorophenol FICIDES/HERBICIDES Chlordane 2,4-D Endrin Heptachlor Lindane Methoxychlor Toxaphene 2,4,5-TP(Silvex)  TY Cyanide Sulfide  /TTY pH	2,4,6-Trichlorophenol 0.200  FICIDES/HERBICIDES  Chlordane 0.003 2,4-D 1.000 Endrin 0.0002 Heptachlor 0.0008 Lindane 0.040 Methoxychlor 1.000 Toxaphene 0.050 2,4,5-TP(Silvex) 0.500  TY  Cyanide 1.0 Sulfide 5.0  FITY  Ignitability  CELLANEOUS	2,4,6-Trichlorophenol   0,200   BQL	2,4,6-Trichlorophenol   0,200   BQL   2,00





### Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 25 April 2018)

			04-25-18 Split		
EPA HW		Quantitation	Results	Characteristic	
<u>Number</u>	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I. TCLP METALS					
D-004	Arsenic	0.010	0.016	5.00	6010
D-005	Barium	0.040	0.985	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	0.020	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.002	N/A	6010
N/A	Copper	0.010	0.020	N/A	6010
N/A	Iron	0.050	0.056	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.108	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.020	0.048	N/A	6010
N/A	Aluminum	0.100	1.15	N/A	6010
N/A	Strontium	0.010	1.00	N/A	6010
	Sample Number:		49746-01		
	Sample Collected Date:		04/25/18		
	Sample Collected Time:		0840		





May 14, 2018

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 25 April 2018)

### I. Miscellaneous **Parameters** Unit 4-25-18 Split Aluminum, Total mg/kg 8,590 Antimony, Total mg/kg <1.21 Arsenic, Total mg/kg 46.7 Barium, Total mg/kg 260 Beryllium, Total 1.53 mg/kg Cadmium, Total < 0.121 mg/kg Chromium, Total mg/kg 15.3 Copper, Total mg/kg 26.1 Iron, Total mg/kg 30,300 Mercury, Total mg/kg 0.336 Molybdenum, Total mg/kg 1.92 Nickel, Total mg/kg 12.0 Lead, Total mg/kg 10.9 Selenium, Total <1.21 mg/kg Silver, Total <1.21 mg/kg Zinc, Total mg/kg 17.7 Strontium, Total mg/kg 66.2 Sample Number: 49746-01 **Sample Collected Date:** 04/25/18 **Sample Collected Time:** 0840



### RESEARCH & ANALYTICAL LABORATORIES, INC. Analytical / Process Consultations Phone (336) 996-2841

# **CHAIN OF CUSTODY RECORD**

Remarks  Rem	Shike 4/as/18 13:15	elinquishell By O	Screens Kenly De K 4.35-18 /945						X174001 4-25-18 840 X	(Lab Use Only) Date Time Comp. Grad °C	Temp	17-1/2 Hooser 502-415-8844	Phone	28202	S	3	Company Charal LLC Job No.	
To be at receipt 2 40 ml. Vials (VOA) HCL  250 ml. G (TOX)  250 ml. P (TOC) H <sub>2</sub> SO <sub>4</sub> 1L P,G (BOD, TSS, Unperserved, etc.)  1L G (Phenol, Oil&Grease) H <sub>2</sub> SO <sub>4</sub> 1L P,G (COD, N, P) H <sub>2</sub> SO <sub>4</sub> 1L P,G (Metals, Hardness) HNO <sub>3</sub> 1L P,G (Cyanide) NaOH  Sterile P,G (Coliform)  Nisc.		a Wester By	1							Yor N (Sor W)	Chlorine Sample			٠	(Please Print)			
	le Temperature at receipt 3.2.								Fall	2 40 n 250 n 250 n 1L P, 1L C 1L P, 1L P,	nl. Vi nl. G nl P G (B G (C G (M G (C	(TOC (TOC OD, T enol, C OD, N etals,	OA)  (S)  HESS,  Oil&  N, P)  Har  (e) N	Unper Great H <sub>2</sub> Sedness	erser ase) I O <sub>4</sub>	H <sub>2</sub> SO <sub>4</sub>		L



### **CASE NARRATIVE**

One (1) ash sample was received in good condition on 25 April 2018. The sample was analyzed without difficulties unless noted below (RAL #49746).

Sidney L. Champion

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**Director of Laboratory Services** 

Date



09 August 2018

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 7-19-18 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 19 July 2018 at the Sanford, NC Brickhaven Landfill Mine Site identified as "7-19-18 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

**Executive Vice President** 

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 19 July 2018)

			7-19-18 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	<u>Contaminant</u>	<u>Limit(mg/L)</u>	(mg/L)	Level(mg/L)	EPA Method
TCLP METALS					
D-004	Arsenic	0.010	0.036	5.00	6010
D-005	Barium	0.040	2.03	100	6010
D-006	Cadmium	0,005	BQL	1.00	6010
D-007	Chromium	0.010	0.030	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
L TCLP VOLATILES					
D-018	Benzene	0,050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260 8260
D-017	Chlorobenzene	0.050	•	100	8260
D-021 D-022			BQL		
D-022 D-028	Chloroform	0.100	BQL	6.00	8260
D-028 D-029	1,2-Dichloroethane	0.050	BQL	0.500	8260
	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
. TCLP SEMI-VOLATI					
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0,050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
. TCLP PESTICIDES/F	IEDDICINES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-020 D-016		1.000			8151
D-010	2,4-D		BQL	10.0	
	Endrin	0.002	BQL	0.020	8081
D-031	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015 D-017	Toxaphene 2,4,5-TP(Silvex)	0.050	BQL	0.500	8081
D-V17	2,4,3-11'(SliveX)	0.500	BQL	1.00	8151
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
I. CORROSIVITY					
D-002	pH	Std. Units	7.79		9045
I. IGNITABILITY					
D-001	Ignitability		WNI		1010
I. TCLP MISCELLANE	ous				
	Paint Filter Test		NFL		
	Sample Number		53725-01		
	•				
	Sample Date		07/19/18		
	Sample Time (hrs)		0845		
	Sample Matrix		Solid		





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 19 July 2018)

			7-19-18 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I. TCLP METALS					
D-004	Arsenic	0.010	0.036	5.00	6010
D-005	Barium	0.040	2.03	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	0.030	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.005	N/A	6010
N/A	Copper	0.010	0.059	N/A	6010
N/A	Iron	0.050	0.086	N/A	6010
N/A	Molybdenum	0.010	0.037	N/A	6010
N/A	Nickel	0.010	0.027	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.020	0.178	N/A	6010
N/A	Aluminum	0.100	1.64	N/A	6010
N/A	Strontium	0.010	0.151	N/A	6010
	Sample Number:		53725-01		
	Sample Collected Date:		07/19/18		
	Sample Collected Time:		0845		





August 9, 2018

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 19 July 2018)

I. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	7-19-18 Split
Aluminum, Total	mg/kg	15,800
Antimony, Total	mg/kg	<1.22
Arsenic, Total	mg/kg	50.0
Barium, Total	mg/kg	336
Beryllium, Total	mg/kg	2.69
Cadmium, Total	mg/kg	< 0.122
Chromium, Total	mg/kg	23.6
Copper, Total	mg/kg	42.5
Iron, Total	mg/kg	25,100
Mercury, Total	mg/kg	0.173
Molybdenum, Total	mg/kg	5.22
Nickel, Total	mg/kg	18.6
Lead, Total	mg/kg	12.6
Selenium, Total	mg/kg	<1.22
Silver, Total	mg/kg	<1.22
Zinc, Total	mg/kg	28.8
Strontium, Total	mg/kg	23.7
Sample Number:		53725-01
Sample Collected Date:		07/19/18
Sample Collected Time:		0845



## **CHAIN OF CUSTODY RECORD**

Relinquished by  Date/Time  Received By  Date/Time  Received By  Mon kee	Jan					5372501 7-19-18 845 X S 7-19-18-5011.+	(t.ab Use Only)  Date  Time  Comp. Grab  C	502-415-8844 - S	Phone Sample	NC 28202	City, State, Zip Sampler Name (Please Print)	<u> </u>	Company Chairh Salutions Inc.		Phone (336) 996-2841
Sample Temperature at receipt 3, °C						2 Full TELP	No. of 2L G (B) 2 40 ml. 250 ml. 0 250 ml 1 1 L P.G (IL P.G (I	Vials (G (TOP) (BOD-Phenol (COD) Metal (Cyan	(VOAOX) (C) I , TSS , Oild , N, P s, Ha ide) !	Pest  H <sub>2</sub> SO  , Un <sub>1</sub> &Gree  H <sub>2</sub> Si  H <sub>2</sub> Si  H <sub>2</sub> Si  rdne	CL derse ease) SO <sub>4</sub>	H <sub>2</sub> SO		Water / Wastewater Misc.	_



## CASE NARRATIVE

One (1) ash sample was received in good condition on 20 July 2018. The sample was analyzed without difficulties unless noted below (RAL Sample #53725).

Sidney L. Champion

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**Director of Laboratory Services** 

08/09/18

Date



19 November 2018

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 10-24-18 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 24 October 2018 at the Sanford, NC Brickhaven Landfill Mine Site identified as "10-24-18 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

**Executive Vice President** 

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 October 2018)

ED 4 11337			10-24-18 Split		
EPA HW <u>Number</u>	Contaminant	Quantitation <u>Limit(mg/L)</u>	Results (mg/L)	Characteristic <u>Level(mg/L)</u>	EPA Metho
I. TCLP METALS					
D-004	Arsenic	0.010	POL	5.00	6010
D-005	Barium	0.010	BQL		
D-005	Cadmium		0.501	100	6010
		0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
I. TCLP VOLATILES					
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-022	Chloroform	0.100	BQL	6.00	8260
D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-025	<del>-</del>		·	200	8260
	Methyl Ethyl Ketone	0.500	BQL		
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLATI					
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-032 D-033			-		8270
	Hexachlorobutadiene	0.050	BQL	0.500	
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-038	Pyridine	0.500	BQL	5.00	8240
D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
, TCLP PESTICIDES/H	ERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-010 D-012	Endrin	0.002	BQL	0.020	8081
D-012 D-031		0.002		0.008	8081
	Heptachlor		BQL		
D-013	Lindane	0.040	BQL	0.400	8081
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015	Toxaphene	0.050	BQL	0.500	8081
D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
REACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
. CORROSIVITY					
D-002	pH	Std. Units	5.76		9045
I. IGNITABILITY					
D-001	Ignitability		WNI		1010
II, TCLP MISCELLANE	ous				
II, I MISSEGGAME	Paint Filter Test		NFL		
	C N t		58352-01		
	Samble Number				
	Sample Number		1004110		
	Sample Number Sample Date		10/24/18		
	•		10/24/18 1330		





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 October 2018)

			10-24-18 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
I. TCLP METALS	S				
D-004	Arsenic	0.010	BQL	5.00	6010
D-005	Barium	0.010	0.501	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.001	N/A	6010
N/A	Copper	0.010	0.025	N/A	6010
N/A	Iron	0.050	BQL	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.019	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.100	0.034	N/A	6010
N/A	Aluminum	0.050	0.728	N/A	6010
N/A	Strontium	0.010	0.692	N/A	6010
	Sample Number:		58352-01		
	Sample Collected Date:		10/24/18		
	Sample Collected Time:		1330		





November 19, 2018

Charah, LLC 435 South Tryon Street Suite 180

Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 October 2018)

## I. Miscellaneous **Parameters** Unit 10-24-18 Split Aluminum, Total mg/kg 20,500 Antimony, Total mg/kg <1.14 Arsenic, Total mg/kg 58.4 Barium, Total mg/kg 330 Beryllium, Total mg/kg 3.02 Cadmium, Total < 0.114 mg/kg Chromium, Total mg/kg 26.7 Copper, Total mg/kg 64.9 Iron, Total 24,100 mg/kg Mercury, Total mg/kg 0.091 Molybdenum, Total mg/kg 3.37 Nickel, Total mg/kg 24.9 Lead, Total mg/kg 18.8 Selenium, Total <1.14 mg/kg Silver, Total mg/kg <1.14 Zinc, Total mg/kg 42.0 218 mg/kg Strontium, Total Sample Number: 58352-01 Sample Collected Date: 10/24/18 1330 Sample Collected Time:



# **CHAIN OF CUSTODY RECORD**

	Relinguished By Date/Time 131410	Strengery Grandwich & 1084 Time V														58352-01   10-24-17   1330   X	(Lab Use Only) Date Time Comp. Grab	Sample Number	Kyle Hover 500-415-8844	Contact Phone	City, State, Zip Charlotte, NC 38803	Street Address 485 South Tryon Stroot, Switch	Company Charah Solutions, Inc.	
	COM	Z							-								ab °C CI.	Temp Res.	Staply	Sampler Sign	Sampler Name (Please Print	Project Bric	Job No.	
	Received By	Received By															Removed Y or N	Chlorine	bel	ature	Gambusch	Klowen-Qua		
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HOn tee		Remarks														10-24-18-5plit	Sample Location / LD.	*	·			Project Brickhauen-Guarterly Ash Sampling		
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Sample Temperature at receipt			$\square$	$\dashv$	$\dashv$	$\bot$	$\bot$	L	L	L			Ĺ	П			2L G (1	BNA.	, Herb	. / F	est.)			П
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e s																Full TOLD	Requested Analysis							



## **CASE NARRATIVE**

One (1) ash sample was received in good condition on 29 October 2018. The sample was analyzed without difficulties unless noted below (RAL #58352).

Sidney L. Champion

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**Director of Laboratory Services** 

11/19/18

Date



13 February 2019

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 1-24-19 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 24 January 2019 at the Sanford, NC Brickhaven Landfill Mine Site identified as "1-24-19 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





February 13, 2019

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 January 2019)

## I. Miscellaneous **Parameters** <u>Unit</u> 1-24-19 Split Aluminum, Total mg/kg 10,800 Antimony, Total mg/kg < 1.28 Arsenic, Total 35.3 mg/kg Barium, Total mg/kg 266 Beryllium, Total 2.93 mg/kg Cadmium, Total mg/kg < 0.128 Chromium, Total mg/kg 20.6 Copper, Total mg/kg 39.1 Iron, Total mg/kg 16,800 Mercury, Total mg/kg 0.197 Molybdenum, Total 2.14 mg/kg Nickel, Total 20.3 mg/kg Lead, Total mg/kg 14.0 Selenium, Total mg/kg 7.12 Silver, Total mg/kg < 1.28 Zinc, Total mg/kg 34.2 mg/kg 208 Strontium, Total 62165-01 Sample Number: Sample Collected Date: 01/24/19 1330 Sample Collected Time:





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 January 2019)

			1-24-19 Split		
EPA HW	6	Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
TCLP METALS					
D-004	Arsenic	0.010	0.056	5.00	6010
D-005	Barium	0.010	1.95	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
. TCLP VOLATILES		0.050	200	0.500	02/0
D-018	Benzene	0.050	BQL	0.500	8260
D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
D-021	Chlorobenzene	0.050	BQL	100	8260
D-022	Chloroform	0.100	BQL	6.00	8260
D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
D-040	Trichloroethylene	0.050	BQL	0.500	8260
D-043	Vinyl Chloride	0.050	BQL	0.200	8260
I. TCLP SEMI-VOLAT	TILES				
D-023	O-Creosol	20.0	BQL	200	8270
D-024	M-Creosol	20.0	BQL	200	8270
D-025	p-Creosol	20.0	BQL	200	8270
D-026	Creosol	20.0	BQL	200	8270
D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
D-034	Hexachloroethane	0.300	BQL	3.00	8270
D-036	Nitrobenzene	0.200	BQL	2.00	8270
D-037	Pentachlorophenol	10.0	BQL	100	8270
D-037	Pyridine	0.500	BQL	5.00	8240
				400	8270
D-041 D-042	2,4,5-Trichlorophenol 2,4,6-Trichlorophenol	40.0 0.200	BQL	2.00	8270
D-042	2,4,6-111cmorophenor	0.200	BQL	2.00	8270
, TCLP PESTICIDES	HERBICIDES				
D-020	Chlordane	0.003	BQL	0.030	8081
D-016	2,4-D	1.000	BQL	10.0	8151
D-012	Endrin	0.002	BQL	0.020	8081
D-031	Heptachlor	0.0008	BQL	0.008	8081
D-013	Lindane	0.040	BQL	0.400	8081
D-014	Methoxychlor	1.000	BQL	10.0	8081
D-015	Toxaphene	0.050	BQL	0.500	8081
D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
DEACTIVITY					
D-003	Cyanide	1.0	BQL		9010
D-003	Sulfide	5.0	BQL		9030
I. CORROSIVITY	-11	C44 11-1-	7.03		9045
D-002	pН	Std. Units	7.93		9043
II. IGNITABILITY					
D-001	Ignitability		WNI		1010
II. TCLP MISCELLAN	EOUS				
II. I CLI WIISCELLAN	Paint Filter Test		NFL		
	Sample Number		62165-01		
	Sample Date		01/24/19		
	Sample Time (hrs)		1330		
	Sample Matrix		Solid		
			M.M.M.		
a	1.11				





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 24 January 2019)

			1-24-19 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
I. TCLP METALS					
D-004	Arsenic	0.010	0.056	5.00	6010
D-005	Barium	0.010	1.95	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.003	N/A	6010
N/A	Copper	0.010	0.040	N/A	6010
N/A	Iron	0.050	0.325	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.017	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.100	BQL	N/A	6010
N/A	Aluminum	0.050	0.890	N/A	6010
N/A	Strontium	0.010	1.09	N/A	6010
	Sample Number:		62165-01		
	Sample Collected Date:		01/24/19		
	Sample Collected Time:		1330		



## RESEARCH & ANALYTICAL LABORATORIES, INC. Analytical / Process Consultations Phone (336) 996-2841

# CHAIN OF CUSTODY RECORD

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Project   Sample Name (Please Prilit)   Project   Sample Name (Please Prilit)   Plane   Friend   Sample Name (Please Prilit)     Comp. Grab   Project   Sample Name (Please Prilit)     Comp. Grab   Project   Native Name (Please Prilit)     Comp. Grab   Project   Native Name   Prilitine   Sample Location / LD.   Project   Pr	Company Charah Soluti	SVO		ob No.									c.)				Treasurers.		
Sampler Name (Please Print)    Comp. Grab	435 South Tryon Str	Swite		roject Brick	hawen	- aunte	ry Ash S	ample							INO <sub>3</sub>				C. C. C. 42
Phone   Comp.   Charles	Charlotte, NC 2820.	2	- 8	ampler	Name	(Please I	Sp. (in)								iness) H		m)		oliverne.
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Time Comp. Grab	Kyle Hoover	(502)415-88		The	Bull	1									tals, l	_	(Col		10 N S
1930   Comp. Grab   Co.   Removed   Matrix   Sample Location / LD.   (Sor W)     1-24-19.   Solid     1-24-19.	Sample Number			emp	Res.	Chlorine	Sample				_				(Me		P,G		SINSIA
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## **CASE NARRATIVE**

One (1) ash sample was received in good condition on 28 January 2019. The sample was analyzed without difficulties unless noted below (RAL#62165).

Sidney L. Champion Director of Laboratory Services

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Date



09 May 2019

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 4-18-19 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 18 April 2019 at the Sanford, NC Brickhaven Landfill Mine Site identified as "4-18-19 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

Executive Vice President

Director of Laboratory Services

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Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 18 April 2019)

				4-18-19 Split		
	EPA HW		Quantitation	Results	Characteristic	
	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
1	TCLP METALS					
	D-004	Arsenic	0.010	0.013	5.00	6010
	D-005	Barium	0.010	0,950	100	6010
	D-006	Cadmium	0.005	BQL	1.00	6010
	D-007	Chromium	0.010	BQL	5.00	6010
	D-008	Lead	0.005	BQL	5.00	6010
	D-009	Mercury	0.0020	BQL	0.200	7470
	D-010	Selenium	0.100	BQL	1.00	6010
	D-011	Silver	0.010	BQL	5.00	6010
II.	TCLP VOLATILES					
	D-018	Benzene	0.050	BQL	0.500	8260
	D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
	D-021	Chlorobenzene	0.050	BQL	100	8260
	D-022	Chloroform	0.100	BQL	6.00	8260
	D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
	D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
	D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
	D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
	D-040	Trichloroethylene	0.050	BQL	0.500	8260
	D-043	Vinyl Chloride	0.050	BQL	0.200	8260
	TCLP SEMI-VOLATIL	EC.				
111.	D-023	O-Creosol	20.0	BQL	200	8270
	D-023 D-024	M-Creosol	20.0	BQL	200	8270
	D-024 D-025		20.0	BQL	200	8270
		p-Creosol	20.0		200	8270
	D-026 D-027	Creosol	0.750	BQL BQL	7.50	8270
	D-027 D-030	1,4-Dichlorobenzene 2,4-Dinitrotoluene	0.750	BQL	0.130	8270
		Hexachlorobenzene	0.050	BQL	0.130	8270
	D-032	Hexachlorobutadiene	0.050		0.500	8270
	D-033		0.300	BQL	3.00	8270
	D-034	Hexachloroethane		BQL	2.00	8270
	D-036	Nitrobenzene	0.200	BQL	100	8270
	D-037	Pentachlorophenol	10.0	BQL	5.00	8240
	D-038	Pyridine	0.500	BQL	400	8270
	D-041	2,4,5-Trichlorophenol	40.0	BQL	2.00	8270
	D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
IV.	TCLP PESTICIDES/HE	RBICIDES				
	D-020	Chlordane	0.003	BQL	0.030	8081
	D-016	2,4-D	1.000	BQL	10.0	8151
	D-012	Endrin	0.002	BQL	0.020	8081
	D-031	Heptachlor	0.0008	BQL	0.008	8081
	D-013	Lindane	0.040	BQL	0.400	8081
	D-014	Methoxychlor	1.000	BQL	10.0	8081
	D-015	Toxaphene	0.050	BQL	0.500	8081
	D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
		500 E 10 E 10 0 500 C 10 0 10 0 10 0 10 0 10 10 10 10 10 10 1		(* 12 <b>3</b> )		
v.	REACTIVITY			0.00000		0010
	D-003	Cyanide	1.0	BQL		9010
	D-003	Sulfide	5.0	BQL		9030
3/1	CORROSIVITY					
VI.	D-002	pH	Std. Units	6.58		9045
	50. 1175	P		111111111111111111111111111111111111111		
VII.	IGNITABILITY					
	D-001	Ignitability		WNI		1010
	TCI D MICCOLL INCO	TIC				
VIII.	TCLP MISCELLANEO	Paint Filter Test		NFL		
		Tant Piter Test		ML		
		Sample Number		65715-01		
		Sample Date		04/18/19		
		Sample Time (hrs)		1400		
		Sample Matrix		Solid		
		Sample Matrix		Solid		





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 18 April 2019)

			4-18-19 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	<b>EPA Method</b>
I. TCLP METALS					
D-004	Arsenic	0.010	0.013	5.00	6010
D-005	Barium	0.010	0.950	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	BQL	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	0.001	N/A	6010
N/A	Copper	0.010	0.038	N/A	6010
N/A	Iron	0.050	0.070	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.015	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.100	0.078	N/A	6010
N/A	Aluminum	0.050	0.522	N/A	6010
N/A	Strontium	0.010	0.702	N/A	6010
	Sample Number:		65715-01		
	Sample Collected Date:		04/18/19		
	Sample Collected Time:		1400		





May 9, 2019

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sampling (A Charah, LLC Project, collected 18 April 2019)

I. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	4-18-19 Split
Aluminum, Total	mg/kg	11,900
Antimony, Total	mg/kg	<1.21
Arsenic, Total	mg/kg	35.3
Barium, Total	mg/kg	145
Beryllium, Total	mg/kg	1.26
Cadmium, Total	mg/kg	< 0.121
Chromium, Total	mg/kg	32.9
Copper, Total	mg/kg	41.4
Iron, Total	mg/kg	26,600
Mercury, Total	mg/kg	0.126
Molybdenum, Total	mg/kg	3.22
Nickel, Total	mg/kg	18.3
Lead, Total	mg/kg	10.4
Selenium, Total	mg/kg	<1.21
Silver, Total	mg/kg	<1.21
Zinc, Total	mg/kg	28.6
Strontium, Total	mg/kg	93.9
Sample Number:		65715-01
Sample Collected Date:		04/18/19
Sample Collected Time:		1400



## RESEARCH & ANALYTICAL LABORATORIES, INC. Analytical / Process Consultations Phone (336) 996-2841

# CHAIN OF CUSTODY RECORD

°C		(Ju)	ceipt	Sample Temperature at receipt	eratur	Temp	mple	Sa	140n tee									
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דיוו דכר ף				4			$\dashv$	_	4:108 61-81-4	S						1400	4-18-19	50102
Requested Analysis		1L P,C Sterile	1L P,C	_	250 ml	250 ml		No. 6	Sample Location / I.D.	Matrix (S or W)	Removed Y or N	Cl.	°C	Grab	Comp.	Time	Date	(Lab Use Only)
		_	6 (M	-					-	Sample	Chlorine	Res.	Temp					Sample Number
			etals,								ind	Maganhul	Me		(502)415-8844	(50Z)	٩	Kyle Hoover
		_	Har	_				_			ture	er Signa	Jdwes			Phone		Contact
			dness)	Grease	2SO <sub>4</sub> Unpers	150	HCL			Print)	Sampler Name (Please Print) Gregory Gambusch	er Namı	Sampl Greg			2	JC 28202	Charlotte, No
					served,				Sample	Brickhaven- Quarterly Ash Sample	n-Quart	Chave	Brojec		081	t, Suit	you stree	Street Address 435 South Tryon Street, Suite 180
		aroveres to			etc.)								Job No.			ions	h Solut	Company Charah Solutions
	Misc.		vater	Water / Wastewater	r/W	Wate		-										



## **CASE NARRATIVE**

One (1) ash sample was received in good condition on 22 April 2019. The sample was analyzed without difficulties unless noted below (RAL #65715).

Sidney L. Champion Director of Laboratory Services

lidy 1. Chy

Date

05/09/19



06 August 2019

Mr. Kyle Hoover, P.E., P.G., PMP Environmental Protection Specialist III Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202

RE: Brickhaven Quarterly Ash Sampling 7-10-19 Split

Dear Mr. Hoover:

Enclosed is one (1) copy of the TCLP Chemical Analysis from the sample collected on 10 July 2019 at the Sanford, NC Brickhaven Landfill Mine Site identified as "7-10-19 Split". The results of this analysis showed these samples to be non-hazardous. If you should require any additional information or have any further questions concerning the information contained in this report please feel free to contact me at 336.996.2841 or info@randalabs.com.

Best Regards,

Sidney L. Champion

**Executive Vice President** 

Director of Laboratory Services

lidy 1. Chy

Research & Analytical Laboratories, Inc.





Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sample (A Charah, LLC Project, collected 10 July 2019)

4.2	Diamen, Ede Troject,	conected to July 2015)				
				7-10-19 Split		
	EPA HW		Quantitation	Results	Characteristic	
	Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
	):					
I.	TCLP METALS					
	D-004	Arsenic	0.010	0.016	5.00	6010
	D-005	Barium	0.010	0.658	100	6010
	D-006	Cadmium	0.005	BQL	1.00	6010
	D-007	Chromium	0.010	0.044	5.00	6010
	D-008	Lead	0.005	BQL	5.00	6010
	D-009	Mercury	0.0020	BQL	0.200	7470
	D-010	Selenium	0.100	BQL	1.00	6010
	D-011	Silver	0.010	BQL	5.00	6010
II.	TCLP VOLATILES					
	D-018	Benzene	0.050	BQL	0.500	8260
	D-019	Carbon Tetrachloride	0.050	BQL	0.500	8260
	D-021	Chlorobenzene	0.050	BQL	100	8260
	D-022	Chloroform	0.100	BQL	6.00	8260
	D-028	1,2-Dichloroethane	0.050	BQL	0.500	8260
	D-029	1,1-Dichloroethylene	0.050	BQL	0.700	8260
	D-035	Methyl Ethyl Ketone	0.500	BQL	200	8260
	D-039	Tetrachloroethylene	0.050	BQL	0.700	8260
	D-040	Trichloroethylene	0.050	BQL	0.500	8260
	D-040 D-043	Vinyl Chloride	0.050		0.200	8260
	D-043	Vinyi Chioride	0.030	BQL	0.200	8200
***	TCLP SEMI-VOLATI	II FC				
ш.			20.0	noi	200	8270
	D-023	O-Creosol	20.0	BQL	200	
	D-024	M-Creosol	20.0	BQL	200	8270
	D-025	p-Creosol	20.0	BQL	200	8270
	D-026	Creosol	20.0	BQL	200	8270
	D-027	1,4-Dichlorobenzene	0.750	BQL	7.50	8270
	D-030	2,4-Dinitrotoluene	0.050	BQL	0.130	8270
	D-032	Hexachlorobenzene	0.050	BQL	0.130	8270
	D-033	Hexachlorobutadiene	0.050	BQL	0.500	8270
	D-034	Hexachloroethane	0.300	BQL	3.00	8270
	D-036	Nitrobenzene	0.200	BQL	2.00	8270
	D-037	Pentachlorophenol	10.0	BQL	100	8270
	D-038	Pyridine	0.500	BQL	5.00	8240
	D-041	2,4,5-Trichlorophenol	40.0	BQL	400	8270
	D-042	2,4,6-Trichlorophenol	0.200	BQL	2.00	8270
		,				
IV.	TCLP PESTICIDES/H	HERBICIDES				
	D-020	Chlordane	0.003	BQL	0.030	8081
	D-016	2,4-D	1.000	BQL	10.0	8151
	D-012	Endrin	0.002	BQL	0.020	8081
	D-031	Heptachlor	0.0008	BQL	0.008	8081
	D-013	Lindane	0.040	BQL	0.400	8081
	D-014	Methoxychlor	1.000	BQL	10.0	8081
	D-015	Toxaphene	0.050	BQL	0.500	8081
	D-017	2,4,5-TP(Silvex)	0.500	BQL	1.00	8151
		T1. T N - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1			3500.50	
V	REACTIVITY					
• •	D-003	Cyanide	1.0	BQL		9010
	D-003	Sulfide	5.0	BQL		9030
VI	CORROSIVITY					
, ,,	D-002	pH	Std. Units	5.64		9045
		and the second		2.01		
VII	IGNITABILITY					
* 11	D-001	Ignitability		WNI		1010
		-gy				
VIII	, TCLP MISCELLANE	OUS				
V 11.	, TODA MADOLDER NA	Paint Filter Test		NFL		
		Sample Number		69361-01		
		2000 Sept. 100 S		07/10/19		
		Sample Date				
		Sample Time (hrs)		1530		
		Sample Matrix		Solid		
				4117		
	mg/kg = milligrams per k	ilogram = parts per million (ppm)		NFL = No Free Liquids		WNI = Will Not Ignite
		iter = parts per million (ppm)		BQL = Below Quantitation I	Limits	FLP = Free Liquids Present





## Toxicity Characteristic Leachate Procedure (TCLP) Analysis of Sample Identified as Brickhaven-Quarterly Ash Sample (A Charah, LLC Project, collected 10 July 2019)

			7-10-19 Split		
EPA HW		Quantitation	Results	Characteristic	
Number	Contaminant	Limit(mg/L)	(mg/L)	Level(mg/L)	EPA Method
I. TCLP METALS					
D-004	Arsenic	0.010	0.016	5.00	6010
D-005	Barium	0.010	0.658	100	6010
D-006	Cadmium	0.005	BQL	1.00	6010
D-007	Chromium	0.010	0.044	5.00	6010
D-008	Lead	0.005	BQL	5.00	6010
D-009	Mercury	0.0020	BQL	0.200	7470
D-010	Selenium	0.100	BQL	1.00	6010
D-011	Silver	0.010	BQL	5.00	6010
N/A	Beryllium	0.001	BQL	N/A	6010
N/A	Copper	0.010	0.029	N/A	6010
N/A	Iron	0.050	1.77	N/A	6010
N/A	Molybdenum	0.010	BQL	N/A	6010
N/A	Nickel	0.010	0.045	N/A	6010
N/A	Antimony	0.010	BQL	N/A	6010
N/A	Zinc	0.100	0.071	N/A	6010
N/A	Aluminum	0.050	0.334	N/A	6010
N/A	Strontium	0.010	0.594	N/A	6010
	Sample Number:		69361-01		
	Sample Collected Date:		07/10/19		
	Sample Collected Time:		1530		





August 6, 2019

Charah, LLC 435 South Tryon Street Suite 180 Charlotte, NC 28202 Attention: Kyle Hoover

Chemical Analysis for Selected Parameters and Sampling Location Identified as Brickhaven-Quarterly Ash Sample (A Charah, LLC Project, collected 10 July 2019)

I. Miscellaneous		
<u>Parameters</u>	<u>Unit</u>	7-10-19 Split
Aluminum, Total	mg/kg	8,970
Antimony, Total	mg/kg	<1.10
Arsenic, Total	mg/kg	27.9
Barium, Total	mg/kg	263
Beryllium, Total	mg/kg	1.80
Cadmium, Total	mg/kg	< 0.110
Chromium, Total	mg/kg	13.7
Copper, Total	mg/kg	26.7
Iron, Total	mg/kg	19,110
Mercury, Total	mg/kg	0.050
Molybdenum, Total	mg/kg	<1.10
Nickel, Total	mg/kg	15.4
Lead, Total	mg/kg	10.5
Selenium, Total	mg/kg	<1.10
Silver, Total	mg/kg	<1.10
Zinc, Total	mg/kg	39.0
Strontium, Total	mg/kg	129
Sample Number:		69361-01
Sample Collected Date:		07/10/19
Sample Collected Time:		1530



## RESEARCH & ANALYTICAL LABORATORIES, INC. Analytical / Process Consultations Phone (336) 996-2841

# CHAIN OF CUSTODY RECORD

	Returibusted By My Bate/Time 1669	Trea Grambusch of 7-1(-19/12)										_	(2)310121 7-10-19 1530 ×	(Lab Use Only)  Date Time Comp. Grab		Hower (502)415-8844	e	arlotte, NC 28202	Saite 180			
		M		$\perp$		+								°C (	Temp R	hugh	Sampler S	Sampler Name	Project Brick!	Job No.		
	Received By	Heretryd By												Cl. Removed Y or N	Res. Chlorine	indel	ignature	Sampler Name (Please Print) Gregory Grambusch	naven - ac			
		~	3										S		e Sample			se Print)	brickhauen - Quarterly Ash Sample			
O6n Ice		Remarks										,	7-10-19 Split	Sample Location / I.D.					sh Sample			
S													Ø	No.					<u> </u>		L	-
Sample Temperature at receipt				+	-	+		_	-	$\vdash$	$\vdash$			2LG( 2 40 m				Pest.) ) HCL				
Temp						1								250 ml	. G	(TOX	()				Water / Wastewater	
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																					Misc.	
"C													Full TCLP	Requested Analysis								1



## **CASE NARRATIVE**

One (1) ash sample was received in good condition on 11 July 2019. The sample was analyzed without difficulties unless noted below (RAL #69361).

Sidney L. Champion

lidy 1. Chy

**Director of Laboratory Services** 

08/06/19 Date







July 20, 2020

Mark Filardi **HDR** 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARRAH

Pace Project No.: 92461259

## Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on January 16, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services Asheville
- · Pace Analytical Services Charlotte
- Pace Analytical Services Ormond Beach

Revision 1 - This report replaces the January 27, 2020 report. This project was revised on June 30, 2020 to add copper, vanadium and zinc to all samples, per client request (Ormond Beach, FL)

If you have any questions concerning this report, please feel free to contact me.

Sincerely.

Kevin Herring

kevin.herring@pacelabs.com

1(704)875-9092

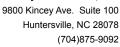
Kein Her

**HORIZON Database Administrator** 

Enclosures

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing







## **CERTIFICATIONS**

Project: **CHARRAH** Pace Project No.: 92461259

**Pace Analytical Services Ormond Beach** 

8 East Tower Circle, Ormond Beach, FL 32174

Alaska DEC- CS/UST/LUST Alabama Certification #: 41320 Arizona Certification# AZ0819

Colorado Certification: FL NELAC Reciprocity

Connecticut Certification #: PH-0216

Delaware Certification: FL NELAC Reciprocity

Florida Certification #: E83079 Georgia Certification #: 955

Guam Certification: FL NELAC Reciprocity Hawaii Certification: FL NELAC Reciprocity

Illinois Certification #: 200068

Indiana Certification: FL NELAC Reciprocity

Kansas Certification #: E-10383 Kentucky Certification #: 90050

Louisiana Certification #: FL NELAC Reciprocity Louisiana Environmental Certificate #: 05007

Maryland Certification: #346

Michigan Certification #: 9911

Missouri Certification #: 236

Mississippi Certification: FL NELAC Reciprocity Wyoming (EPA Region 8): FL NELAC Reciprocity

South Carolina Certification # 99006001 Florida/NELAP Certification #: E87627 Kentucky UST Certification #: 84 Virginia/VELAP Certification #: 460221

Montana Certification #: Cert 0074

New Jersey Certification #: FL022

New York Certification #: 11608

Ohio DEP 87780

Nebraska Certification: NE-OS-28-14 New Hampshire Certification #: 2958

North Carolina Certification #: 12710

Pennsylvania Certification #: 68-00547

South Carolina Certification: #96042001

Texas Certification: FL NELAC Reciprocity

Virginia Environmental Certification #: 460165

US Virgin Islands Certification: FL NELAC Reciprocity

Puerto Rico Certification #: FL01264

Tennessee Certification #: TN02974

West Virginia Certification #: 9962C

Wisconsin Certification #: 399079670

North Dakota Certification #: R-216

Oklahoma Certification #: D9947

North Carolina Environmental Certificate #: 667

**Pace Analytical Services Charlotte** 

9800 Kincey Ave. Ste 100, Huntersville, NC 28078 Louisiana/NELAP Certification # LA170028 North Carolina Drinking Water Certification #: 37706

North Carolina Field Services Certification #: 5342 North Carolina Wastewater Certification #: 12

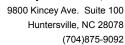
**Pace Analytical Services Asheville** 

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222

## REPORT OF LABORATORY ANALYSIS





## **SAMPLE SUMMARY**

Project: CHARRAH
Pace Project No.: 92461259

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92461259001	SB1	Solid	01/15/20 12:15	01/16/20 17:10
92461259002	SB2	Solid	01/15/20 14:45	01/16/20 17:10
92461259003	SB3	Solid	01/15/20 15:10	01/16/20 17:10
92461259004	SB4	Solid	01/15/20 15:40	01/16/20 17:10
92461259005	SB5	Solid	01/15/20 16:05	01/16/20 17:10
92461259006	SB6	Solid	01/15/20 16:25	01/16/20 17:10
92461259007	SB7	Solid	01/15/20 16:45	01/16/20 17:10
92461259008	SB8	Solid	01/16/20 09:00	01/16/20 17:10
92461259009	SB9	Solid	01/16/20 09:20	01/16/20 17:10
92461259010	SB10	Solid	01/16/20 10:00	01/16/20 17:10



## **SAMPLE ANALYTE COUNT**

Project: CHARRAH
Pace Project No.: 92461259

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92461259001	SB1	EPA 6010	ATC	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259002	SB2	EPA 6010	ATC	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259003	SB3	EPA 6010	ATC	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259004	SB4	EPA 6010	ATC	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	S00	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259005	SB5	EPA 6010	KPP	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259006	SB6	EPA 6010	KPP	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
2461259007	SB7	EPA 6010	ATC, CS2	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	soo	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
92461259008	SB8	EPA 6010	ATC	4	PASI-O

## **REPORT OF LABORATORY ANALYSIS**

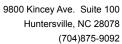


## **SAMPLE ANALYTE COUNT**

Project: CHARRAH
Pace Project No.: 92461259

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7471B	soo	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
92461259009	SB9	EPA 6010	ATC	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	S00	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A
92461259010	SB10	EPA 6010	KPP	4	PASI-O
		EPA 6010D	SH1	13	PASI-A
		EPA 7471B	soo	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		EPA 9060A	MJP	5	PASI-A

PASI-A = Pace Analytical Services - Asheville
PASI-C = Pace Analytical Services - Charlotte
PASI-O = Pace Analytical Services - Ormond Beach



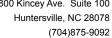


## **SUMMARY OF DETECTION**

Project: CHARRAH
Pace Project No.: 92461259

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifier
92461259001	SB1					
EPA 6010	Copper	1.9	mg/kg	0.36	01/24/20 18:44	
EPA 6010	Vanadium	11.8	mg/kg	0.71	01/24/20 18:44	
EPA 6010	Zinc	4.9	mg/kg	1.4	01/24/20 18:44	
EPA 6010D	Barium	9.1	mg/kg	0.58	01/21/20 04:27	
EPA 6010D	Calcium	21.8	mg/kg	11.6	01/21/20 04:27	
EPA 6010D	Chromium	2.1	mg/kg	0.58	01/21/20 04:27	
EPA 6010D	Lead	3.1	mg/kg	0.58	01/21/20 04:27	
EPA 7471B	Mercury	0.021	mg/kg	0.0062	01/22/20 11:26	
ASTM D2974-87	Percent Moisture	17.0	%	0.10	01/17/20 15:57	
PA 9060A	Total Organic Carbon	6430	mg/kg	722	01/25/20 11:33	
EPA 9060A	Total Organic Carbon	6860	mg/kg	722	01/25/20 11:33	
PA 9060A	Total Organic Carbon	7830	mg/kg	722	01/25/20 11:33	
PA 9060A	Total Organic Carbon	5050	mg/kg	722	01/25/20 11:33	
PA 9060A	Mean Total Organic Carbon	6540	mg/kg	722	01/25/20 11:33	
2461259002	SB2					
EPA 6010	Copper	10.8	mg/kg	1.6	01/24/20 18:47	
PA 6010	Vanadium	39.2	mg/kg	3.1	01/24/20 18:47	
EPA 6010	Zinc	8.9	mg/kg	6.3	01/24/20 18:47	
PA 6010D	Arsenic	5.6	mg/kg	1.1	01/21/20 04:30	
PA 6010D	Barium	36.4	mg/kg	0.54	01/21/20 04:30	
PA 6010D	Beryllium	0.32	mg/kg	0.11	01/21/20 04:30	
PA 6010D	Calcium	227	mg/kg	10.8	01/21/20 04:30	
EPA 6010D	Chromium	12.3	mg/kg	0.54	01/21/20 04:30	
EPA 6010D	Cobalt	1.8	mg/kg	0.54	01/21/20 04:30	
EPA 6010D	Lead	6.2	mg/kg	0.54	01/21/20 04:30	
STM D2974-87	Percent Moisture	18.6	%	0.10	01/17/20 15:58	
EPA 9060A	Total Organic Carbon	2110	mg/kg	737	01/25/20 12:00	
EPA 9060A	Total Organic Carbon	1730	mg/kg	737	01/25/20 12:00	
PA 9060A	Total Organic Carbon	5110	mg/kg	737	01/25/20 12:00	
PA 9060A	Total Organic Carbon	1970	mg/kg	737	01/25/20 12:00	
PA 9060A	Mean Total Organic Carbon	2730	mg/kg	737	01/25/20 12:00	
2461259003	SB3					
PA 6010	Copper	12.4	mg/kg	0.31	01/24/20 18:51	
PA 6010	Vanadium	13.6	mg/kg	0.63	01/24/20 18:51	
PA 6010	Zinc	14.7	mg/kg	1.3	01/24/20 18:51	
PA 6010D	Arsenic	4.7	mg/kg	0.83	01/21/20 04:45	
PA 6010D	Barium	35.9	mg/kg	0.41	01/21/20 04:45	
PA 6010D	Beryllium	0.22	mg/kg	0.083	01/21/20 04:45	
PA 6010D	Calcium	94.4	mg/kg	8.3	01/21/20 04:45	
PA 6010D	Chromium	11.8	mg/kg	0.41	01/21/20 04:45	
PA 6010D	Cobalt	2.1	mg/kg	0.41	01/21/20 04:45	
PA 6010D	Lead	11.7	mg/kg	0.41	01/21/20 04:45	
PA 6010D	Molybdenum	0.52	mg/kg	0.41	01/21/20 04:45	
PA 7471B	Mercury	0.0093	mg/kg	0.0039	01/22/20 11:31	
STM D2974-87	Percent Moisture	8.6	%	0.10	01/17/20 15:58	

## **REPORT OF LABORATORY ANALYSIS**



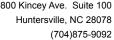


## **SUMMARY OF DETECTION**

Project: CHARRAH
Pace Project No.: 92461259

	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifier
2461259004	SB4					
EPA 6010	Copper	2.5	mg/kg	0.34	01/24/20 18:54	
EPA 6010	Vanadium	20.8	mg/kg	0.68	01/24/20 18:54	
EPA 6010	Zinc	7.1	mg/kg	1.4	01/24/20 18:54	
EPA 6010D	Barium	16.8	mg/kg	0.48	01/21/20 04:48	
EPA 6010D	Calcium	74.1	mg/kg	9.6	01/21/20 04:48	
EPA 6010D	Chromium	3.0	mg/kg	0.48	01/21/20 04:48	
EPA 6010D	Lead	4.5	mg/kg	0.48	01/21/20 04:48	
PA 7471B	Mercury	0.0081	mg/kg	0.0036	01/22/20 11:34	
ASTM D2974-87	Percent Moisture	13.4	%	0.10	01/17/20 15:58	
EPA 9060A	Total Organic Carbon	3180	mg/kg	693	01/25/20 12:19	
EPA 9060A	Total Organic Carbon	2650	mg/kg	693	01/25/20 12:19	
EPA 9060A	Total Organic Carbon	2690	mg/kg	693	01/25/20 12:19	
EPA 9060A	Total Organic Carbon	3520	mg/kg	693	01/25/20 12:19	
EPA 9060A	Mean Total Organic Carbon	3010	mg/kg	693	01/25/20 12:19	
2461259005	SB5					
EPA 6010	Copper	10.9	mg/kg	1.7	01/27/20 15:17	
EPA 6010	Vanadium	19.6	mg/kg	3.5	01/27/20 15:17	
EPA 6010	Zinc	58.3	mg/kg	6.9	01/27/20 15:17	
PA 6010D	Arsenic	4.1	mg/kg	0.81	01/21/20 04:51	
PA 6010D	Barium	98.9	mg/kg	0.41	01/21/20 04:51	
EPA 6010D	Beryllium	0.52	mg/kg	0.081	01/21/20 04:51	
EPA 6010D	Calcium	1830	mg/kg	8.1	01/21/20 04:51	
PA 6010D	Chromium	6.3	mg/kg	0.41	01/21/20 04:51	
EPA 6010D	Cobalt	8.2	mg/kg	0.41	01/21/20 04:51	
EPA 6010D	Lead	9.5	mg/kg	0.41	01/21/20 04:51	
ASTM D2974-87	Percent Moisture	18.0	///w//////////////////////////////////		01/17/20 15:58	
2461259006	SB6					
PA 6010	Copper	16.5	mg/kg	1.6	01/27/20 15:21	
PA 6010	Vanadium	37.0	mg/kg	3.3	01/27/20 15:21	
PA 6010	Zinc	58.0	mg/kg	6.5	01/27/20 15:21	
PA 6010D	Arsenic	6.0	mg/kg		01/21/20 04:54	
PA 6010D	Barium	104	mg/kg	0.59	01/21/20 04:54	
PA 6010D	Beryllium	0.75	mg/kg		01/21/20 04:54	
PA 6010D	Calcium	2190	mg/kg	11.7	01/21/20 04:54	
EPA 6010D	Chromium	11.9	mg/kg	0.59	01/21/20 04:54	
EPA 6010D	Cobalt	13.7	mg/kg		01/21/20 04:54	
EPA 6010D	Lead	10.9	mg/kg	0.59	01/21/20 04:54	
EPA 7471B	Mercury	0.0050	mg/kg	0.0035	01/22/20 11:38	
STM D2974-87	Percent Moisture	21.2	111g/kg %	0.10	01/17/20 15:58	
PA 9060A	Total Organic Carbon	1410	mg/kg	761	01/17/20 13:30	
EPA 9060A	Total Organic Carbon  Total Organic Carbon	1320	mg/kg	761 761	01/25/20 12:48	
EPA 9060A	Total Organic Carbon  Total Organic Carbon	1280	mg/kg	761 761	01/25/20 12:48	
		957			01/25/20 12:48	
	Total Organic Carbon		mg/kg	761		
EPA 9060A EPA 9060A	Mean Total Organic Carbon	1740	ma/ka	/n 1	() 1/25/2011 7.48	
:PA 9060A :PA 9060A <b>2461259007</b>	Mean Total Organic Carbon  SB7	1240	mg/kg	761	01/25/20 12:48	

## **REPORT OF LABORATORY ANALYSIS**

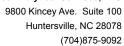




### **SUMMARY OF DETECTION**

Project: CHARRAH
Pace Project No.: 92461259

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifier
2461259007	SB7					
EPA 6010	Vanadium	13.2	mg/kg	3.3	01/25/20 10:27	
EPA 6010	Zinc	14.2	mg/kg	6.5	01/25/20 10:27	
EPA 6010D	Arsenic	4.1	mg/kg	0.71	01/21/20 04:57	
EPA 6010D	Barium	79.9	mg/kg	0.35	01/21/20 04:57	
EPA 6010D	Beryllium	0.45	mg/kg	0.071	01/21/20 04:57	
EPA 6010D	Calcium	1090	mg/kg	7.1	01/21/20 04:57	
EPA 6010D	Chromium	8.0	mg/kg	0.35	01/21/20 04:57	
PA 6010D	Cobalt	7.2	mg/kg	0.35	01/21/20 04:57	
PA 6010D	Lead	9.3	mg/kg	0.35	01/21/20 04:57	
STM D2974-87	Percent Moisture	16.8	%	0.10	01/17/20 15:58	
PA 9060A	Total Organic Carbon	2910	mg/kg	721	01/25/20 13:31	
EPA 9060A	Total Organic Carbon	1600	mg/kg	721	01/25/20 13:31	
PA 9060A	Total Organic Carbon	1540	mg/kg	721	01/25/20 13:31	
EPA 9060A	Total Organic Carbon	1510	mg/kg	721	01/25/20 13:31	
PA 9060A	Mean Total Organic Carbon	1890	mg/kg	721	01/25/20 13:31	
2461259008	SB8					
PA 6010	Copper	5.5	mg/kg	0.34	01/24/20 13:55	
PA 6010	Vanadium	16.3	mg/kg	0.69	01/24/20 13:55	
PA 6010	Zinc	18.0	mg/kg	1.4	01/24/20 13:55	
PA 6010D	Arsenic	3.3	mg/kg	0.84	01/21/20 05:00	
PA 6010D	Barium	40.4	mg/kg	0.42		
PA 6010D	Beryllium	0.22	mg/kg	0.084	01/21/20 05:00	
PA 6010D	Calcium	421	mg/kg	8.4		
PA 6010D	Chromium	9.7	mg/kg	0.42	01/21/20 05:00	
PA 6010D	Cobalt	3.0	mg/kg		01/21/20 05:00	
PA 6010D	Lead	7.2	mg/kg		01/21/20 05:00	
PA 6010D	Molybdenum	0.71	mg/kg		01/21/20 05:00	
EPA 7471B	Mercury	0.016	mg/kg	0.0035	01/22/20 11:43	
STM D2974-87	Percent Moisture	12.1	%	0.10	01/17/20 15:58	
PA 9060A	Total Organic Carbon	9770	mg/kg	683	01/25/20 13:49	
EPA 9060A	Total Organic Carbon	11500	mg/kg	683	01/25/20 13:49	
EPA 9060A	Total Organic Carbon	10100	mg/kg	683	01/25/20 13:49	
PA 9060A	Total Organic Carbon	13500	mg/kg	683	01/25/20 13:49	
PA 9060A	Mean Total Organic Carbon	11200	mg/kg	683	01/25/20 13:49	
2461259009	SB9					
PA 6010	Copper	4.6	mg/kg	0.38	01/24/20 13:59	
EPA 6010	Vanadium	34.3	mg/kg	0.76	01/24/20 13:59	
PA 6010	Zinc	5.8	mg/kg	1.5	01/24/20 13:59	
PA 6010D	Arsenic	5.1	mg/kg	0.92	01/21/20 05:03	
PA 6010D	Barium	33.7	mg/kg	0.46	01/21/20 05:03	
PA 6010D	Beryllium	0.23	mg/kg		01/21/20 05:03	
PA 6010D	Calcium	212	mg/kg	9.2		
PA 6010D	Chromium	16.9	mg/kg	0.46	01/21/20 05:03	
PA 6010D	Cobalt	1.3	mg/kg	0.46	01/21/20 05:03	
EPA 6010D	Lead	6.8	mg/kg	0.46	01/21/20 05:03	
EPA 7471B	Mercury	0.022	mg/kg		01/22/20 11:45	





### **SUMMARY OF DETECTION**

Project: CHARRAH
Pace Project No.: 92461259

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92461259009	SB9					
ASTM D2974-87	Percent Moisture	20.9	%	0.10	01/17/20 15:58	
EPA 9060A	Total Organic Carbon	1670	mg/kg	758	01/25/20 13:58	
EPA 9060A	Total Organic Carbon	2440	mg/kg	758	01/25/20 13:58	
EPA 9060A	Total Organic Carbon	2030	mg/kg	758	01/25/20 13:58	
EPA 9060A	Total Organic Carbon	2490	mg/kg	758	01/25/20 13:58	
EPA 9060A	Mean Total Organic Carbon	2160	mg/kg	758	01/25/20 13:58	
92461259010	SB10					
EPA 6010	Copper	1.8	mg/kg	0.34	01/24/20 14:41	
EPA 6010	Vanadium	12.3	mg/kg	0.67	01/24/20 14:41	
EPA 6010	Zinc	13.2	mg/kg	1.3	01/24/20 14:41	
EPA 6010D	Arsenic	2.4	mg/kg	0.86	01/21/20 05:07	
EPA 6010D	Barium	39.3	mg/kg	0.43	01/21/20 05:07	
EPA 6010D	Beryllium	0.33	mg/kg	0.086	01/21/20 05:07	
EPA 6010D	Calcium	113	mg/kg	8.6	01/21/20 05:07	
EPA 6010D	Chromium	3.5	mg/kg	0.43	01/21/20 05:07	
EPA 6010D	Cobalt	3.8	mg/kg	0.43	01/21/20 05:07	
EPA 6010D	Lead	8.9	mg/kg	0.43	01/21/20 05:07	
EPA 7471B	Mercury	0.016	mg/kg	0.0058	01/22/20 11:48	
ASTM D2974-87	Percent Moisture	15.8	%	0.10	01/17/20 15:58	
EPA 9060A	Total Organic Carbon	6120	mg/kg	713	01/25/20 14:21	
EPA 9060A	Total Organic Carbon	7260	mg/kg	713	01/25/20 14:21	
EPA 9060A	Total Organic Carbon	5470	mg/kg	713	01/25/20 14:21	
EPA 9060A	Total Organic Carbon	5730	mg/kg	713	01/25/20 14:21	
EPA 9060A	Mean Total Organic Carbon	6140	mg/kg	713	01/25/20 14:21	



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB1	Lab ID: 9246	<b>61259001</b> Co	ollected: 01/15/2	0 12:15	Received: 01	/16/20 17:10 N	latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for perce	ent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	od: EPA 6010D	Preparation Me	thod: E	PA 3050B			
	Pace Analytica	Services - Ash	eville					
Antimony	ND	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7440-36-0	
Arsenic	ND	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:27	7440-38-2	
Barium	9.1	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7440-39-3	
Beryllium	ND	mg/kg	0.12	1	01/19/20 12:19	01/21/20 04:27	7440-41-7	
Boron	ND	mg/kg	5.8	1	01/19/20 12:19	01/21/20 04:27	7440-42-8	
Cadmium	ND	mg/kg	0.12	1	01/19/20 12:19	01/21/20 04:27	7440-43-9	
Calcium	21.8	mg/kg	11.6	1	01/19/20 12:19	01/21/20 04:27	7440-70-2	
Chromium	2.1	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7440-47-3	
Cobalt	ND	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7440-48-4	
_ead	3.1	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7439-92-1	
Molybdenum	ND	mg/kg	0.58	1	01/19/20 12:19	01/21/20 04:27	7439-98-7	
Selenium	ND	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:27	7782-49-2	
「hallium	ND	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:27	7440-28-0	
6010 MET ICP	Analytical Method: EPA 6010 Preparation Method: EPA 3050							
	Pace Analytica	Services - Orm	nond Beach					
Copper	1.9	mg/kg	0.36	1	01/23/20 18:03	01/24/20 18:44	7440-50-8	
_ithium	ND	mg/kg	35.5	1		01/24/20 18:44		N2
√anadium	11.8	mg/kg	0.71	1		01/24/20 18:44		
Zinc	4.9	mg/kg	1.4	1		01/24/20 18:44		
7471 Mercury	Analytical Meth	od: EPA 7471B	Preparation Me	thod: E	PA 7471B			
•	Pace Analytica	Services - Ash	eville					
Mercury	0.021	mg/kg	0.0062	1	01/21/20 10:20	01/22/20 11:26	7439-97-6	
Percent Moisture	Analytical Meth	od: ASTM D29	74-87					
Croon Moistare	Pace Analytica							
Damagat Majatuwa				4		04/47/20 45:57		
Percent Moisture	17.0	%	0.10	1		01/17/20 15:57		
Total Organic Carbon	Analytical Meth	od: EPA 9060A						
	Pace Analytica	Services - Ash	eville					
Total Organic Carbon	6430	mg/kg	722	1		01/25/20 11:33	7440-44-0	
Total Organic Carbon	6860	mg/kg	722	1		01/25/20 11:33		
Total Organic Carbon	7830	mg/kg	722	1		01/25/20 11:33		
Total Organic Carbon	5050	mg/kg	722	1		01/25/20 11:33		
Mean Total Organic Carbon	6540	mg/kg	722	1		01/25/20 11:33		



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB2	Lab ID: 924	61259002	Collected: 01/15/2	20 14:45	Received: 01	/16/20 17:10 N	latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for pe	ercent moisture, sa	ample s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation Me	ethod: E	PA 3050B			
	Pace Analytica	I Services -	Asheville					
Antimony	ND	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7440-36-0	
Arsenic	5.6	mg/kg	1.1	1	01/19/20 12:19	01/21/20 04:30	7440-38-2	
Barium	36.4	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7440-39-3	
Beryllium	0.32	mg/kg	0.11	1	01/19/20 12:19	01/21/20 04:30	7440-41-7	
Boron	ND	mg/kg	5.4	1	01/19/20 12:19	01/21/20 04:30	7440-42-8	
Cadmium	ND	mg/kg	0.11	1	01/19/20 12:19	01/21/20 04:30	7440-43-9	
Calcium	227	mg/kg	10.8	1	01/19/20 12:19	01/21/20 04:30	7440-70-2	
Chromium	12.3	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7440-47-3	
Cobalt	1.8	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7440-48-4	
Lead	6.2	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7439-92-1	
Molybdenum	ND	mg/kg	0.54	1	01/19/20 12:19	01/21/20 04:30	7439-98-7	
Selenium	ND	mg/kg	1.1	1	01/19/20 12:19	01/21/20 04:30	7782-49-2	
Γhallium	ND	mg/kg	1.1	1	01/19/20 12:19	01/21/20 04:30	7440-28-0	
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Metl	hod: EP	A 3050			
	•		Ormond Beach					
Copper	10.8	mg/kg	1.6	5	01/23/20 18:03	01/24/20 18:47	7440-50-8	
_ithium	ND	mg/kg	157	5		01/24/20 18:47		D3,N2
Vanadium	39.2	mg/kg	3.1	5		01/24/20 18:47		,
Zinc	8.9	mg/kg	6.3	5		01/24/20 18:47		
7471 Mercury	Analytical Meth	nod: FPA 74	71B Preparation Me	ethod: F	PA 7471B			
Tr i moroury	Pace Analytica		·	Z				
Mercury	ND	mg/kg	0.0065	1	01/21/20 10:20	01/22/20 11:29	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM E	)2974-87					
	Pace Analytica	l Services -	Charlotte					
Percent Moisture	18.6	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 90	30A					
	Pace Analytica							
Total Organic Carbon	2110	mg/kg	737	1		01/25/20 12:00	7440-44-0	
Total Organic Carbon	1730	mg/kg	737	1		01/25/20 12:00		
Total Organic Carbon	5110	mg/kg	737	1		01/25/20 12:00		
Total Organic Carbon	1970	mg/kg	737	1		01/25/20 12:00		
Mean Total Organic Carbon	2730	mg/kg	737	1		01/25/20 12:00		



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB3	Lab ID: 924	61259003	Collected: 01/15/2	20 15:10	Received: 01	/16/20 17:10 N	latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for p	ercent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	l Services -	Asheville					
Copper	12.4	mg/kg	0.31	1	01/23/20 18:03	01/24/20 18:51	7440-50-8	
Lithium	ND	mg/kg	31.5	1	01/23/20 18:03	01/24/20 18:51	7439-93-2	N2
√anadium	13.6	mg/kg	0.63	1	01/23/20 18:03	01/24/20 18:51	7440-62-2	
Zinc	14.7	mg/kg	1.3	1	01/23/20 18:03	01/24/20 18:51	7440-66-6	
Antimony	ND	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7440-36-0	
Arsenic	4.7	mg/kg	0.83	1	01/19/20 12:19	01/21/20 04:45	7440-38-2	
Barium	35.9	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7440-39-3	
Beryllium	0.22	mg/kg	0.083	1	01/19/20 12:19	01/21/20 04:45	7440-41-7	
Boron	ND	mg/kg	4.1	1	01/19/20 12:19	01/21/20 04:45	7440-42-8	
Cadmium	ND	mg/kg	0.083	1	01/19/20 12:19	01/21/20 04:45	7440-43-9	
Calcium	94.4	mg/kg	8.3	1	01/19/20 12:19	01/21/20 04:45	7440-70-2	
Chromium	11.8	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7440-47-3	
Cobalt	2.1	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7440-48-4	
_ead	11.7	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7439-92-1	
Molybdenum	0.52	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:45	7439-98-7	
Selenium	ND	mg/kg	0.83	1	01/19/20 12:19	01/21/20 04:45	7782-49-2	
Γhallium	ND	mg/kg	0.83	1	01/19/20 12:19	01/21/20 04:45	7440-28-0	
7471 Mercury	Analytical Meth	nod: EPA 74	71B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	l Services -	Asheville					
Mercury	0.0093	mg/kg	0.0039	1	01/21/20 10:20	01/22/20 11:31	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM I	D2974-87					
	Pace Analytica	l Services -	Charlotte					
Percent Moisture	8.6	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 90	60A					
	Pace Analytica	l Services -	Asheville					
Total Organic Carbon	ND	mg/kg	657	1		01/25/20 12:10	7440-44-0	
Total Organic Carbon	ND	mg/kg	657	1		01/25/20 12:10	7440-44-0	
Total Organic Carbon	ND	mg/kg	657	1		01/25/20 12:10	7440-44-0	
Total Organic Carbon	ND	mg/kg	657	1		01/25/20 12:10	7440-44-0	
Mean Total Organic Carbon	ND	mg/kg	657	1		01/25/20 12:10	7440-44-0	



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB4	Lab ID: 924		Collected: 01/15/2				latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for p	ercent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	I Services -	Asheville					
Copper	2.5	mg/kg	0.34	1	01/23/20 18:03	01/24/20 18:54	7440-50-8	
_ithium	ND	mg/kg	33.8	1	01/23/20 18:03	01/24/20 18:54	7439-93-2	N2
/anadium	20.8	mg/kg	0.68	1	01/23/20 18:03	01/24/20 18:54	7440-62-2	
Zinc	7.1	mg/kg	1.4	1	01/23/20 18:03	01/24/20 18:54	7440-66-6	
Antimony	ND	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7440-36-0	
Arsenic	ND	mg/kg	0.96	1	01/19/20 12:19	01/21/20 04:48	7440-38-2	
Barium	16.8	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7440-39-3	
Beryllium	ND	mg/kg	0.096	1	01/19/20 12:19	01/21/20 04:48	7440-41-7	
Boron	ND	mg/kg	4.8	1	01/19/20 12:19	01/21/20 04:48	7440-42-8	
Cadmium	ND	mg/kg	0.096	1	01/19/20 12:19	01/21/20 04:48	7440-43-9	
Calcium	74.1	mg/kg	9.6	1	01/19/20 12:19	01/21/20 04:48	7440-70-2	
Chromium	3.0	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7440-47-3	
Cobalt	ND	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7440-48-4	
ead	4.5	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7439-92-1	
Nolybdenum	ND	mg/kg	0.48	1	01/19/20 12:19	01/21/20 04:48	7439-98-7	
Selenium	ND	mg/kg	0.96	1	01/19/20 12:19	01/21/20 04:48	7782-49-2	
hallium	ND	mg/kg	0.96	1	01/19/20 12:19	01/21/20 04:48	7440-28-0	
471 Mercury	Analytical Meth	nod: EPA 74	71B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	l Services -	Asheville					
Mercury	0.0081	mg/kg	0.0036	1	01/21/20 10:20	01/22/20 11:34	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM [	D2974-87					
	Pace Analytica	I Services -	Charlotte					
Percent Moisture	13.4	%	0.10	1		01/17/20 15:58		
otal Organic Carbon	Analytical Meth	nod: EPA 90	60A					
	Pace Analytica	l Services -	Asheville					
otal Organic Carbon	3180	mg/kg	693	1		01/25/20 12:19	7440-44-0	
otal Organic Carbon	2650	mg/kg	693	1		01/25/20 12:19	7440-44-0	
otal Organic Carbon	2690	mg/kg	693	1		01/25/20 12:19	7440-44-0	
Total Organic Carbon	3520	mg/kg	693	1		01/25/20 12:19		
Mean Total Organic Carbon	3010	mg/kg	693	1		01/25/20 12:19		



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB5	Lab ID: 924		Collected: 01/15/2				latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for p	ercent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	I Services -	Asheville					
Copper	10.9	mg/kg	1.7	5	01/23/20 18:03	01/27/20 15:17	7440-50-8	
Lithium	ND	mg/kg	174	5	01/23/20 18:03	01/27/20 15:17	7439-93-2	N2
Vanadium	19.6	mg/kg	3.5	5	01/23/20 18:03	01/27/20 15:17	7440-62-2	
Zinc	58.3	mg/kg	6.9	5	01/23/20 18:03	01/27/20 15:17	7440-66-6	
Antimony	ND	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7440-36-0	
Arsenic	4.1	mg/kg	0.81	1	01/19/20 12:19	01/21/20 04:51	7440-38-2	
Barium	98.9	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7440-39-3	
Beryllium	0.52	mg/kg	0.081	1	01/19/20 12:19	01/21/20 04:51	7440-41-7	
Boron	ND	mg/kg	4.1	1	01/19/20 12:19	01/21/20 04:51	7440-42-8	
Cadmium	ND	mg/kg	0.081	1	01/19/20 12:19	01/21/20 04:51	7440-43-9	
Calcium	1830	mg/kg	8.1	1	01/19/20 12:19	01/21/20 04:51	7440-70-2	
Chromium	6.3	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7440-47-3	
Cobalt	8.2	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7440-48-4	
₋ead	9.5	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7439-92-1	
Molybdenum	ND	mg/kg	0.41	1	01/19/20 12:19	01/21/20 04:51	7439-98-7	
Selenium	ND	mg/kg	0.81	1	01/19/20 12:19	01/21/20 04:51	7782-49-2	
-hallium	ND	mg/kg	0.81	1	01/19/20 12:19	01/21/20 04:51	7440-28-0	
471 Mercury	Analytical Meth	nod: EPA 74	71B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	mg/kg	0.0038	1	01/21/20 10:20	01/22/20 11:36	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM [	D2974-87					
	Pace Analytica	l Services -	Charlotte					
Percent Moisture	18.0	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 90	60A					
	Pace Analytica	l Services -	Asheville					
Total Organic Carbon	ND	mg/kg	731	1		01/25/20 12:28	7440-44-0	
Total Organic Carbon	ND	mg/kg	731	1		01/25/20 12:28	7440-44-0	
Total Organic Carbon	ND	mg/kg	731	1		01/25/20 12:28	7440-44-0	
Total Organic Carbon	ND	mg/kg	731	1		01/25/20 12:28		
Mean Total Organic Carbon	ND	mg/kg	731	1		01/25/20 12:28	7440-44-0	



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB6	Lab ID: 924		Collected: 01/15/2				latrix: Solid	
Results reported on a "dry weig	-	•		-	•			
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 601	0 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	l Services - A	Asheville					
Copper	16.5	mg/kg	1.6	5	01/23/20 18:03	01/27/20 15:21	7440-50-8	
Lithium	ND	mg/kg	164	5		01/27/20 15:21		N2
Vanadium	37.0	mg/kg	3.3	5		01/27/20 15:21		
Zinc	58.0	mg/kg	6.5	5	01/23/20 18:03	01/27/20 15:21	7440-66-6	
Antimony	ND	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7440-36-0	
Arsenic	6.0	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:54	7440-38-2	
Barium	104	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7440-39-3	
Beryllium	0.75	mg/kg	0.12	1	01/19/20 12:19	01/21/20 04:54	7440-41-7	
Boron	ND	mg/kg	5.9	1	01/19/20 12:19	01/21/20 04:54	7440-42-8	
Cadmium	ND	mg/kg	0.12	1	01/19/20 12:19	01/21/20 04:54	7440-43-9	
Calcium	2190	mg/kg	11.7	1	01/19/20 12:19	01/21/20 04:54	7440-70-2	
Chromium	11.9	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7440-47-3	
Cobalt	13.7	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7440-48-4	
Lead	10.9	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7439-92-1	
Molybdenum	ND	mg/kg	0.59	1	01/19/20 12:19	01/21/20 04:54	7439-98-7	
Selenium	ND	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:54	7782-49-2	
Thallium	ND	mg/kg	1.2	1	01/19/20 12:19	01/21/20 04:54	7440-28-0	
7471 Mercury	Analytical Meth	nod: EPA 747	1B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	l Services - A	Asheville					
Mercury	0.0050	mg/kg	0.0035	1	01/21/20 10:20	01/22/20 11:38	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM D	2974-87					
	Pace Analytica							
Percent Moisture	21.2	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 906	60A					
-	Pace Analytica	l Services - A	Asheville					
Total Organic Carbon	1410	mg/kg	761	1		01/25/20 12:48	7440-44-0	
Total Organic Carbon	1320	mg/kg	761	1		01/25/20 12:48	7440-44-0	
Total Organic Carbon	1280	mg/kg	761	1		01/25/20 12:48	7440-44-0	
Total Organic Carbon	957	mg/kg	761	1		01/25/20 12:48	7440-44-0	
Mean Total Organic Carbon	1240	mg/kg	761	1		01/25/20 12:48		



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB7	Lab ID: 924		Collected: 01/15/2				latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for p	ercent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	l Services -	Asheville					
Copper	2.4	mg/kg	1.6	5	01/23/20 18:03	01/25/20 10:27	7440-50-8	
_ithium	ND	mg/kg	32.6	1	01/23/20 18:03	01/24/20 13:36	7439-93-2	N2
/anadium	13.2	mg/kg	3.3	5	01/23/20 18:03	01/25/20 10:27	7440-62-2	
Zinc	14.2	mg/kg	6.5	5	01/23/20 18:03	01/25/20 10:27	7440-66-6	
Antimony	ND	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7440-36-0	
Arsenic	4.1	mg/kg	0.71	1	01/19/20 12:19	01/21/20 04:57	7440-38-2	
Barium	79.9	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7440-39-3	
Beryllium	0.45	mg/kg	0.071	1	01/19/20 12:19	01/21/20 04:57	7440-41-7	
Boron	ND	mg/kg	3.5	1	01/19/20 12:19	01/21/20 04:57	7440-42-8	
Cadmium	ND	mg/kg	0.071	1	01/19/20 12:19	01/21/20 04:57	7440-43-9	
Calcium	1090	mg/kg	7.1	1	01/19/20 12:19	01/21/20 04:57	7440-70-2	
Chromium	8.0	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7440-47-3	
Cobalt	7.2	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7440-48-4	
_ead	9.3	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7439-92-1	
Molybdenum	ND	mg/kg	0.35	1	01/19/20 12:19	01/21/20 04:57	7439-98-7	
Selenium	ND	mg/kg	0.71	1	01/19/20 12:19	01/21/20 04:57	7782-49-2	
hallium	ND	mg/kg	0.71	1	01/19/20 12:19	01/21/20 04:57	7440-28-0	
471 Mercury	Analytical Meth	nod: EPA 74	71B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	mg/kg	0.0053	1	01/21/20 10:20	01/22/20 11:41	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM [	D2974-87					
	Pace Analytica	l Services -	Charlotte					
Percent Moisture	16.8	%	0.10	1		01/17/20 15:58		
otal Organic Carbon	Analytical Meth	nod: EPA 90	60A					
	Pace Analytica	l Services -	Asheville					
otal Organic Carbon	2910	mg/kg	721	1		01/25/20 13:31	7440-44-0	
Total Organic Carbon	1600	mg/kg	721	1		01/25/20 13:31	7440-44-0	
otal Organic Carbon	1540	mg/kg	721	1		01/25/20 13:31	7440-44-0	
otal Organic Carbon	1510	mg/kg	721	1		01/25/20 13:31	7440-44-0	
Mean Total Organic Carbon	1890	mg/kg	721	1		01/25/20 13:31	7440-44-0	



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB8	Lab ID: 924		Collected: 01/16/2				latrix: Solid	
Results reported on a "dry weig	ht" basis and are adj	usted for p	ercent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	I Services -	Asheville					
Copper	5.5	mg/kg	0.34	1	01/23/20 18:03	01/24/20 13:55	7440-50-8	
_ithium	ND	mg/kg	34.4	1	01/23/20 18:03	01/24/20 13:55	7439-93-2	N2
/anadium	16.3	mg/kg	0.69	1	01/23/20 18:03	01/24/20 13:55	7440-62-2	
Zinc	18.0	mg/kg	1.4	1	01/23/20 18:03	01/24/20 13:55	7440-66-6	
Antimony	ND	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7440-36-0	
Arsenic	3.3	mg/kg	0.84	1	01/19/20 12:19	01/21/20 05:00	7440-38-2	
Barium	40.4	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7440-39-3	
Beryllium	0.22	mg/kg	0.084	1	01/19/20 12:19	01/21/20 05:00	7440-41-7	
Boron	ND	mg/kg	4.2	1	01/19/20 12:19	01/21/20 05:00	7440-42-8	
Cadmium	ND	mg/kg	0.084	1	01/19/20 12:19	01/21/20 05:00	7440-43-9	
Calcium	421	mg/kg	8.4	1	01/19/20 12:19	01/21/20 05:00	7440-70-2	
Chromium	9.7	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7440-47-3	
Cobalt	3.0	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7440-48-4	
_ead	7.2	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7439-92-1	
Nolybdenum	0.71	mg/kg	0.42	1	01/19/20 12:19	01/21/20 05:00	7439-98-7	
Selenium	ND	mg/kg	0.84	1	01/19/20 12:19	01/21/20 05:00	7782-49-2	
hallium	ND	mg/kg	0.84	1	01/19/20 12:19	01/21/20 05:00	7440-28-0	
471 Mercury	Analytical Meth	nod: EPA 74	71B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	I Services -	Asheville					
Mercury	0.016	mg/kg	0.0035	1	01/21/20 10:20	01/22/20 11:43	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM [	02974-87					
	Pace Analytica	l Services -	Charlotte					
Percent Moisture	12.1	%	0.10	1		01/17/20 15:58		
otal Organic Carbon	Analytical Meth	nod: EPA 90	60A					
	Pace Analytica	l Services -	Asheville					
Total Organic Carbon	9770	mg/kg	683	1		01/25/20 13:49	7440-44-0	
Total Organic Carbon	11500	mg/kg	683	1		01/25/20 13:49	7440-44-0	
otal Organic Carbon	10100	mg/kg	683	1		01/25/20 13:49	7440-44-0	
otal Organic Carbon	13500	mg/kg	683	1		01/25/20 13:49	7440-44-0	
Mean Total Organic Carbon	11200	mg/kg	683	1		01/25/20 13:49	7440-44-0	



Project: CHARRAH
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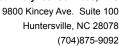
Sample: SB9	Lab ID: 924		Collected: 01/16/2				latrix: Solid	
Results reported on a "dry weig	ght" basis and are adj	usted for pe	rcent moisture, sa	mple s	ize and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 601	0 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	I Services - A	sheville					
Copper	4.6	mg/kg	0.38	1	01/23/20 18:03	01/24/20 13:59	7440-50-8	
Lithium	ND	mg/kg	37.9	1	01/23/20 18:03	01/24/20 13:59	7439-93-2	N2
Vanadium	34.3	mg/kg	0.76	1	01/23/20 18:03	01/24/20 13:59	7440-62-2	
Zinc	5.8	mg/kg	1.5	1	01/23/20 18:03	01/24/20 13:59	7440-66-6	
Antimony	ND	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7440-36-0	
Arsenic	5.1	mg/kg	0.92	1	01/19/20 12:19	01/21/20 05:03	7440-38-2	
Barium	33.7	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7440-39-3	
Beryllium	0.23	mg/kg	0.092	1		01/21/20 05:03		
Boron	ND	mg/kg	4.6	1	01/19/20 12:19	01/21/20 05:03	7440-42-8	
Cadmium	ND	mg/kg	0.092	1		01/21/20 05:03		
Calcium	212	mg/kg	9.2	1	01/19/20 12:19	01/21/20 05:03	7440-70-2	
Chromium	16.9	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7440-47-3	
Cobalt	1.3	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7440-48-4	
Lead	6.8	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7439-92-1	
Molybdenum	ND	mg/kg	0.46	1	01/19/20 12:19	01/21/20 05:03	7439-98-7	
Selenium	ND	mg/kg	0.92	1	01/19/20 12:19	01/21/20 05:03	7782-49-2	
Thallium	ND	mg/kg	0.92	1	01/19/20 12:19	01/21/20 05:03	7440-28-0	
7471 Mercury	Analytical Meth	nod: EPA 747	1B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	I Services - A	sheville					
Mercury	0.022	mg/kg	0.0045	1	01/21/20 10:20	01/22/20 11:45	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM D	2974-87					
	Pace Analytica	l Services - C	Charlotte					
Percent Moisture	20.9	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 906	0A					
	Pace Analytica	I Services - A	sheville					
Total Organic Carbon	1670	mg/kg	758	1		01/25/20 13:58	7440-44-0	
Total Organic Carbon	2440	mg/kg	758	1		01/25/20 13:58	7440-44-0	
Total Organic Carbon	2030	mg/kg	758	1		01/25/20 13:58	7440-44-0	
Total Organic Carbon	2490	mg/kg	758	1		01/25/20 13:58	7440-44-0	
Mean Total Organic Carbon	2160	mg/kg	758	1		01/25/20 13:58	7440-44-0	



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Sample: SB10	Lab ID: 924		Collected: 01/16/2				latrix: Solid	
Results reported on a "dry weig	ght" basis and are adj	usted for pe	rcent moisture, sa	mple s	ize and any dilut	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 601	0 Preparation Meth	nod: EP	A 3050			
	Pace Analytica	I Services - A	sheville					
Copper	1.8	mg/kg	0.34	1	01/23/20 18:03	01/24/20 14:41	7440-50-8	
Lithium	ND	mg/kg	33.7	1	01/23/20 18:03	01/24/20 14:41	7439-93-2	N2
Vanadium	12.3	mg/kg	0.67	1	01/23/20 18:03	01/24/20 14:41	7440-62-2	
Zinc	13.2	mg/kg	1.3	1	01/23/20 18:03	01/24/20 14:41	7440-66-6	
Antimony	ND	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7440-36-0	
Arsenic	2.4	mg/kg	0.86	1	01/19/20 12:19	01/21/20 05:07	7440-38-2	
Barium	39.3	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7440-39-3	
Beryllium	0.33	mg/kg	0.086	1	01/19/20 12:19	01/21/20 05:07	7440-41-7	
Boron	ND	mg/kg	4.3	1	01/19/20 12:19	01/21/20 05:07	7440-42-8	
Cadmium	ND	mg/kg	0.086	1	01/19/20 12:19	01/21/20 05:07	7440-43-9	
Calcium	113	mg/kg	8.6	1	01/19/20 12:19	01/21/20 05:07	7440-70-2	
Chromium	3.5	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7440-47-3	
Cobalt	3.8	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7440-48-4	
Lead	8.9	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7439-92-1	
Molybdenum	ND	mg/kg	0.43	1	01/19/20 12:19	01/21/20 05:07	7439-98-7	
Selenium	ND	mg/kg	0.86	1	01/19/20 12:19	01/21/20 05:07	7782-49-2	
Thallium	ND	mg/kg	0.86	1	01/19/20 12:19	01/21/20 05:07	7440-28-0	
7471 Mercury	Analytical Meth	nod: EPA 747	1B Preparation Me	thod: E	PA 7471B			
	Pace Analytica	I Services - A	sheville					
Mercury	0.016	mg/kg	0.0058	1	01/21/20 10:20	01/22/20 11:48	7439-97-6	
Percent Moisture	Analytical Meth	nod: ASTM D	2974-87					
	Pace Analytica	l Services - C	Charlotte					
Percent Moisture	15.8	%	0.10	1		01/17/20 15:58		
Total Organic Carbon	Analytical Meth	nod: EPA 906	0A					
	Pace Analytica	l Services - A	sheville					
Total Organic Carbon	6120	mg/kg	713	1		01/25/20 14:21	7440-44-0	
Total Organic Carbon	7260	mg/kg	713	1		01/25/20 14:21	7440-44-0	
Total Organic Carbon	5470	mg/kg	713	1		01/25/20 14:21	7440-44-0	
Total Organic Carbon	5730	mg/kg	713	1		01/25/20 14:21	7440-44-0	
Mean Total Organic Carbon	6140	mg/kg	713	1		01/25/20 14:21	7440-44-0	





Project: CHARRAH
Pace Project No.: 92461259

QC Batch: 520441

QC Batch Method: EPA 7471B

Analysis Method: EPA 7471B

Analysis Description: 7471 Mercury

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

METHOD BLANK: 2784858

Parameter

Mercury

Date: 07/20/2020 03:15 PM

Matrix: Solid

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

Units

Blank Result Reporting

Limit Analyzed Qualifiers

Mercury mg/kg ND 0.0060 01/22/20 10:58

LABORATORY CONTROL SAMPLE: 2784859

Spike LCS LCS % Rec Parameter Units Result % Rec Limits Qualifiers Conc. 98 80-120 mg/kg 0.083 0.081

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2784860 2784861

MS MSD

92461176004 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual 0.056 0.050 75-125 20 M1,R1 Mercury 0.035 0.047 0.13 -18 158 90 mg/kg

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

QC Batch: 520146 Analysis Method: EPA 6010D QC Batch Method: EPA 3050B Analysis Description: 6010 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

METHOD BLANK: 2783520 Matrix: Solid

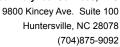
Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Antimony	mg/kg	ND ND	0.50	01/21/20 04:05	
Arsenic	mg/kg	ND	1.0	01/21/20 04:05	
Barium	mg/kg	ND	0.50	01/21/20 04:05	
Beryllium	mg/kg	ND	0.10	01/21/20 04:05	
Boron	mg/kg	ND	5.0	01/21/20 04:05	
Cadmium	mg/kg	ND	0.10	01/21/20 04:05	
Calcium	mg/kg	ND	10.0	01/21/20 04:05	
Chromium	mg/kg	ND	0.50	01/21/20 04:05	
Cobalt	mg/kg	ND	0.50	01/21/20 04:05	
Lead	mg/kg	ND	0.50	01/21/20 04:05	
Molybdenum	mg/kg	ND	0.50	01/21/20 04:05	
Selenium	mg/kg	ND	1.0	01/21/20 04:05	
Thallium	mg/kg	ND	1.0	01/21/20 04:05	

LABORATORY CONTROL SAMPLE:	2783521	Spike	LC	S	LCS	% F	Rec				
Parameter	Units	Conc.	Res		% Rec	Lim		Qualifiers			
Antimony	mg/kg		50	47.9	9		80-120				
Arsenic	mg/kg		50	47.2	9	4	80-120				
Barium	mg/kg		50	49.6	9	9	80-120				
Beryllium	mg/kg		50	49.2	9	8	80-120				
Boron	mg/kg		50	46.9	9	4	80-120				
Cadmium	mg/kg		50	48.1	9	6	80-120				
Calcium	mg/kg	50	00	494	9	9	80-120				
Chromium	mg/kg		50	49.1	9	8	80-120				
Cobalt	mg/kg		50	49.3	9	9	80-120				
Lead	mg/kg		50	48.8	9	8	80-120				
Molybdenum	mg/kg		50	47.8	9	6	80-120				
Selenium	mg/kg	Ę	50	44.5	8	9	80-120				
Thallium	mg/kg	Ę	50	48.8	9	8	80-120				
MATRIX SPIKE & MATRIX SPIKE DU	PLICATE: 2783	522		2783523	3						
		MS	MSD								
	92461210003	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter Unit	ts Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony mg/l	kg ND	54.2	54.2	25.0	26.9	45	49	75-125	7	20	M1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

MATRIX SPIKE & MATRIX	SPIKE DUPLIC	ATE: 2783			2783523							
	9:	2461210003	MS Spike	MSD Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Arsenic	mg/kg	2.9	54.2	54.2	53.2	53.8	93	94	75-125	1	20	
Barium	mg/kg	62.0	54.2	54.2	115	111	99	91	75-125	4	20	
Beryllium	mg/kg	0.32	54.2	54.2	51.7	52.8	95	97	75-125	2	20	
Boron	mg/kg	8.8	54.2	54.2	60.1	60.0	95	95	75-125	0	20	
Cadmium	mg/kg	0.11	54.2	54.2	52.2	52.9	96	97	75-125	1	20	
Calcium	mg/kg	48600	542	542	58000	54100	1740	1000	75-125	7	20	E,M1
Chromium	mg/kg	29.9	54.2	54.2	82.9	83.5	98	99	75-125	1	20	
Cobalt	mg/kg	2.0	54.2	54.2	52.0	53.0	92	94	75-125	2	20	
Lead	mg/kg	24.7	54.2	54.2	83.1	77.9	108	98	75-125	6	20	
Molybdenum	mg/kg	0.83	54.2	54.2	50.1	51.0	91	92	75-125	2	20	
Selenium	mg/kg	ND	54.2	54.2	46.0	48.4	85	89	75-125	5	20	
Thallium	mg/kg	ND	54.2	54.2	49.7	51.0	91	93	75-125	2	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

QC Batch: 604355 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET Solid

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006

METHOD BLANK: 3285163 Matrix: Solid

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Copper	mg/kg	ND	0.31	01/24/20 18:06	
Lithium	mg/kg	ND	30.8	01/24/20 18:06	N2
Vanadium	mg/kg	ND	0.62	01/24/20 18:06	
Zinc	mg/kg	ND	1.2	01/24/20 18:06	

LABORATORY CONTROL SAMPLE:	3285164					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Copper	mg/kg	15.5	15.8	102	80-120	
Lithium	mg/kg	774	758	98		N2
Vanadium	mg/kg	15.5	16.3	105	80-120	
Zinc	mg/kg	77.4	79.5	103	80-120	

MATRIX SPIKE & MATRIX S	PIKE DUPLIC	ATE: 3285	165		3285166							
			MS	MSD								
	3	5524760001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Copper	mg/kg	0.57	16.7	17.5	15.8	16.5	92	91	75-125	4	20	
Lithium	mg/kg	5.9J	831	875	755	780	90	88		3		N2
Vanadium	mg/kg	2.3	16.7	17.5	19.6	20.0	104	101	75-125	2	20	
Zinc	mg/kg	0.61U	83.1	87.5	77.0	80.3	92	91	75-125	4	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

QC Batch: 604361 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET Solid

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92461259007, 92461259008, 92461259009, 92461259010

METHOD BLANK: 3285241 Matrix: Solid

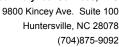
Associated Lab Samples: 92461259007, 92461259008, 92461259009, 92461259010

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Copper	mg/kg	ND -	0.29	01/24/20 13:22	
Lithium	mg/kg	ND	29.1	01/24/20 13:22	N2
Vanadium	mg/kg	ND	0.58	01/24/20 13:22	
Zinc	mg/kg	ND	1.2	01/24/20 13:22	

LABORATORY CONTROL SAMPLE:	3285242					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Copper	mg/kg	15.4	17.4	113	80-120	
Lithium	mg/kg	772	743	96	ļ	N2
Vanadium	mg/kg	15.4	16.9	110	80-120	
Zinc	mg/kg	77.2	80.2	104	80-120	

MATRIX SPIKE & MATRIX SF	PIKE DUPLIC	ATE: 3285	243		3285244							
			MS	MSD								
	92	2461259007	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Copper	mg/kg	2.4	17.9	15.7	25.8	28.9	130	169	75-125	11	20	
Lithium	mg/kg	ND	898	785	854	797	95	101		7		N2
Vanadium	mg/kg	13.2	17.9	15.7	44.4	53.4	174	256	75-125	18	20	
Zinc	mg/kg	14.2	89.8	78.5	120	121	117	136	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARRAH
Pace Project No.: 92461259

QC Batch: 520039 Analysis Method: ASTM D2974-87

QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture

Laboratory: Pace Analytical Services - Charlotte

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

SAMPLE DUPLICATE: 2782891

92459602005 Dup Max Parameter Units Result Result **RPD RPD** Qualifiers Percent Moisture % 95.6 95.6 0 25

SAMPLE DUPLICATE: 2783101

Date: 07/20/2020 03:15 PM

92461292001 Dup Max **RPD** RPD Parameter Units Result Result Qualifiers 25.7 Percent Moisture % 25.3 2 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

QC Batch: 521064 Analysis Method: EPA 9060A
QC Batch Method: EPA 9060A Analysis Description: 9060 TOC, AVL

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

METHOD BLANK: 2787838 Matrix: Water

Associated Lab Samples: 92461259001, 92461259002, 92461259003, 92461259004, 92461259005, 92461259006, 92461259007,

92461259008, 92461259009, 92461259010

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Mean Total Organic Carbon	mg/kg	ND	600	01/25/20 10:59	
Total Organic Carbon	mg/kg	ND	600	01/25/20 10:59	
Total Organic Carbon	mg/kg	ND	600	01/25/20 10:59	
Total Organic Carbon	mg/kg	ND	600	01/25/20 10:59	
Total Organic Carbon	mg/kg	ND	600	01/25/20 10:59	

LABORATORY CONTROL SAMPLE:	2787839					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Mean Total Organic Carbon	mg/kg	120000	119000	99	80-120	
Total Organic Carbon	mg/kg	120000	129000	107		
Total Organic Carbon	mg/kg	120000	111000	92		
Total Organic Carbon	mg/kg	120000	114000	95		
Total Organic Carbon	mg/kg	120000	123000	102		

MATRIX SPIKE & MATRIX SP	IKE DUPLI	CATE: 2787	'840		2787841							
			MS	MSD								
	9	92461259001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Mean Total Organic Carbon	mg/kg	6540	57800	57800	62900	68900	98	108	80-120	9	20	
Total Organic Carbon	mg/kg	6860	57800	57800	58500	60500	89	93		3		
Total Organic Carbon	mg/kg	5050	57800	57800	75900	69400	123	111		9		
Total Organic Carbon	mg/kg	6430	57800	57800	60500	78200	94	124		25		
Total Organic Carbon	mg/kg	7830	57800	57800	56800	67500	85	103		17		

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALIFIERS**

Project: CHARRAH
Pace Project No.: 92461259

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **ANALYTE QUALIFIERS**

Date: 07/20/2020 03:15 PM

- D3 Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
- E Analyte concentration exceeded the calibration range. The reported result is estimated.
- M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
- N2 The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A
  - complete list of accreditations/certifications is available upon request.
- R1 RPD value was outside control limits.

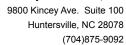


### **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92461259001	SB1	EPA 3050B	520146	EPA 6010D	520186
92461259001	SB1	EPA 3050	604355	EPA 6010	604437
92461259002	SB2	EPA 3050B	520146	EPA 6010D	520186
92461259002	SB2	EPA 3050	604355	EPA 6010	604437
92461259003	SB3	EPA 3050B	520146	EPA 6010D	520186
92461259003	SB3	EPA 3050	604355	EPA 6010	604437
92461259004	SB4	EPA 3050B	520146	EPA 6010D	520186
92461259004	SB4	EPA 3050	604355	EPA 6010	604437
92461259005	SB5	EPA 3050B	520146	EPA 6010D	520186
92461259005	SB5	EPA 3050	604355	EPA 6010	604437
92461259006	SB6	EPA 3050B	520146	EPA 6010D	520186
92461259006	SB6	EPA 3050	604355	EPA 6010	604437
92461259007	SB7	EPA 3050B	520146	EPA 6010D	520186
92461259007	SB7	EPA 3050	604361	EPA 6010	604438
92461259008	SB8	EPA 3050B	520146	EPA 6010D	520186
92461259008	SB8	EPA 3050	604361	EPA 6010	604438
92461259009	SB9	EPA 3050B	520146	EPA 6010D	520186
92461259009	SB9	EPA 3050	604361	EPA 6010	604438
92461259010	SB10	EPA 3050B	520146	EPA 6010D	520186
92461259010	SB10	EPA 3050	604361	EPA 6010	604438
92461259001	SB1	EPA 7471B	520441	EPA 7471B	520481
92461259002	SB2	EPA 7471B	520441	EPA 7471B	520481
92461259003	SB3	EPA 7471B	520441	EPA 7471B	520481
92461259004	SB4	EPA 7471B	520441	EPA 7471B	520481
92461259005	SB5	EPA 7471B	520441	EPA 7471B	520481
92461259006	SB6	EPA 7471B	520441	EPA 7471B	520481
92461259007	SB7 SB8	EPA 7471B	520441	EPA 7471B	520481
92461259008 92461259009	SB9	EPA 7471B EPA 7471B	520441 520441	EPA 7471B EPA 7471B	520481 520481
92461259010	SB10	EPA 7471B	520441	EPA 7471B	520481
92461259001	SB1	ASTM D2974-87	520039		
92461259002	SB2	ASTM D2974-87	520039		
92461259003	SB3	ASTM D2974-87	520039		
92461259004	SB4	ASTM D2974-87	520039		
92461259005	SB5	ASTM D2974-87	520039		
92461259006	SB6	ASTM D2974-87	520039		
92461259007	SB7	ASTM D2974-87	520039		
92461259008	SB8	ASTM D2974-87	520039		





### **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARRAH
Pace Project No.: 92461259

Date: 07/20/2020 03:15 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytica Batch
92461259009	SB9	ASTM D2974-87	520039		
92461259010	SB10	ASTM D2974-87	520039		
92461259001	SB1	EPA 9060A	521064		
92461259002	SB2	EPA 9060A	521064		
92461259003	SB3	EPA 9060A	521064		
92461259004	SB4	EPA 9060A	521064		
92461259005	SB5	EPA 9060A	521064		
92461259006	SB6	EPA 9060A	521064		
92461259007	SB7	EPA 9060A	521064		
92461259008	SB8	EPA 9060A	521064		
92461259009	SB9	EPA 9060A	521064		
92461259010	SB10	EPA 9060A	521064		

# Pace Analytical®

### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.:

Document Revised: February 7, 2018

Page 1 of 2
Issuing Authority:
Pace Carolinas Quality Offi

	F-CAR-0	S-033-Rev.06		Issuing Authority	<i>(</i> :
Laboratory receiving samples:				ace Carolinas Quality	Office
Asheville Eden	Greenwood [	Hunt	ersville 🕡	Raleigh 🗌	Mechanics ville
Upon Receipt Client Name:	DR	Pro	oject#: WO	#:9246	1259
Courier: Fed Ex [	UPS USPS	Client			
	Other:				
stody Seal Present? Yes No	Seals Intact?	es 🖺 No	924612	259	
		C3	Date/Initi	als Person Evamining of	ontents: 1-16-20A
cking Material: Bubble Wrap	☐Bubble Bags ☐N	one $\square$ ou			
ermometer:		_ / _	•	Biological Tissue	Frozen?
IR Gun ID: 92T058	Type of Ice:	☐Wet ☐Blue	□None	□Yes □No □	N/A
oler Temp (°C):	Factor: Add/Subtract (°C)	0.0°C			
oler Temp Corrected (°C):			Temp should be	above freezing to 6°	<b>c</b>
DA Regulated Soil ( N/A, water sample)			L_Samples ou has begun	t of temp criteria. Samp	les on ice, cooling proces
samples originate in a quarantine zone within the	he United States: CA NV	SC (check - )-			
LITES LINO	Distes. CA, NT, OF	oc (check maps)?	Did samples origin including Hawaii a	ate from a foreign sour nd Puerto Rico)?	ce (internationally,
Chain of Custody Present?				comments/Discrepand	No
	Yes □No	□N/A 1.	75		
Samples Arrived within Hold Time?	✓Yes □No	□N/A 12.	-		
Short Hold Time Analysis (<72 hr.)?	□Yes □No	□N/A 3.			
Rush Turn Around Time Requested?	□Yes □No	□N/A 4.			
Sufficient Volume?		□N/A 5.			
Correct Containers Used? -Pace Containers Used?	□Yes □No	□N/A 6.			
	□Yes □No	□N/A			
Containers Intact?	☐Yes ☐No	N/A 7.		(4)	
Dissolved analysis: Samples Field Filtered? Sample Labels Match COC?	□Yes □No	□N/A 8.		61	
comple cases watch cocy	□Yes □No	□N/A 9.			
-Includes Date/Time/ID/Analysis Matrix:	L AB 1-16-2	0			
				7949	3
leadspace in VOA Vials (>5-6mm)? rip Blank Present?	Yes No	☑N/A 10.		4.	
	Yes No	□N/A 11.			<del>-, </del>
rip Blank Custody Seals Present?	Yes No	□N/A		9	
MMENTS/SAMPLE DISCREPANCY	1				•
				Field Data Requi	red? Yes No
NOTIFICATION/RESOLUTION		Lot I	D of split container	'S:	
The second secon			<u> </u>	2	-
on contacted:		Date/Time:	4 .		
		oute/ fille:	The		
ject Manager SCURF Review:					
			Date:		
ect Manager SRF Review:			Date:		
			oute.		



## Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority:
Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

WO#: 92461259

PM: KLH1

Due Date: 01/27/20

CLIENT: 92-HDR

1	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	8P4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG3S-250 mL Amber H2SO4 (pH < 2)	#534(DG3A)-250 mt Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SP5T-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)		BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AGOU-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)
2	7				7				5				7															
					7				5																			
3	7		. ,						5			4 . 4			/													
4	/						/		5	. 7					7						1		$\dashv$		7			
5									5					7	7													-
6					1			1	5	,			T		1		7	$\neg$		14	+	+	+	1	7	-		
7					7	7	7	7	5		7		7	7		$\dashv$	$\dashv$	1		$\dashv$	-+	$\dashv$	-	7	7		$\dashv$	$\dashv$
8					1	7			5		1		1	7	7		+		+	$\dashv$		$\dashv$		$\langle \cdot \rangle$	1	+	$\dashv$	$\dashv$
9					7	7	1	7	5		7	$\dashv$	7	7	7		+	$\dashv$	+		+	$\dashv$	-	7	+	$\dashv$	$\dashv$	
. 10					7	7	7	7	5	$\rightarrow$	7	$\dashv$	7	7	7	$\dashv$	+		+	-		+	$\dashv$	+	+	+	$\dashv$	$\dashv$
11					7	7	7	1		-	7	$\dashv$	$\langle \cdot \rangle$	1	7	$\dashv$	$\dashv$	$\dashv$	+	+	+	+	$\dashv$	1	4		+	$\dashv$
12	7	-	_		7	$\langle \cdot \rangle$	$\forall$	1	-	$\dashv$	1	-	$\langle \cdot \rangle$	$\forall$	+	+	+	-	+	+	+		-	1	4	$\dashv$	_	$\dashv$
					7	V	V	V			7			$\mathcal{I}$	7									7	7			

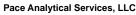
		P	ljustment Log for Pres	erved Samples		
ample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #

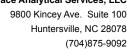
Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.

Pace Analytical

# CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

(N/Y) Samples SAMPLE CONDITIONS (N/Y) Cooler ŏ anelyses pelees Custody Regulatory Agency State / Location (N/X) 90 Received on Residual Chlorine (Y/N) Page: TEMP in C 170 TIME DATE Signed: /////2 0 16-3 DATE SPLP Analyses Class Surface kevin.herring@pacelabs.com Total Organic Carbon ACCEPTED BY / AFFILIATION LDL Metals/Mercury N/A Analyses Test Nethanol Preservatives Na2S2O3 ・デナイン HOBN Pace Quote: Pace Project Manager: Pace Profile #: -6906 HCI Section C Invoice Information: ниоз Company Name: H2SO4 17/0 Address: TIME Unpreserved # ОF СОИТАІИЕРЯ SAMPLER NAME AND SIGNATURE 1/16/20 SAMPLE TEMP AT COLLECTION PRINT Name of SAMPLER: SIGNATURE of SAMPLER: DATE END DATE COLLECTED RELINQUISHED BY I AFFILIATION 510 1540 227 5421 1605 0920 755 12090 TIME 1/5/12/1215 000 START しょるスキュ DATE Required Project Information:
Report To: Jacob Ruffing
Copy To: Soils SAMPLE TYPE (G=GRAB C=COMP) Purchase Order #: MATRIX CODE (see valid codes to left) Project Name: Project #: Section B CODE WW WW SP WW OP OP OF TS MATRIX
Drinking Water
Water
Waste Water
Product
Product
Soll/Solid
Oil
Wipe
Air
Other
Tissue ADDITIONAL COMMENTS (A-Z, 0-9 / , -) Sample Ids must be unique One Character per box. SAMPLE ID 440 S. Church Street Suite 900, Charlotte, NC 28202 Email: Phone: (704)338-6824 Requested Due Date: Required Client Information: SPLP: Met/Hg/TDS/pH/Cl, F, SO4 SBio SR3 562 587 784 84 888 588 SBI 586 SB9 Phone: 10 Page 32 of 32 2 6 8 # M3TI 12 F







July 09, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH SOIL Pace Project No.: 92474300

### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on April 17, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

· Pace Analytical Services - Asheville

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Herring

kevin.herring@pacelabs.com

Keni Herry

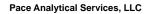
1(704)875-9092

HORIZON Database Administrator

Enclosures

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing





Pace Analytical www.pacelabs.com

9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

### **CERTIFICATIONS**

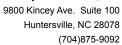
Project: CHARAH SOIL
Pace Project No.: 92474300

Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222





### **SAMPLE SUMMARY**

Project: CHARAH SOIL
Pace Project No.: 92474300

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92474300001	SB-6	Solid	04/17/20 10:58	04/17/20 16:14
92474300002	SB-7	Solid	04/17/20 11:58	04/17/20 16:14
92474300003	SB-5	Solid	04/17/20 12:50	04/17/20 16:14

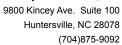


### **SAMPLE ANALYTE COUNT**

Project: CHARAH SOIL
Pace Project No.: 92474300

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92474300001	SB-6	EPA 6010D	SH1	14	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		SM 2540C-2011	JNS	1	PASI-A
		EPA 9040C	SMK	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	2	PASI-A
		SM 4500-CI-E-2011	CJL	1	PASI-A
92474300002	SB-7	EPA 6010D	SH1	14	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		SM 2540C-2011	JNS	1	PASI-A
		EPA 9040C	SMK	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	2	PASI-A
		SM 4500-CI-E-2011	CJL	1	PASI-A
92474300003	SB-5	EPA 6010D	SH1	14	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		SM 2540C-2011	JNS	1	PASI-A
		EPA 9040C	SMK	1	PASI-A
		EPA 300.0 Rev 2.1 1993	CDC	2	PASI-A
		SM 4500-CI-E-2011	CJL	1	PASI-A

PASI-A = Pace Analytical Services - Asheville





### **SUMMARY OF DETECTION**

Project: CHARAH SOIL
Pace Project No.: 92474300

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92474300001	SB-6					•
EPA 6010D	Barium	0.11	mg/L	0.050	05/02/20 23:15	
EPA 6010D	Zinc	0.057	mg/L	0.050	05/02/20 23:15	
EPA 6020B	Boron	87.4	ug/L	50.0	04/27/20 00:18	M1
SM 2540C-2011	Total Dissolved Solids	610	mg/L	250	04/27/20 11:28	
EPA 9040C	pH at 25 Degrees C	4.6	Std. Units	0.10	04/26/20 13:25	D6
EPA 300.0 Rev 2.1 1993	Sulfate	3.2	mg/L	1.0	04/29/20 10:09	В
SM 4500-CI-E-2011	Chloride	30.9	mg/L	10.0	04/29/20 12:16	M6
2474300002	SB-7					
EPA 6010D	Barium	0.21	mg/L	0.050	05/02/20 23:18	
EPA 6010D	Vanadium	0.013	mg/L	0.0050	05/02/20 23:18	
EPA 6010D	Zinc	0.081	mg/L	0.050	05/02/20 23:18	
SM 2540C-2011	Total Dissolved Solids	1610	mg/L	250	04/27/20 11:28	
EPA 9040C	pH at 25 Degrees C	5.0	Std. Units	0.10	04/26/20 13:37	
EPA 300.0 Rev 2.1 1993	Fluoride	0.23	mg/L	0.10	04/29/20 10:52	
EPA 300.0 Rev 2.1 1993	Sulfate	2.6	mg/L	1.0	04/29/20 10:52	В
SM 4500-CI-E-2011	Chloride	50.1	mg/L	10.0	04/29/20 12:18	
2474300003	SB-5					
EPA 6010D	Barium	0.18	mg/L	0.050	05/02/20 23:27	
EPA 6010D	Chromium	0.0059	mg/L	0.0050	05/02/20 23:27	
EPA 6010D	Copper	0.0058	mg/L	0.0050	05/02/20 23:27	
EPA 6010D	Vanadium	0.021	mg/L	0.0050	05/02/20 23:27	
EPA 6010D	Zinc	0.061	mg/L	0.050	05/02/20 23:27	
EPA 6020B	Boron	91.4	ug/L	50.0	04/27/20 01:06	
EPA 6020B	Lithium	6.0	ug/L	2.5	04/27/20 01:06	
SM 2540C-2011	Total Dissolved Solids	1460	mg/L	250	04/27/20 11:29	
EPA 9040C	pH at 25 Degrees C	5.2	Std. Units	0.10	04/26/20 13:42	
EPA 300.0 Rev 2.1 1993	Fluoride	0.23	mg/L	0.10	04/29/20 11:07	
EPA 300.0 Rev 2.1 1993	Sulfate	2.4	mg/L	1.0	04/29/20 11:07	В
SM 4500-CI-E-2011	Chloride	40.2	mg/L	10.0	04/29/20 12:19	



Date: 07/09/2020 03:49 PM

### **ANALYTICAL RESULTS**

Project: CHARAH SOIL
Pace Project No.: 92474300

Pace Project No.: 92474300								
Sample: SB-6	Lab ID: 924	74300001	Collected: 04/17/2	0 10:5	8 Received: 04	I/17/20 16:14 N	latrix: Solid	
Results reported on a "dry weig	ght" basis and are ad	justed for pe	rcent moisture, sa	mple s	size and any dilu	tions.		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
6010 MET ICP, SPLP	Analytical Met	hod: EPA 601	0D Preparation Me	thod: I	EPA 3010A			
	Leachate Meth	nod/Date: EPA	A 1312; 04/24/20 15	:00				
	Pace Analytica	al Services - A	sheville					
Antimony	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:15	7440-36-0	
Arsenic	ND	mg/L	0.010	1	04/25/20 10:43	05/02/20 23:15	7440-38-2	
Barium	0.11	mg/L	0.050	1	04/25/20 10:43	05/02/20 23:15	7440-39-3	
Beryllium	ND	mg/L	0.0010	1	04/25/20 10:43	05/02/20 23:15	7440-41-7	
Cadmium	ND	mg/L	0.0010	1	04/25/20 10:43	05/02/20 23:15	7440-43-9	
Calcium	ND	mg/L	1.0	1	04/25/20 10:43	05/02/20 23:15	7440-70-2	
Chromium	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:15	7440-47-3	
Cobalt	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:15	7440-48-4	
Copper	ND	mg/L	0.0050	1		05/02/20 23:15		
Lead	ND	mg/L	0.0050	1		05/02/20 23:15		
Molybdenum	ND	mg/L	0.0050	1		05/02/20 23:15		
Selenium	ND	mg/L	0.010	1		05/02/20 23:15		
Vanadium	ND	mg/L	0.0050	1		05/02/20 23:15		
Zinc	0.057	mg/L	0.050	1	04/25/20 10:43	05/02/20 23:15	7440-66-6	
6020 MET ICPMS, SPLP	Analytical Met	hod: EPA 602	0B Preparation Me	thod: E	EPA 3010A			
	Leachate Meth	nod/Date: EPA	A 1312; 04/24/20 15	:00				
	Pace Analytica	al Services - A	sheville					
Boron	87.4	ug/L	50.0	1	04/25/20 10:43	04/27/20 00:18	7440-42-8	M1
Lithium	ND	ug/L	2.5	1		04/27/20 00:18		
Thallium	ND	ug/L	0.10	1	04/25/20 10:43	04/27/20 00:18	7440-28-0	
7470 Mercury, SPLP	Analytical Met	hod: FPA 747	0A Preparation Me	thad: F	=PΔ 7470Δ			
7470 Mercury, Sr Er	· · · · · · · · · · · · · · · · · · ·		\ 1312; 04/24/20 15		-177707			
			•	.00				
	Pace Analytica	ai Services - A						
Mercury	ND	mg/L	0.00020	1	04/27/20 10:44	04/27/20 15:22	7439-97-6	
2540C Total DS, SPLP	Analytical Met	hod: SM 2540	C-2011 Leachate I	Method	d/Date: EPA 1312;	04/24/20 15:00		
	Pace Analytica	al Services - A	sheville					
Total Dissolved Solids	610	mg/L	250	1		04/27/20 11:28		
0040 mH CDLD	Analytical Mot	had: EDA 004	0C Leachate Metho	nd/Dat	o: EDA 1312: 04/2	14/20 15:00		
9040 pH, SPLP				Ju/Dai	e. LFA 1312, 04/2	4/20 13.00		
	Pace Analytica	ai Services - A	sneville					
pH at 25 Degrees C	4.6	Std. Units	0.10	1		04/26/20 13:25		D6
300.0 IC Anions, SPLP	Analytical Met	hod: EPA 300	.0 Rev 2.1 1993 Le	achate	e Method/Date: EF	PA 1312; 04/24/2	15:00	
,	Pace Analytica	al Services - A	sheville					
Fluoride	ND	mg/L	0.10	1		04/29/20 10:09	16984_48_8	M1
Sulfate	3.2	mg/L	1.0	1		04/29/20 10:09		
Ounate	3.2	mg/L	1.0	'		07123120 10.09	1-000-13-0	ט
4500 Chloride, SPLP	Analytical Met	hod: SM 4500	-CI-E-2011 Leacha	ite Me	thod/Date: EPA 13	312; 04/24/20 15:	00	
	Pace Analytica	al Services - A	sheville					
Chloride	30.9	mg/L	10.0	10		04/29/20 12:16	16887-00-6	M6
Chiloride	30.3	mg/L	10.0	10		07120120 12.10	10007-00-0	1410



Project: CHARAH SOIL
Pace Project No.: 92474300

Date: 07/09/2020 03:49 PM

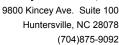
Analytical Method: EPA 6010D   Preparation Method: EPA 3010A   Leachate Method/Date: EPA 1312; 04/24/20 15:00   Pace Analytical Services - Asheville	Sample: SB-7	Lab ID: 9247	74300002	Collected: 04/17/2	0 11:5	8 Received: 04	1/17/20 16:14 N	fatrix: Solid	
Analytical Method: EPA 6010D   Preparation Method: EPA 3010A   Leachate Method/Date: EPA 1312; 04/24/20 15:00   Pace Analytical Services - Asheville	Results reported on a "dry weig	ght" basis and are adj	usted for p	ercent moisture, sa	mple s	size and any dilu	tions.		
Leachate Method/Date: EPA 1312; 04/24/20 15:00	Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual
Pace Analytical Services - Asheville	6010 MET ICP, SPLP	Analytical Meth	od: EPA 60	010D Preparation Me	thod: E	EPA 3010A			
Antimony ND mg/L 0.0050 1 04/25/20 10.43 05/02/20 23:18 7440-36-0 ND mg/L 0.010 1 04/25/20 10.43 05/02/20 23:18 7440-38-2 and mm mg/L 0.050 1 04/25/20 10.43 05/02/20 23:18 7440-39-3 and mm mg/L 0.0050 1 04/25/20 10.43 05/02/20 23:18 7440-39-3 and mm mg/L 0.0010 1 04/25/20 10.43 05/02/20 23:18 7440-41-7 and mm/L 0.0010 1 04/25/20 10.43 05/02/20 23:18 7440-41-7 and mm/L 0.0050 1 04/25/20 10.43 05/02/20 23:18 7440-41-7 and mm/L 0.0050 1 04/25/20 10.43 05/02/20 23:18 7440-41-7 and mm/L 0.0050 1 04/25/20 10.43 05/02/20 23:18 7440-43-9 05/02/20 05/03	·	Leachate Meth	od/Date: El	PA 1312; 04/24/20 15	:00				
ND		Pace Analytical	Services -	Asheville					
ND mg/L 0.010 1 0.425/20 10.43 05/02/20 23:18 7440-38-2  again/m 0.21 mg/L 0.050 1 0.425/20 10.43 05/02/20 23:18 7440-38-2  Beryllium ND mg/L 0.0010 1 0.425/20 10.43 05/02/20 23:18 7440-39-3  Beryllium ND mg/L 0.0010 1 0.425/20 10.43 05/02/20 23:18 7440-43-9  Beryllium ND mg/L 0.0010 1 0.425/20 10.43 05/02/20 23:18 7440-43-9  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-43-9  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-43-9  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-70-2  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-84-8  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-84-8  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-84-8  Beryllium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-50-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7439-92-1  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-50-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-50-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 23:18 7440-60-8  Bellenium ND mg/L 0.0050 1 0.425/20 10.43 05/02/20 0:58 7440-60-8  Bellenium ND mg/L	Antimony	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:18	7440-36-0	
Seryllium	Arsenic	ND	•	0.010	1	04/25/20 10:43	05/02/20 23:18	7440-38-2	
Cadmium	Barium	0.21	mg/L	0.050	1	04/25/20 10:43	05/02/20 23:18	7440-39-3	
Calcium	Beryllium	ND	mg/L	0.0010	1	04/25/20 10:43	05/02/20 23:18	7440-41-7	
ND mg/L   0.0050   1   0.4725/20   10.43   0.502/20   23.18   7440-47-3   0.505   1   0.4725/20   10.43   0.5002/20   23.18   7440-48-4   74.505   0.505   1   0.4725/20   10.43   0.5002/20   0.318   7440-48-4   74.505   0.505   1   0.4725/20   10.43   0.5002/20   0.318   7440-50-8   0.505	Cadmium	ND	mg/L	0.0010	1	04/25/20 10:43	05/02/20 23:18	7440-43-9	
ND   mg/L   0.0050   1   04/25/20 10:43   05/02/20 23:18   7440-48-4   7440-69-8   7440	Calcium	ND	mg/L	1.0	1	04/25/20 10:43	05/02/20 23:18	7440-70-2	
Description	Chromium	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:18	7440-47-3	
ND mg/L   0.0050   1   04/25/20 10:43   05/02/20 23:18   7439-92-1	Cobalt	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:18	7440-48-4	
ND mg/L   0.0050   1   04/25/20 10:43   05/02/20 23:18   7439-98-7   7489-98	Copper	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:18	7440-50-8	
ND   mg/L   0.010   1   04/25/20 10:43   05/02/20 23:18   7782-49-2   0.013   mg/L   0.0050   1   04/25/20 10:43   05/02/20 23:18   7782-49-2   0.013   mg/L   0.050   1   04/25/20 10:43   05/02/20 23:18   7740-66-6   0.081   mg/L   0.050   1   04/25/20 10:43   05/02/20 23:18   7440-66-6   0.081   mg/L   0.050   1   04/25/20 10:43   05/02/20 23:18   7440-66-6   0.081   mg/L   0.0050   1   04/25/20 10:43   05/02/20 23:18   7440-66-6   0.081	Lead	ND	mg/L	0.0050	1	04/25/20 10:43	05/02/20 23:18	7439-92-1	
200   201	Molybdenum	ND	-	0.0050	1	04/25/20 10:43	05/02/20 23:18	7439-98-7	
Analytical Method: EPA 6020B Preparation Method: EPA 3010A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND ug/L 2:5 1 04/25/20 10:43 04/27/20 23:28 7440-42-8 ND ug/L 2:5 1 04/25/20 10:43 04/27/20 23:28 7440-42-8 ND ug/L 2:5 1 04/25/20 10:43 04/27/20 00:58 7439-93-2 Inallium ND ug/L 0:10 1 04/25/20 10:43 04/27/20 00:58 7440-28-0  Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND mg/L 0:00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Analytical Method: Services - Asheville  ND mg/L 0:00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Analytical Method: Services - Asheville  Fotal Dissolved Solids 1610 mg/L 250 1 04/27/20 11:28  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Old40 pH, SPLP Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Old40 pH, SPLP Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Old40 pH, SPLP Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: Services - Asheville	Selenium	ND	mg/L	0.010	1	04/25/20 10:43	05/02/20 23:18	7782-49-2	
Analytical Method: EPA 6020B Preparation Method: EPA 3010A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND ug/L 250 5 04/25/20 10:43 04/27/20 23:28 7440-42-8 ND ug/L 0.10 1 04/25/20 10:43 04/27/20 23:28 7440-42-8 ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7439-93-2 Inhilim ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7440-28-0  Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Mercury ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fotal Dissolved Solids  1610 mg/L 250 1 04/27/20 11:28  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  OH at 25 Degrees C  5.0 Std. Units 0.10 1 04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  0.023 mg/L 0.10 1 04/29/20 10:52 16984-48-8 Elfuoride  0.23 mg/L 0.10 1 04/29/20 10:52 16984-48-8 Elfuoride 0.23 mg/L 0.10 1 04/29/20 10:52 14808-79-8 B  Analytical Method: SPLP  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	Vanadium	0.013	_	0.0050	1	04/25/20 10:43	05/02/20 23:18	7440-62-2	
Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND ug/L 2.5 1 04/25/20 10:43 04/27/20 23:28 7440-42-8 Ithium ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7439-93-2 Ithium ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7440-28-0  Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fotal Dissolved Solids 1610 mg/L 250 1 04/27/20 11:28  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: SPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	Zinc	0.081	•	0.050	1	04/25/20 10:43	05/02/20 23:18	7440-66-6	
Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  ND ug/L 2.5 1 04/25/20 10:43 04/27/20 23:28 7440-42-8 Ithium ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7439-93-2 Ithium ND ug/L 0.10 1 04/25/20 10:43 04/27/20 00:58 7440-28-0  Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fotal Dissolved Solids 1610 mg/L 250 1 04/27/20 11:28  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: SPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	SO20 MET ICPMS SPLP	Analytical Meth	od: FPA 60	120B Preparation Me	thod: F	-PA 3010A			
Pace Analytical Services - Asheville	0020 MIET 101 MIO, OT EI					_17(00107(			
ND				·	.00				
ND	Boron	ND	ug/L	250	5	04/25/20 10:43	04/27/20 23:28	7440-42-8	
ND	_ithium	ND	-	2.5	1	04/25/20 10:43	04/27/20 00:58	7439-93-2	
Leachate Method//Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury  ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:24 7439-97-6  2540C Total DS, SPLP  Analytical Method: SM 2540C-2011 Leachate Method//Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Total Dissolved Solids  1610 mg/L 250 1 04/27/20 11:28  D040 pH, SPLP  Analytical Method: EPA 9040C Leachate Method//Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  DH at 25 Degrees C  5.0 Std. Units 0.10 1 04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method//Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fluoride  0.23 mg/L 0.10 1 04/29/20 10:52 16984-48-8 ang/L 1.0 1 04/29/20 10:52 14808-79-8 B  Analytical Method: SM 4500-CI-E-2011 Leachate Method//Date: EPA 1312; 04/24/20 15:00 Pace Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	Thallium	ND	-	0.10	1	04/25/20 10:43	04/27/20 00:58	7440-28-0	
Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fotal Dissolved Solids  1610 mg/L 250 1 04/27/20 11:28  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  OH at 25 Degrees C  5.0 Std. Units 0.10 1 04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fluoride  0.23 mg/L 0.10 1 04/29/20 10:52 16984-48-8 Sulfate  2.6 mg/L 1.0 1 04/29/20 10:52 14808-79-8 B  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	7470 Mercury, SPLP	Leachate Meth	od/Date: El	PA 1312; 04/24/20 15		EPA 7470A			
Pace Analytical Services - Asheville  1610 mg/L 250 1 04/27/20 11:28  2040 pH, SPLP  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  OH at 25 Degrees C  5.0 Std. Units 0.10 1 04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fluoride  0.23 mg/L 0.10 1 04/29/20 10:52 16984-48-8 Sulfate  2.6 mg/L 1.0 1 04/29/20 10:52 14808-79-8 B  1500 Chloride, SPLP  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	Mercury	ND	mg/L	0.00020	1	04/27/20 10:44	04/27/20 15:24	7439-97-6	
Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  OH at 25 Degrees C  5.0 Std. Units  0.10 1  04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Fluoride Sulfate  0.23 mg/L 0.10 1 04/29/20 10:52 16984-48-8 Sulfate  2.6 mg/L 1.0 1 04/29/20 10:52 14808-79-8 B  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville	2540C Total DS, SPLP				/lethoo	d/Date: EPA 1312;	04/24/20 15:00		
Pace Analytical Services - Asheville  3H at 25 Degrees C  5.0 Std. Units  0.10 1  04/26/20 13:37  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville  Fluoride  0.23 mg/L  0.10 1  04/29/20 10:52 16984-48-8  Sulfate  0.26 mg/L  1.0 1  04/29/20 10:52 14808-79-8 B  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville	Total Dissolved Solids	1610	mg/L	250	1		04/27/20 11:28		
Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville  Fluoride  9.23 mg/L  9.10 1  94/29/20 10:52 16984-48-8  9.1500 Chloride, SPLP  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville	9040 pH, SPLP	,			od/Dat	e: EPA 1312; 04/2	24/20 15:00		
Pace Analytical Services - Asheville  Fluoride  0.23 mg/L  0.10 1  04/29/20 10:52 16984-48-8  Sulfate  2.6 mg/L  1.0 1  04/29/20 10:52 14808-79-8 B  Sulfate  Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville	oH at 25 Degrees C	•			1		04/26/20 13:37		
Sulfate 2.6 mg/L 1.0 1 04/29/20 10:52 14808-79-8 B  1500 Chloride, SPLP Analytical Method: SM 4500-CI-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville	300.0 IC Anions, SPLP	•			achate	e Method/Date: ER	PA 1312; 04/24/20	0 15:00	
Pace Analytical Services - Asheville	Fluoride Sulfate		•						В
Chloride <b>50.1</b> mg/L 10.0 10 04/29/20 12:18 16887-00-6	4500 Chloride, SPLP				te Met	thod/Date: EPA 13	312; 04/24/20 15:	00	
	Chloride	50.1	mg/L	10.0	10		04/29/20 12:18	16887-00-6	



Project: CHARAH SOIL Pace Project No.: 92474300

Date: 07/09/2020 03:49 PM

Parameters   Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.	Sample: SB-5	Lab ID: 92474300003	Collected: 04/17/20 12:50	Received: 04	/17/20 16:14 N	//atrix: Solid	
Analytical Method: EPA 6010D   Preparation Method: EPA 3010A	Results reported on a "dry weig	ht" basis and are adjusted for pe	rcent moisture, sample si	ze and any dilu	tions.		
Leachate Method/Date: EPA 1312; 04/24/20 15:00	Parameters	Results Units	Report Limit DF	Prepared	Analyzed	CAS No.	Qual
Antimony Ansenic ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-38-2 Barium 0.18 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-39-3 Berlyllium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-39-3 Berlyllium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-7 Cadmium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-9 Calcidum ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-9 Calcidum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-43-9 Calcidum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-43-9 Calcidum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-43-9 Calcidum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 Copper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-4 Copper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-8 Lead ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7449-8-8 Lead ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7449-8-8 Elenium ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-8 Elenium ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-8-2 Zinc 0.061 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:	6010 MET ICP, SPLP	Analytical Method: EPA 60°	0D Preparation Method: El	PA 3010A			
Antimony Ant	•	Leachate Method/Date: EP	A 1312; 04/24/20 15:00				
Arsenic ND mg/L 0.010 1 04/25/20 10:43 05/02/20 23:27 7440-38-2 Barlum 0.18 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-38-3 Beryllium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-47-7 Cadmium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-47-7 Cadmium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-47-7 Calcitum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Calcitum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Cabmium 0.0059 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Cobalt ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 Copper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-50-8 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-50-8 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7449-50-8 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 ND mg/L 0.0050 1 0		Pace Analytical Services - A	sheville				
Arsenic ND mg/L 0.010 1 04/25/20 10:43 05/02/20 23:27 7440-38-2 Barlum 0.18 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-38-3 Beryllium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-7 Cadmium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-7 Calcium ND mg/L 0.0010 1 04/25/20 10:43 05/02/20 23:27 7440-41-7 Calcium ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Cablum 0.0059 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Cablum 0.0059 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 Capper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 Capper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-48-4 Capper 0.0058 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-50-8 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-50-8 ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 Molybdenum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 Molybdenum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 Molybdenum ND mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 Molybdenum 0.021 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 740-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-66-6 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 04/27/20 01:06 7440-62-2 Molybdenum 0.021 mg/L 0.050 1 04/25/20 10:43 04/27/20 01:06 7440-62-2 Molybdenum 0.021 mg/L 0.0020 1 04/25/20 10:43 04/27/20 01:06 7440-62-2 Molybdenum 0.021 mg/L 0.0020 1 04/25/20 10:43 04/27/20 01:06 7440-62-2 Molybdenum 0	Antimony	ND mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7440-36-0	
ND mg/L   0.0010   1   04/25/20 10:43   05/02/20 23:27   7440-41-7   7440-41	Arsenic	•	0.010 1	04/25/20 10:43	05/02/20 23:27	7440-38-2	
Cadmium         ND         mg/L         0.0010         1         04/25/20 10:43         05/02/20 23:27         7440-43-9           Calcium         ND         mg/L         1.0         1         04/25/20 10:43         05/02/20 23:27         7440-70-2           Chromium         0.0059         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7440-70-3           Cobalt         ND         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7440-48-4           Copper         0.0058         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7440-50-8           Lead         ND         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7439-98-7           Selenium         ND         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7430-98-7           Selenium         ND         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7440-50-8           Vanadium         0.021         mg/L         0.0050         1         04/25/20 10:43         05/02/20 23:27         7440-50-8           Selenium         ND	Barium	<b>0.18</b> mg/L	0.050 1	04/25/20 10:43	05/02/20 23:27	7440-39-3	
Calcium ND mg/L 1.0 1 04/25/20 10:43 05/02/20 23:27 7440-70-2 Chromium 0.0059 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-47-3 Chromium 0.0059 mg/L 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-87-8 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-87-8 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-88-4 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-50-8 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 0.0050 1 04/25/20 10:43 05/02/20 23:27 7439-92-1 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0061 mg/L 0.050 1 04/25/20 10:43 05/02/20 23:27 7440-62-2 0.0050 1 04/25/20 10:43 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/20 05/02/2	Beryllium	ND mg/L	0.0010 1	04/25/20 10:43	05/02/20 23:27	7440-41-7	
Chromium	Cadmium	ND mg/L	0.0010 1	04/25/20 10:43	05/02/20 23:27	7440-43-9	
ND mg/L	Calcium	ND mg/L	1.0 1	04/25/20 10:43	05/02/20 23:27	7440-70-2	
Copper	Chromium	<b>0.0059</b> mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7440-47-3	
ND mg/L	Cobalt	ND mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7440-48-4	
Molybdenum	Copper	<b>0.0058</b> mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7440-50-8	
ND   mg/L   0.010   1   04/25/20 10:43   05/02/20 23:27   7782-49-2   7740-62-2   7740-6	₋ead	ND mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7439-92-1	
Name	Molybdenum	ND mg/L	0.0050 1	04/25/20 10:43	05/02/20 23:27	7439-98-7	
Analytical Method: EPA 6020B   Preparation Method: EPA 3010A	Selenium	ND mg/L	0.010 1	04/25/20 10:43	05/02/20 23:27	7782-49-2	
Analytical Method: EPA 6020B Preparation Method: EPA 3010A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Boron  91.4 ug/L  6.0 ug/L  0.10 1 04/25/20 10:43 04/27/20 01:06 7440-42-8 Elithium  6.0 ug/L  0.10 1 04/25/20 10:43 04/27/20 01:06 7439-93-2 Elithium  ND ug/L  0.10 1 04/25/20 10:43 04/27/20 01:06 7439-93-2 Elithium  ND ug/L  7470 Mercury, SPLP  Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury  ND mg/L  0.00020 1 04/27/20 10:44 04/27/20 15:27 7439-97-6  2540C Total DS, SPLP  Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Total Dissolved Solids  1460 mg/L  250 1 04/27/20 11:29  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  DH at 25 Degrees C  5.2 Std. Units  0.10 1 04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	/anadium	<del>-</del>	0.0050 1	04/25/20 10:43	05/02/20 23:27	7440-62-2	
Leachate Method/Date: EPA 1312; 04/24/20 15:00	Zinc		0.050 1	04/25/20 10:43	05/02/20 23:27	7440-66-6	
Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Boron 91.4 ug/L 50.0 1 04/25/20 10:43 04/27/20 01:06 7440-42-8 Lithium 6.0 ug/L 2.5 1 04/25/20 10:43 04/27/20 01:06 7439-93-2 Thallium ND ug/L 0.10 1 04/25/20 10:43 04/27/20 01:06 7440-28-0  7470 Mercury, SPLP Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:27 7439-97-6  2540C Total DS, SPLP Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Total Dissolved Solids 1460 mg/L 250 1 04/27/20 11:29  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  DH at 25 Degrees C 5.2 Std. Units 0.10 1 04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	SO20 MET ICPMS SPI P	Analytical Method: EPA 603	OB Preparation Method: FI	PA 3010A			
Pace Analytical Services - Asheville	7020 MET 101 MO, 01 E			71001071			
### Body Color of Col			•				
Thallium         ND         ug/L         0.10         1         04/25/20 10:43         04/27/20 01:06         7440-28-0           7470 Mercury, SPLP         Analytical Method: EPA 7470A Preparation Method: EPA 7470A Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville         ND         mg/L         0.00020         1         04/27/20 10:44         04/27/20 15:27         7439-97-6           2540C Total DS, SPLP         Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville         1         04/27/20 11:29         04/27/20 11:29           3040 pH, SPLP         Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville         Degrees C         5.2         Std. Units         0.10         1         04/26/20 13:42           300.0 IC Anions, SPLP         Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	Boron	<b>91.4</b> ug/L	50.0 1	04/25/20 10:43	04/27/20 01:06	7440-42-8	
ND   ug/L   0.10   1   04/25/20 10:43   04/27/20 01:06   7440-28-0	ithium	<b>6.0</b> ug/L	2.5 1	04/25/20 10:43	04/27/20 01:06	7439-93-2	
Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Mercury  ND mg/L 0.00020 1 04/27/20 10:44 04/27/20 15:27 7439-97-6  2540C Total DS, SPLP  Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Total Dissolved Solids  1460 mg/L 250 1 04/27/20 11:29  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  OH at 25 Degrees C  5.2 Std. Units 0.10 1 04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	Thallium	<del>_</del>	0.10 1	04/25/20 10:43	04/27/20 01:06	7440-28-0	
Analytical Method: SM 2540C-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  Total Dissolved Solids  1460 mg/L 250 1 04/27/20 11:29  9040 pH, SPLP  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  pH at 25 Degrees C  5.2 Std. Units  0.10 1 04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	7470 Mercury, SPLP	Leachate Method/Date: EP	A 1312; 04/24/20 15:00	PA 7470A			
Pace Analytical Services - Asheville  Total Dissolved Solids  1460 mg/L 250 1 04/27/20 11:29  9040 pH, SPLP  Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville  pH at 25 Degrees C  5.2 Std. Units  0.10 1 04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	Mercury	ND mg/L	0.00020 1	04/27/20 10:44	04/27/20 15:27	7439-97-6	
Analytical Method: EPA 9040C Leachate Method/Date: EPA 1312; 04/24/20 15:00 Pace Analytical Services - Asheville  DH at 25 Degrees C  5.2 Std. Units  0.10 1  04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	2540C Total DS, SPLP	-		Date: EPA 1312;	04/24/20 15:00		
Pace Analytical Services - Asheville  DH at 25 Degrees C  5.2 Std. Units  0.10 1  04/26/20 13:42  Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	Total Dissolved Solids	<b>1460</b> mg/L	250 1		04/27/20 11:29		
300.0 IC Anions, SPLP Analytical Method: EPA 300.0 Rev 2.1 1993 Leachate Method/Date: EPA 1312; 04/24/20 15:00	9040 pH, SPLP	•		: EPA 1312; 04/2	4/20 15:00		
	oH at 25 Degrees C	•			04/26/20 13:42		
	300.0 IC Anions, SPLP			Method/Date: EF	PA 1312; 04/24/20	0 15:00	
Fluoride <b>0.23</b> mg/L 0.10 1 04/29/20 11:07 16984-48-8 Sulfate <b>0.24</b> mg/L 1.0 1 04/29/20 11:07 14808-79-8							В
4500 Chloride, SPLP  Analytical Method: SM 4500-Cl-E-2011 Leachate Method/Date: EPA 1312; 04/24/20 15:00  Pace Analytical Services - Asheville	1500 Chloride, SPLP			od/Date: EPA 13	12; 04/24/20 15:	00	
Chloride <b>40.2</b> mg/L 10.0 10 04/29/20 12:19 16887-00-6	Chloride	<b>40.2</b> mg/L	10.0 10		04/29/20 12:19	16887-00-6	





Project: CHARAH SOIL
Pace Project No.: 92474300

QC Batch: 538177 Analysis Method: EPA 7470A

QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

METHOD BLANK: 2868750 Matrix: Water

Associated Lab Samples: 92474300001, 92474300002, 92474300003

Blank Reporting

Parameter Units Result Limit Analyzed Qualifiers

Mercury mg/L ND 0.00020 04/27/20 15:10

LABORATORY CONTROL SAMPLE: 2869817

Date: 07/09/2020 03:49 PM

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units Mercury mg/L 0.0025 0.0025 101 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2869818 2869819

MS MSD 92474300001 Spike Spike MS

MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Result ND 0.0025 0.0026 106 20 Mercury mg/L 0.0025 0.0027 107 75-125

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Date: 07/09/2020 03:49 PM

### **QUALITY CONTROL DATA**

Project: CHARAH SOIL
Pace Project No.: 92474300

QC Batch: 538174 Analysis Method: EPA 6010D

QC Batch Method: EPA 3010A Analysis Description: 6010 MET SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

METHOD BLANK: 2868750 Matrix: Water

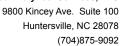
Associated Lab Samples: 92474300001, 92474300002, 92474300003

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	 mg/L	ND	0.0050	05/02/20 22:57	
Arsenic	mg/L	ND	0.010	05/02/20 22:57	
Barium	mg/L	ND	0.050	05/02/20 22:57	
Beryllium	mg/L	ND	0.0010	05/02/20 22:57	
Cadmium	mg/L	ND	0.0010	05/02/20 22:57	
Calcium	mg/L	ND	1.0	05/02/20 22:57	
Chromium	mg/L	ND	0.0050	05/02/20 22:57	
Cobalt	mg/L	ND	0.0050	05/02/20 22:57	
Lead	mg/L	ND	0.0050	05/02/20 22:57	
Molybdenum	mg/L	ND	0.0050	05/02/20 22:57	
Selenium	mg/L	ND	0.010	05/02/20 22:57	

LABORATORY CONTROL SAMPLE:	2869807					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	mg/L	0.5	0.51	102	80-120	
Arsenic	mg/L	0.5	0.51	102	80-120	
Barium	mg/L	0.5	0.52	104	80-120	
Beryllium	mg/L	0.5	0.50	100	80-120	
Cadmium	mg/L	0.5	0.50	100	80-120	
Calcium	mg/L	5	5.1	103	80-120	
Chromium	mg/L	0.5	0.50	99	80-120	
Cobalt	mg/L	0.5	0.50	100	80-120	
Lead	mg/L	0.5	0.50	100	80-120	
Molybdenum	mg/L	0.5	0.50	100	80-120	
Selenium	mg/L	0.5	0.52	105	80-120	

MATRIX SPIKE & MATRIX S	PIKE DUPL	ICATE: 2869	2869809 MSD									
		92474300001	MS Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	mg/L	ND	0.5	0.5	0.55	0.54	109	109	75-125	1	20	
Arsenic	mg/L	ND	0.5	0.5	0.52	0.53	105	106	75-125	1	20	
Barium	mg/L	0.11	0.5	0.5	0.57	0.57	92	93	75-125	0	20	
Beryllium	mg/L	ND	0.5	0.5	0.50	0.51	101	101	75-125	0	20	
Cadmium	mg/L	ND	0.5	0.5	0.49	0.48	97	96	75-125	1	20	
Calcium	mg/L	ND	5	5	219	218	4380	4360	75-125	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH SOIL
Pace Project No.: 92474300

Date: 07/09/2020 03:49 PM

MATRIX SPIKE & MATRIX	SPIKE DUPL	ICATE: 2869	808		2869809							
		92474300001	MS Spike	MSD Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chromium	mg/L	ND	0.5	0.5	0.49	0.49	97	97	75-125	0	20	
Cobalt	mg/L	ND	0.5	0.5	0.54	0.54	108	108	75-125	1	20	
Lead	mg/L	ND	0.5	0.5	0.49	0.48	98	97	75-125	1	20	
Molybdenum	mg/L	ND	0.5	0.5	0.56	0.56	112	112	75-125	0	20	
Selenium	mg/L	ND	0.5	0.5	0.54	0.55	108	110	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH SOIL
Pace Project No.: 92474300

Date: 07/09/2020 03:49 PM

QC Batch: 538175 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

METHOD BLANK: 2868750 Matrix: Water

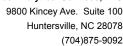
Associated Lab Samples: 92474300001, 92474300002, 92474300003

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Boron	ug/L	ND ND	50.0	04/26/20 22:00	
Lithium	ug/L	ND	2.5	04/26/20 22:00	
Thallium	ug/L	ND	0.10	04/26/20 22:00	

LABORATORY CONTROL SAMPLE: 2869811 Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers Boron 50 111 80-120 ug/L 55.4 Lithium 50 48.3 80-120 ug/L 97 Thallium 10 97 80-120 ug/L 9.7

MATRIX SPIKE & MATRIX SP	IKE DUPL	ICATE: 2869	812		2869813							
			MS	MSD								
		92474300001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	87.4	50	50	103J	111J	31	47	75-125		20	M1
Lithium	ug/L	ND	50	50	52.8	49.4	102	95	75-125	7	20	
Thallium	ug/L	ND	10	10	10.1	9.6	101	96	75-125	5	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project:

CHARAH SOIL

Pace Project No.:

92474300

QC Batch:

538306

Analysis Method:

SM 2540C-2011

QC Batch Method: SM 2540C-2011

Parameter

Analysis Description:

2540C Total Dissolved Solids

Laboratory:

Pace Analytical Services - Asheville

Associated Lab Samples:

92474300001, 92474300002, 92474300003

METHOD BLANK: Associated Lab Samples:

Matrix: Water 92474300001, 92474300002, 92474300003

Blank Result Reporting Limit

Analyzed

Qualifiers

Total Dissolved Solids

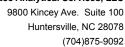
Date: 07/09/2020 03:49 PM

Units mg/L

ND

25.0 04/27/20 11:28

LABORATORY CONTROL SAMPLE & LCSD: 2870386 2870387 Spike LCS **LCSD** LCS **LCSD** % Rec Max Parameter RPD RPD Qualifiers Units Conc. Result Result % Rec % Rec Limits **Total Dissolved Solids** mg/L 250 256 258 102 103 90-110





Project: CHARAH SOIL

Pace Project No.: 92474300

QC Batch: 538209 QC Batch Method: EPA 9040C Analysis Method:

EPA 9040C 9040 pH

Analysis Description: Laboratory:

Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

SAMPLE DUPLICATE: 2869913

Date: 07/09/2020 03:49 PM

		92474300001	Dup		Max	
Parameter	Units	Result	Result	RPD	RPD	Qualifiers
pH at 25 Degrees C	Std. Units	4.6	4.4	3		9 D6



Project: CHARAH SOIL
Pace Project No.: 92474300

Fluoride

Sulfate

Date: 07/09/2020 03:49 PM

QC Batch: 538688 Analysis Method: EPA 300.0 Rev 2.1 1993

QC Batch Method: EPA 300.0 Rev 2.1 1993 Analysis Description: 300.0 IC Anions

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

METHOD BLANK: 2868750 Matrix: Water

Associated Lab Samples: 92474300001, 92474300002, 92474300003

Blank Reporting Qualifiers Parameter Units Result Limit Analyzed ND 0.10 04/29/20 09:39 mg/L 2.6 1.0 04/29/20 09:39 mg/L

LABORATORY CONTROL SAMPLE: 2872004

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers Fluoride 2.5 2.7 109 90-110 mg/L Sulfate mg/L 50 52.8 106 90-110

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2872005 2872006 MS MSD 92474300001 Spike Spike MS MSD MS MSD % Rec Max RPD Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** Qual Fluoride mg/L ND 2.5 2.5 2.2 2.3 84 90-110 10 M1 Sulfate 3.2 50 50 55.1 55.1 104 104 90-110 0 10 mg/L



Project: CHARAH SOIL
Pace Project No.: 92474300

QC Batch: 538737 Analysis Method: SM 4500-CI-E-2011
QC Batch Method: SM 4500-CI-E-2011 Analysis Description: 4500 Chloride

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474300001, 92474300002, 92474300003

METHOD BLANK: 2868750 Matrix: Water

Associated Lab Samples: 92474300001, 92474300002, 92474300003

Blank Reporting
Parameter Units Result Limit Analyzed Qualifiers

Chloride mg/L ND 1.0 04/29/20 12:09

LABORATORY CONTROL SAMPLE: 2872115

Date: 07/09/2020 03:49 PM

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units Chloride mg/L 20 20.1 101 90-110

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2872116 2872117

MS MSD 92474300001 Spike Spike

MS MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec **RPD RPD** Qual Result Limits 30.9 10 37.2 10 M6 Chloride mg/L 10 37.4 63 65 90-110

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALIFIERS**

Project: CHARAH SOIL
Pace Project No.: 92474300

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### ANALYTE QUALIFIERS

Date: 07/09/2020 03:49 PM

- B Analyte was detected in the associated method blank.
- D6 The precision between the sample and sample duplicate exceeded laboratory control limits.
- M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
- M6 Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.



### **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH SOIL
Pace Project No.: 92474300

Date: 07/09/2020 03:49 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92474300001	SB-6	EPA 3010A	538174	EPA 6010D	538183
92474300002	SB-7	EPA 3010A	538174	EPA 6010D	538183
92474300003	SB-5	EPA 3010A	538174	EPA 6010D	538183
92474300001	SB-6	EPA 3010A	538175	EPA 6020B	538184
92474300002	SB-7	EPA 3010A	538175	EPA 6020B	538184
92474300003	SB-5	EPA 3010A	538175	EPA 6020B	538184
92474300001	SB-6	EPA 7470A	538177	EPA 7470A	538300
92474300002	SB-7	EPA 7470A	538177	EPA 7470A	538300
2474300003	SB-5	EPA 7470A	538177	EPA 7470A	538300
92474300001	SB-6	SM 2540C-2011	538306		
2474300002	SB-7	SM 2540C-2011	538306		
92474300003	SB-5	SM 2540C-2011	538306		
92474300001	SB-6	EPA 9040C	538209		
92474300002	SB-7	EPA 9040C	538209		
92474300003	SB-5	EPA 9040C	538209		
2474300001	SB-6	EPA 300.0 Rev 2.1 1993	538688		
92474300002	SB-7	EPA 300.0 Rev 2.1 1993	538688		
92474300003	SB-5	EPA 300.0 Rev 2.1 1993	538688		
92474300001	SB-6	SM 4500-CI-E-2011	538737		
92474300002	SB-7	SM 4500-CI-E-2011	538737		
92474300003	SB-5	SM 4500-CI-E-2011	538737		

### Document Revised: February 7, 2018 Document Name: Sample Condition Upon Receipt(SCUR) Page 1 of 2 Pace Analytical® Issuing Authority: Document No.: Pace Carolinas Quality Office F-CAR-CS-033-Rev.06 Laboratory receiving samples: Huntersville 7 Raleigh . Mechanicsville Greenwood Asheville Eden 92474300 Sample Condition Client Name: Project #: Upon Receipt Client USPS Fed Ex Courler: Pace Other: Commercial UNO ☐Yes MNO Seals Intact? Yes **Custody Seal Present?** Date/initials Person Examining Contents: Biological Tissue Frozen? Bubble Bags None Other Bubble Wrap Packing Material: ☐Yes ☐No ☐N/A Thermometer: ₩et Blue None 92T061 TR Gun ID: Correction Factor: Add/Subtract (°C) +0.1 Cooler Temp (°C): Temp should be above freezing to 6°C Samples out of temp criteria. Samples on Ice, cooling process Cooler Temp Corrected (°C): has begun USDA Regulated Soil ( N/A, water sample) Did samples originate from a foreign source (internationally, Did samples originate in a quarantine zone within the United States: CA, NY, or SC (check maps)? including Hawa II and Puerto Rico)? ☐Yes \_Yes 🔼₩o Comments/Discrepancy: Ves No □N/A 1. Chain of Custody Present? □N/A Teres No Samples Arrived within Hold Time? No □N/A 3. Yes Short Hold Time Analysis (<72 hr.)? **□**N6 □N/A 4. Yes Rush Turn Around Time Requested? Yes □No □N/A Sufficient Volume? 6. Yes □N/A No Correct Containers Used? □N/A Ves □No -Pace Containers Used? Wes No □N/A Containers Intact? IN/A □No Dissolved analysis: Samples Field Filtered? □Yes Yes □No □N/A Sample Labels Match COC? -Includes Date/Time/ID/Analysis Matrix: 1 N/A 10. Yes □No Headspace in VOA Vials (>5-6mm)? 11. M/A Yes No Trip Blank Present? UN/A □No Yes Trip Blank Custody Seals Present? Field Data Required? ☐Yes ☐No COMMENTS/SAMPLE DISCREPANCY Lot ID of split containers:

Date/Time:

Date:

CLIENT NOTIFICATION/RESOLUTION

Project Manager SCURF Review:

Project Manager SRF Review:

Person contacted:



### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project # W0#:92474300

PM: KLH1

Due Date: 04/28/20

CLIENT: 92-HDR

	ltem#	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP4Z-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG35-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HC! (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SPST-12S mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)		BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AG0U-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	
1											1																			
2						1	1	1	/		1																			
1						1	/				Ì																			
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	12	/						/																	/					

		pH Ad	justment Log for Pres	erved Samples		
Sample ID	Type of Preservative	pH upon recelpt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.



# CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

Samples Intact (Y/N)	Custody Sealed Cooler (Y/N)	Received Ice (Y/N)	TEMP in (	20	04/17/2020	17/	100	DATE Signed:	TES	DA	$\square$	, 6	Chenge	50 9		5 5	harles	0	"  "	MPLE	SIGNATURE of SAMPLER:	SNATUF	Si A								
		on	;		_				(1) (1)										TURE	SIGNA	SAMPLER NAME AND SIGNATURE	ER NAM	SAMPL								
					+		+												+		+										
		_																	+								Lo	d, Ca, Cr,	is= 5b, As, Ba, Ba, Ba, B, Cd, Ca, Co, Ca Ta, Ci, Ma, 52, T1,	(200.8)	for detect
7	2	₹	23	1614	<u>^</u>	17-1-	_0	′	(2)	B	A	7	6	6	X			1111	116	112/H1/h0	•	SOF	1/	1	/	1	C			1	6020: B, Li, TI CI by 4500
	SAMPLE CONDITIONS	SAMPLE C		TIME		DATE	452		NO.	ACCEPTED BY / AFFIDATION	/ AFF	DBY	HAR	) ACC	/			TIME	STATE OF	DATE		NOI	RELINQUISHED BY I AFFILIATION	SHED BY	NQUI	R			ADDITIONAL COMMENTS		
																										$\vdash$					12
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							$\neg$		_	-								-	_				1350	3426	G.	75			SB-5		ω
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									_	_				_	_				_			-	105%		9	'n			58-6		1
7	THAMA	53	Residual Chlorine (Y/N)					Mercury 245.1	Low-Jetection Cacos	SPLP Metals/TDS/pH/Cl, F,	Analyses Test	Olher	Methanol	NaOH Na2S203	HCI	HNO3	H2SO4	Unpreserved	# OF CONTAINERS	SAMPLETEMPAT COLLECT	======================================	DATE	START	DA	SAMPLETYPE (G=GRAB C	MATRIX CODE (see valid cod	13 J & & P & P & P & P & P & P & P & P & P	Water Waste Water Product Soil/Soild Oil Wipe Air Other Tissue	SAMPLE ID  One Character per box. (A-Z, 0-9 /, -)  Sample Ids must be unique	SA One C (/	ITEM#
											Y/N		l"	tive	Preservatives	Pres	]		211			COLLECTED	COL	T.	2000	es to left\	CODE	MATRIX			
07- 07- 649-		N		(N)	Requested Analysis Filtered (Y/N)	sis Filt	d Analy	ueste	Req	H-SECTION AND ADDRESS OF THE PERSON AND ADDR	100.00	Ц	П	П		П		1	{	$\  \ $	$\  \ $	$\  \ $			11	┨ <b>╎</b>					
100	q	State / Location	State	the later and					.com,	(evin.herring@pacelabs.com,	@pac	rring	vin.he	€e	7672	1 2	Pace Profile #:	8 P	Pa				. 12	1002 1146	000	- 1	Project #:			Requested Due Date:	Requeste
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	СУ	Regulatory Agency	Regula	があることが	STATE OF THE PARTY												"	Address:	Ą										28202	Suite 900, Charlotte, NC 28202	Suite 900
											-					ne:	Company Name:	Attention: Company	ဂ္ဂ နဲ			enberg	Mark Filardi / Charles Gruenberg	ilardi / Cr	ark r	- 1	Copy To:		hurch St	440 S. Church St	Address:
_	Q.	_	Page:	<u>_</u>											ž	Invoice Information:	Infor	/oice	=				"	ormation	ct Int	١ž	Required Project Information:		ation:	1	Company:
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9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

July 09, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on May 13, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services Asheville
- · Pace Analytical Services Charlotte
- Pace Analytical Services Ormond Beach

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Herring

kevin.herring@pacelabs.com

Kai Slung

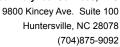
1(704)875-9092

HORIZON Database Administrator

**Enclosures** 

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing







### **CERTIFICATIONS**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

**Pace Analytical Services Ormond Beach** 

8 East Tower Circle, Ormond Beach, FL 32174

Alaska DEC- CS/UST/LUST Alabama Certification #: 41320 Arizona Certification# AZ0819

Colorado Certification: FL NELAC Reciprocity

Connecticut Certification #: PH-0216

Delaware Certification: FL NELAC Reciprocity

Florida Certification #: E83079 Georgia Certification #: 955

Guam Certification: FL NELAC Reciprocity Hawaii Certification: FL NELAC Reciprocity

Illinois Certification #: 200068

Indiana Certification: FL NELAC Reciprocity

Kansas Certification #: E-10383 Kentucky Certification #: 90050

Louisiana Certification #: FL NELAC Reciprocity

Louisiana Environmental Certificate #: 05007

Maryland Certification: #346 Michigan Certification #: 9911

Mississippi Certification: FL NELAC Reciprocity

Missouri Certification #: 236

Nebraska Certification: NE-OS-28-14 New Hampshire Certification #: 2958 New Jersey Certification #: FL022 New York Certification #: 11608

North Carolina Environmental Certificate #: 667

North Carolina Certification #: 12710 North Dakota Certification #: R-216

Montana Certification #: Cert 0074

Ohio DEP 87780

Oklahoma Certification #: D9947
Pennsylvania Certification #: 68-00547
Puerto Rico Certification #: FL01264
South Carolina Certification: #96042001
Tennessee Certification #: TN02974
Texas Certification: FL NELAC Reciprocity

US Virgin Islands Certification: FL NELAC Reciprocity

Virginia Environmental Certification #: 460165

West Virginia Certification #: 9962C Wisconsin Certification #: 399079670

Wyoming (EPA Region 8): FL NELAC Reciprocity

**Pace Analytical Services Charlotte** 

9800 Kincey Ave. Ste 100, Huntersville, NC 28078

Louisiana/NELAP Certification # LA170028

North Carolina Drinking Water Certification #: 37706

North Carolina Field Services Certification #: 5342

North Carolina Wastewater Certification #: 12

South Carolina Certification #: 99006001 Florida/NELAP Certification #: E87627 Kentucky UST Certification #: 84 Virginia/VELAP Certification #: 460221

**Pace Analytical Services Asheville** 

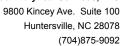
2225 Riverside Drive, Asheville, NC 28804

Florida/NELAP Certification #: E87648

Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222





### **SAMPLE SUMMARY**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92477624001	ASH-1	Solid	05/12/20 09:31	05/13/20 13:45
92477624002	ASH-2	Solid	05/12/20 09:41	05/13/20 13:45
92477624003	ASH-3	Solid	05/12/20 09:46	05/13/20 13:45



### **SAMPLE ANALYTE COUNT**

Project: CHARAH ASH SAMPLING

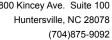
Pace Project No.: 92477624

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92477624001	ASH-1	EPA 6010	CS2	1	PASI-O
		EPA 6010D	DS, SH1	16	PASI-A
		EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	1	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 7471B	SOO	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		ASTM D2974-87	JM2	1	PASI-O
92477624002	ASH-2	EPA 6010	CS2	1	PASI-O
		EPA 6010D	DS, SH1	16	PASI-A
		EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	1	PASI-A
		EPA 7470A	S00	1	PASI-A
		EPA 7471B	S00	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		ASTM D2974-87	JM2	1	PASI-O
92477624003	ASH-3	EPA 6010	CS2	1	PASI-O
		EPA 6010D	DS, SH1	16	PASI-A
		EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	1	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 7471B	soo	1	PASI-A
		ASTM D2974-87	KDF	1	PASI-C
		ASTM D2974-87	JM2	1	PASI-O

PASI-A = Pace Analytical Services - Asheville

PASI-C = Pace Analytical Services - Charlotte

PASI-O = Pace Analytical Services - Ormond Beach





### **SUMMARY OF DETECTION**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2477624001	ASH-1					
EPA 6010D	Arsenic	55.3	mg/kg	5.1	05/23/20 21:04	
EPA 6010D	Barium	340	mg/kg	2.6	05/23/20 21:04	
EPA 6010D	Beryllium	2.8	mg/kg	0.51	05/23/20 21:04	
EPA 6010D	Boron	23.2J	mg/kg	25.6	05/23/20 21:04	
EPA 6010D	Calcium	2410	mg/kg	51.2	05/23/20 21:04	P8
EPA 6010D	Chromium	16.6	mg/kg	2.6	05/23/20 21:04	
EPA 6010D	Cobalt	11.1	mg/kg	2.6	05/23/20 21:04	
EPA 6010D	Copper	65.9	mg/kg	2.6	05/23/20 21:04	
EPA 6010D	Lead	16.8	mg/kg	2.6	05/23/20 21:04	
PA 6010D	Vanadium	61.0	mg/kg	2.6	05/23/20 21:04	
PA 6010D	Zinc	28.5	mg/kg	5.1	05/23/20 21:04	
PA 6010D	Antimony	0.0052	mg/L	0.0050	06/04/20 23:58	
PA 6010D	Arsenic	0.090	mg/L	0.010	06/04/20 23:58	
PA 6010D	Barium	0.13	mg/L	0.050	06/04/20 23:58	
PA 6010D	Boron	0.051J	mg/L	0.20	06/04/20 23:58	
PA 6010D	Calcium	7.5	mg/L	1.0	06/05/20 11:45	
PA 6010D	Molybdenum	0.016	mg/L	0.0050	06/04/20 23:58	
PA 6010D	Selenium	0.0053J	mg/L	0.010	06/04/20 23:58	
PA 6010D	Vanadium	0.11	mg/L	0.0050	06/04/20 23:58	
PA 6020B	Lithium	3.5	ug/L	2.5	06/02/20 02:42	
PA 7471B	Mercury	0.028	mg/kg	0.0026	05/19/20 15:30	
STM D2974-87	Percent Moisture	15.9	g/kg %	0.10	05/14/20 17:00	
STM D2974-87	Percent Moisture	26.3	%	0.10	05/20/20 09:08	
2477624002	ASH-2	20.0	70	0.10	00/20/20 00:00	
EPA 6010D	Arsenic	53.0	mg/kg	5.0	05/23/20 21:07	
EPA 6010D	Barium	318	mg/kg	2.5	05/23/20 21:07	
EPA 6010D	Beryllium	2.8	mg/kg	0.50	05/23/20 21:07	
EPA 6010D	Boron	20.9J	mg/kg	25.2		
PA 6010D	Calcium	2370	mg/kg	50.3	05/23/20 21:07	
PA 6010D	Chromium	15.8	mg/kg	2.5	05/23/20 21:07	
PA 6010D	Cobalt	10.8	mg/kg	2.5	05/23/20 21:07	
PA 6010D	Copper	62.7	mg/kg	2.5	05/23/20 21:07	
PA 6010D	Lead	16.5	mg/kg	2.5	05/23/20 21:07	
PA 6010D	Molybdenum	1.4J	mg/kg	2.5	05/23/20 21:07	
PA 6010D	Selenium	2.7J	mg/kg	5.0	05/23/20 21:07	
EPA 6010D	Thallium	2.8J	mg/kg	5.0	05/26/20 18:23	
EPA 6010D					05/23/20 21:07	
EPA 6010D	Vanadium Zinc	57.6 28.3	mg/kg mg/kg	2.5 5.0		
EPA 6010D		28.3	mg/kg	0.0050	05/23/20 21:07 06/05/20 00:01	
PA 6010D	Antimony	0.0054 0.048	mg/L		06/05/20 00:01	
	Arsenic		mg/L	0.010		
PA 6010D	Barium	0.18	mg/L	0.050	06/05/20 00:01	
PA 6010D	Boron	0.064J	mg/L	0.20	06/05/20 00:01	
PA 6010D PA 6010D	Calcium	5.7	mg/L	1.0	06/05/20 11:48	
	Molybdenum	0.018	mg/L	0.0050	06/05/20 00:01	
PA 6010D	Vanadium	0.083	mg/L	0.0050	06/05/20 00:01	
EPA 6010D	Zinc	0.011J	mg/L	0.050	06/05/20 00:01	
EPA 6020B	Lithium	3.5	ug/L	2.5	06/02/20 03:25	



### **SUMMARY OF DETECTION**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92477624002	ASH-2					
EPA 7471B	Mercury	0.028	mg/kg	0.0029	05/19/20 15:32	
ASTM D2974-87	Percent Moisture	14.4	%	0.10	05/14/20 17:01	
ASTM D2974-87	Percent Moisture	13.2	%	0.10	05/20/20 09:08	
92477624003	ASH-3					
EPA 6010D	Antimony	0.49J	mg/kg	0.52	05/26/20 18:27	
EPA 6010D	Arsenic	48.3	mg/kg	1.0	05/23/20 21:10	
EPA 6010D	Barium	277	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Beryllium	2.1	mg/kg	0.10	05/23/20 21:10	
EPA 6010D	Boron	17.5	mg/kg	5.2	05/23/20 21:10	
EPA 6010D	Cadmium	0.23	mg/kg	0.10	05/23/20 21:10	
EPA 6010D	Calcium	1980	mg/kg	10.3	05/23/20 21:10	P8
EPA 6010D	Chromium	13.6	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Cobalt	8.9	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Copper	58.1	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Lead	13.8	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Molybdenum	2.5	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Selenium	0.71J	mg/kg	1.0	05/23/20 21:10	
EPA 6010D	Thallium	0.77J	mg/kg	1.0	05/26/20 18:27	
EPA 6010D	Vanadium	55.2	mg/kg	0.52	05/23/20 21:10	
EPA 6010D	Zinc	23.4	mg/kg	1.0	05/23/20 21:10	
EPA 6010D	Antimony	0.0064	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Arsenic	0.085	mg/L	0.010	06/05/20 00:04	
EPA 6010D	Barium	0.35	mg/L	0.050	06/05/20 00:04	
EPA 6010D	Beryllium	0.0029	mg/L	0.0010	06/05/20 00:04	
EPA 6010D	Boron	0.096J	mg/L	0.20	06/05/20 00:04	
EPA 6010D	Calcium	6.1	mg/L	1.0	06/05/20 11:52	
EPA 6010D	Chromium	0.011	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Cobalt	0.011	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Copper	0.047	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Lead	0.016	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Molybdenum	0.027	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Vanadium	0.14	mg/L	0.0050	06/05/20 00:04	
EPA 6010D	Zinc	0.056	mg/L	0.050	06/05/20 00:04	
EPA 6020B	Lithium	19.9	ug/L	12.5	06/02/20 03:44	
EPA 7471B	Mercury	0.032	mg/kg	0.0036	05/19/20 15:35	
ASTM D2974-87	Percent Moisture	15.0	//////////////////////////////////////	0.10	05/14/20 17:01	
ASTM D2974-87	Percent Moisture	11.2	%	0.10	05/20/20 09:08	



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-1 Lab ID: 92477624001 Collected: 05/12/20 09:31 Received: 05/13/20 13:45 Matrix: Solid Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions. Report **Parameters** Results Units Limit MDL DF Prepared Analyzed CAS No. Qual Analytical Method: EPA 6010D Preparation Method: EPA 3050B **6010 MET ICP** Pace Analytical Services - Asheville ND 26 20 5 05/19/20 08:43 05/26/20 18:20 7440-36-0 **Antimony** mg/kg Arsenic 55.3 mg/kg 5.1 2.6 5 05/19/20 08:43 05/23/20 21:04 7440-38-2 05/23/20 21:04 7440-39-3 Barium 340 mg/kg 26 1.3 5 05/19/20 08:43 Beryllium 2.8 mg/kg 0.51 0.26 5 05/19/20 08:43 05/23/20 21:04 7440-41-7 Boron 23.2J mg/kg 25.6 12.8 5 05/19/20 08:43 05/23/20 21:04 7440-42-8 Cadmium ND mg/kg 0.51 0.26 5 05/19/20 08:43 05/23/20 21:04 7440-43-9 2410 51.2 25.6 05/19/20 08:43 05/23/20 21:04 7440-70-2 Calcium mg/kg 5 P8 Chromium 16.6 mg/kg 2.6 1.3 5 05/19/20 08:43 05/23/20 21:04 7440-47-3 Cobalt 11.1 2.6 1.3 5 05/19/20 08:43 05/23/20 21:04 7440-48-4 mg/kg Copper 65.9 mg/kg 2.6 1.3 5 05/19/20 08:43 05/23/20 21:04 7440-50-8 16.8 2.6 1.3 05/19/20 08:43 05/23/20 21:04 7439-92-1 Lead mg/kg 5 ND 2.6 1.3 05/23/20 21:04 7439-98-7 Molybdenum mg/kg 5 05/19/20 08:43 ND 5.1 2.6 5 05/19/20 08:43 05/23/20 21:04 7782-49-2 Selenium mg/kg 2.6 Thallium ND mg/kg 5.1 5 05/19/20 08:43 05/26/20 18:20 7440-28-0 Vanadium 61.0 mg/kg 2.6 1.3 5 05/19/20 08:43 05/23/20 21:04 7440-62-2 Zinc 28.5 mg/kg 5.1 2.6 5 05/19/20 08:43 05/23/20 21:04 7440-66-6 Analytical Method: EPA 6010 Preparation Method: EPA 3050 **6010 MET ICP** Pace Analytical Services - Ormond Beach Lithium mg/kg 148 18.9 5 05/19/20 17:17 05/22/20 14:29 7439-93-2 D3,N2 Analytical Method: EPA 6010D Preparation Method: EPA 3010A 6010 MET ICP, SPLP Leachate Method/Date: EPA 1312: 05/26/20 14:46 Pace Analytical Services - Asheville 0.0052 0.0050 0.0030 06/01/20 11:52 06/04/20 23:58 7440-36-0 Antimony mg/L 1 0.090 0.0047 mg/L 0.010 1 06/01/20 11:52 06/04/20 23:58 7440-38-2 Arsenic 0.050 0.0035 0.13 mg/L 06/01/20 11:52 06/04/20 23:58 7440-39-3 Barium 1 Beryllium ND mg/L 0.0010 0.00070 06/01/20 11:52 06/04/20 23:58 7440-41-7 1 0.051J 06/04/20 23:58 Boron mg/L 0.20 0.032 1 06/01/20 11:52 7440-42-8 Cadmium ND mg/L 0.0010 0.00040 1 06/01/20 11:52 06/04/20 23:58 7440-43-9 Calcium 7.5 mg/L 1.0 0.094 06/01/20 11:52 06/05/20 11:45 7440-70-2 1 ND 0.0050 0.0037 06/01/20 11:52 06/04/20 23:58 7440-47-3 Chromium mg/L ND 0.0050 0.0036 06/01/20 11:52 06/04/20 23:58 7440-48-4 Cobalt mg/L ND 0.0043 Copper mg/L 0.0050 1 06/01/20 11:52 06/04/20 23:58 7440-50-8 Lead ND mg/L 0.0050 0.0045 06/01/20 11:52 06/04/20 23:58 7439-92-1 1 Molybdenum 0.016 mg/L 0.0050 0.0039 1 06/01/20 11:52 06/04/20 23:58 7439-98-7 0.0053J Selenium mg/L 0.010 0.0047 1 06/01/20 11:52 06/04/20 23:58 7782-49-2 Thallium NΠ 5.5 0.0081 06/01/20 11:52 06/04/20 23:58 7440-28-0 mg/L 1 0.11 0.0039 Vanadium mg/L 0.0050 1 06/01/20 11:52 06/04/20 23:58 7440-62-2 Zinc ND mg/L 0.050 0.0095 1 06/01/20 11:52 06/04/20 23:58 7440-66-6



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-1	Lab ID:	9247762400	1 Collected	d: 05/12/20	09:31	Received: 05/	13/20 13:45 Ma	atrix: Solid	
Results reported on a "dry we	ight" basis and are	adjusted fo	or percent mo	oisture, sai	nple si	ize and any diluti	ions.		
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS, SPLP	Analytical	Method: EPA	A 6020B Prep	aration Met	hod: El	PA 3010A			
	Leachate I	Method/Date	: EPA 1312; 0	5/26/20 14:	46				
	Pace Anal	ytical Service	es - Asheville						
Lithium	3.5	ug/L	2.5	0.39	1	06/01/20 11:54	06/02/20 02:42	7439-93-2	
7470 Mercury, SPLP	Leachate I	Method/Date	A 7470A Prep : EPA 1312; 0 es - Asheville			PA 7470A			
Mercury	ND	mg/L	0.00020	0.00012	1	06/01/20 12:47	06/01/20 18:56	7439-97-6	
7471 Mercury	•		A 7471B Prep es - Asheville	aration Met	hod: El	PA 7471B			
Mercury	0.028	mg/kg	0.0026	0.0020	1	05/19/20 13:16	05/19/20 15:30	7439-97-6	
Percent Moisture	•		M D2974-87 es - Charlotte						
Percent Moisture	15.9	%	0.10	0.10	1		05/14/20 17:00		
Percent Moisture	,		M D2974-87 es - Ormond E	Beach					
Percent Moisture	26.3	%	0.10	0.10	1		05/20/20 09:08		



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-2 Lab ID: 92477624002 Collected: 05/12/20 09:41 Received: 05/13/20 13:45 Matrix: Solid Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions. Report **Parameters** Results Units Limit MDL DF Prepared Analyzed CAS No. Qual Analytical Method: EPA 6010D Preparation Method: EPA 3050B **6010 MET ICP** Pace Analytical Services - Asheville ND 25 20 5 05/19/20 08:43 05/26/20 18:23 7440-36-0 **Antimony** mg/kg Arsenic 53.0 mg/kg 5.0 2.5 5 05/19/20 08:43 05/23/20 21:07 7440-38-2 Barium 318 mg/kg 25 1.3 5 05/19/20 08:43 05/23/20 21:07 7440-39-3 Beryllium 2.8 mg/kg 0.50 0.25 5 05/19/20 08:43 05/23/20 21:07 7440-41-7 Boron 20.9J mg/kg 25.2 12.6 5 05/19/20 08:43 05/23/20 21:07 7440-42-8 Cadmium ND mg/kg 0.50 0.25 5 05/19/20 08:43 05/23/20 21:07 7440-43-9 2370 50.3 25.2 05/19/20 08:43 05/23/20 21:07 7440-70-2 Calcium mg/kg 5 Chromium 15.8 mg/kg 2.5 1.3 5 05/19/20 08:43 05/23/20 21:07 7440-47-3 Cobalt 10.8 2.5 1.3 5 05/19/20 08:43 05/23/20 21:07 7440-48-4 mg/kg Copper 62.7 2.5 1.3 5 05/19/20 08:43 05/23/20 21:07 7440-50-8 mg/kg 16.5 2.5 1.3 05/19/20 08:43 05/23/20 21:07 7439-92-1 Lead mg/kg 5 1.4J 2.5 1.3 05/23/20 21:07 7439-98-7 Molybdenum mg/kg 5 05/19/20 08:43 2.7J 5.0 2.5 5 05/19/20 08:43 05/23/20 21:07 7782-49-2 Selenium mg/kg 5.0 2.8J 2.5 Thallium mg/kg 5 05/19/20 08:43 05/26/20 18:23 7440-28-0 Vanadium 57.6 mg/kg 2.5 1.3 5 05/19/20 08:43 05/23/20 21:07 7440-62-2 Zinc 28.3 mg/kg 5.0 2.5 5 05/19/20 08:43 05/23/20 21:07 7440-66-6 Analytical Method: EPA 6010 Preparation Method: EPA 3050 **6010 MET ICP** Pace Analytical Services - Ormond Beach Lithium mg/kg 152 19.4 5 05/19/20 17:17 05/22/20 14:33 7439-93-2 D3,N2 Analytical Method: EPA 6010D Preparation Method: EPA 3010A 6010 MET ICP, SPLP Leachate Method/Date: EPA 1312: 05/26/20 14:46 Pace Analytical Services - Asheville 0.0054 0.0050 0.0030 06/01/20 11:52 06/05/20 00:01 7440-36-0 Antimony mg/L 1 0.0047 0.048 mg/L 0.010 1 06/01/20 11:52 06/05/20 00:01 7440-38-2 Arsenic 0.050 0.0035 0.18 mg/L 06/01/20 11:52 06/05/20 00:01 7440-39-3 Barium 1 Beryllium ND mg/L 0.0010 0.00070 06/01/20 11:52 06/05/20 00:01 7440-41-7 1 Boron 0.064J mg/L 0.20 0.032 1 06/01/20 11:52 06/05/20 00:01 7440-42-8 Cadmium ND mg/L 0.0010 0.00040 1 06/01/20 11:52 06/05/20 00:01 7440-43-9 Calcium 5.7 mg/L 1.0 0.094 06/01/20 11:52 06/05/20 11:48 7440-70-2 1 ND 0.0050 0.0037 06/01/20 11:52 06/05/20 00:01 7440-47-3 Chromium mg/L ND 0.0050 0.0036 06/01/20 11:52 06/05/20 00:01 7440-48-4 Cobalt mg/L 0.0043 06/05/20 00:01 7440-50-8 Copper ND mg/L 0.0050 1 06/01/20 11:52 ND mg/L 0.0050 0.0045 06/01/20 11:52 06/05/20 00:01 7439-92-1 Lead 1 Molybdenum 0.018 mg/L 0.0050 0.0039 06/01/20 11:52 06/05/20 00:01 7439-98-7 1 Selenium ND mg/L 0.010 0.0047 1 06/01/20 11:52 06/05/20 00:01 7782-49-2 Thallium ND 0.0081 06/01/20 11:52 06/05/20 00:01 7440-28-0 mg/L 5.5 1 0.083 0.0039 Vanadium mg/L 0.0050 1 06/01/20 11:52 06/05/20 00:01 7440-62-2 0.011J 06/05/20 00:01 7440-66-6 Zinc mg/L 0.050 0.0095 06/01/20 11:52



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-2	Lab ID:	9247762400	2 Collecte	d: 05/12/2	09:41	Received: 05/	13/20 13:45 Ma	atrix: Solid	
Results reported on a "dry we	ight" basis and are	adjusted fo	or percent me	oisture, sa	nple si	ize and any diluti	ions.		
			Report						
Parameters	Results	Units	Limit	MDL	DF	Prepared	Analyzed	CAS No.	Qual
6020 MET ICPMS, SPLP	Analytical	Method: EPA	A 6020B Prep	aration Me	hod: El	PA 3010A			
	Leachate I	Method/Date	: EPA 1312; 0	5/26/20 14:	46				
	Pace Anal	ytical Service	es - Asheville						
Lithium	3.5	ug/L	2.5	0.39	1	06/01/20 11:54	06/02/20 03:25	7439-93-2	
7470 Mercury, SPLP	Leachate I	Method/Date	A 7470A Prep : EPA 1312; 0 es - Asheville			PA 7470A			
Mercury	ND	mg/L	0.00020	0.00012	1	06/01/20 12:47	06/01/20 18:58	7439-97-6	
7471 Mercury	•		A 7471B Prep es - Asheville	aration Me	hod: El	PA 7471B			
Mercury	0.028	mg/kg	0.0029	0.0022	1	05/19/20 13:16	05/19/20 15:32	7439-97-6	
Percent Moisture			TM D2974-87 es - Charlotte						
Percent Moisture	14.4	%	0.10	0.10	1		05/14/20 17:01		
Percent Moisture	Analytical	Method: AST	M D2974-87						
	Pace Anal	ytical Service	es - Ormond E	Beach					
Percent Moisture	13.2	%	0.10	0.10	1		05/20/20 09:08		



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-3 Lab ID: 92477624003 Collected: 05/12/20 09:46 Received: 05/13/20 13:45 Matrix: Solid Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions. Report **Parameters** Results Units Limit MDL DF Prepared Analyzed CAS No. Qual Analytical Method: EPA 6010D Preparation Method: EPA 3050B **6010 MET ICP** Pace Analytical Services - Asheville 0.49J 0.52 0.40 05/19/20 08:43 05/26/20 18:27 7440-36-0 Antimony mg/kg 1 Arsenic 48.3 mg/kg 0.52 1 05/19/20 08:43 05/23/20 21:10 7440-38-2 1.0 Barium 277 mg/kg 0.52 0.26 1 05/19/20 08:43 05/23/20 21:10 7440-39-3 Beryllium 2.1 mg/kg 0.10 0.052 1 05/19/20 08:43 05/23/20 21:10 7440-41-7 Boron 17.5 mg/kg 5.2 2.6 05/19/20 08:43 05/23/20 21:10 7440-42-8 Cadmium 0.23 mg/kg 0.10 0.052 05/19/20 08:43 05/23/20 21:10 7440-43-9 1980 10.3 5.2 05/19/20 08:43 05/23/20 21:10 7440-70-2 Calcium mg/kg P8 0.52 Chromium 13.6 mg/kg 0.26 05/19/20 08:43 05/23/20 21:10 7440-47-3 Cobalt 8.9 0.52 0.26 05/19/20 08:43 05/23/20 21:10 7440-48-4 mg/kg Copper 58.1 mg/kg 0.52 0.26 05/19/20 08:43 05/23/20 21:10 7440-50-8 1 13.8 0.52 0.26 05/19/20 08:43 05/23/20 21:10 7439-92-1 Lead mg/kg 1 0.26 2.5 0.52 05/19/20 08:43 05/23/20 21:10 7439-98-7 Molybdenum mg/kg 1 0.52 0.71J 1.0 05/19/20 08:43 05/23/20 21:10 7782-49-2 Selenium mg/kg 1 0.52 Thallium 0.77J mg/kg 1.0 1 05/19/20 08:43 05/26/20 18:27 7440-28-0 Vanadium 55.2 mg/kg 0.52 0.26 1 05/19/20 08:43 05/23/20 21:10 7440-62-2 Zinc 23.4 mg/kg 1.0 0.52 05/19/20 08:43 05/23/20 21:10 7440-66-6 Analytical Method: EPA 6010 Preparation Method: EPA 3050 **6010 MET ICP** Pace Analytical Services - Ormond Beach 20.2 Lithium mg/kg 158 5 05/19/20 17:17 05/22/20 14:36 7439-93-2 D3,N2 Analytical Method: EPA 6010D Preparation Method: EPA 3010A 6010 MET ICP, SPLP Leachate Method/Date: EPA 1312: 05/26/20 14:46 Pace Analytical Services - Asheville 0.0064 0.0050 0.0030 06/01/20 11:52 06/05/20 00:04 7440-36-0 Antimony mg/L 1 0.085 0.0047 mg/L 0.010 1 06/01/20 11:52 06/05/20 00:04 7440-38-2 Arsenic 0.050 0.0035 0.35 mg/L 06/01/20 11:52 06/05/20 00:04 7440-39-3 Barium 1 Beryllium 0.0029 mg/L 0.0010 0.00070 06/01/20 11:52 06/05/20 00:04 7440-41-7 1 Boron 0.096J mg/L 0.20 0.032 1 06/01/20 11:52 06/05/20 00:04 7440-42-8 Cadmium ND mg/L 0.0010 0.00040 1 06/01/20 11:52 06/05/20 00:04 7440-43-9 Calcium 6.1 mg/L 1.0 0.094 06/01/20 11:52 06/05/20 11:52 7440-70-2 1 0.011 0.0050 0.0037 06/01/20 11:52 06/05/20 00:04 7440-47-3 Chromium mg/L 0.011 0.0050 0.0036 06/01/20 11:52 06/05/20 00:04 7440-48-4 Cobalt mg/L 0.0043 06/05/20 00:04 7440-50-8 Copper 0.047 mg/L 0.0050 1 06/01/20 11:52 0.016 mg/L 0.0050 0.0045 06/01/20 11:52 06/05/20 00:04 7439-92-1 Lead 1 Molybdenum 0.027 mg/L 0.0050 0.0039 06/01/20 11:52 06/05/20 00:04 7439-98-7 1 Selenium ND mg/L 0.010 0.0047 06/01/20 11:52 06/05/20 00:04 7782-49-2 1 Thallium ND 0.0081 06/01/20 11:52 06/05/20 00:04 7440-28-0 mg/L 5.5 1 0.14 0.0039 Vanadium mg/L 0.0050 1 06/01/20 11:52 06/05/20 00:04 7440-62-2 0.056 Zinc mg/L 0.050 0.0095 06/01/20 11:52 06/05/20 00:04 7440-66-6



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

Sample: ASH-3 Lab ID: 92477624003 Collected: 05/12/20 09:46 Received: 05/13/20 13:45 Matrix: Solid Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions. Report **Parameters** Results Units Limit MDL DF Prepared Analyzed CAS No. Qual 6020 MET ICPMS, SPLP Analytical Method: EPA 6020B Preparation Method: EPA 3010A Leachate Method/Date: EPA 1312; 05/26/20 14:46 Pace Analytical Services - Asheville Lithium 19.9 uq/L 12.5 2.0 5 06/01/20 11:54 06/02/20 03:44 7439-93-2 Analytical Method: EPA 7470A Preparation Method: EPA 7470A 7470 Mercury, SPLP Leachate Method/Date: EPA 1312; 05/26/20 14:46 Pace Analytical Services - Asheville 06/01/20 12:47 06/01/20 19:01 7439-97-6 ND 0.00020 0.00012 Mercury mg/L 7471 Mercury Analytical Method: EPA 7471B Preparation Method: EPA 7471B Pace Analytical Services - Asheville 0.032 0.0036 0.0028 mg/kg Mercury **Percent Moisture** Analytical Method: ASTM D2974-87 Pace Analytical Services - Charlotte Percent Moisture 15.0 0.10 0.10 05/14/20 17:01 1 Analytical Method: ASTM D2974-87 **Percent Moisture** Pace Analytical Services - Ormond Beach Percent Moisture 11.2 0.10 0.10 05/20/20 09:08 1



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 544424 Analysis Method: EPA 7470A

QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92477624001, 92477624002, 92477624003

METHOD BLANK: 2894106 Matrix: Water

Associated Lab Samples: 92477624001, 92477624002, 92477624003

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Mercury mg/L ND 0.00020 0.00012 06/01/20 18:44

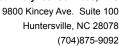
LABORATORY CONTROL SAMPLE: 2899187

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units Mercury mg/L 0.0025 0.0023 91 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2899188 2899189

MS MSD

92477107001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec **RPD** RPD Qual Result Limits ND 0.0025 0.0021 20 Mercury mg/L 0.0025 0.0022 86 90 75-125 5





Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 542309 Analysis Method: EPA 7471B

QC Batch Method: EPA 7471B Analysis Description: 7471 Mercury

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92477624001, 92477624002, 92477624003

METHOD BLANK: 2889439 Matrix: Solid

Associated Lab Samples: 92477624001, 92477624002, 92477624003

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Mercury mg/kg ND 0.0060 0.0046 05/19/20 14:45

LABORATORY CONTROL SAMPLE: 2889440

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units Mercury 0.083 0.084 101 80-120 mg/kg

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2889441 2889442

MSD MS 92477189001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec **RPD RPD** Qual Limits ND 0.044 0.036 0.044 20 R1 Mercury mg/kg 0.049 81 90 75-125 22

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 542256 Analysis Method: EPA 6010D
QC Batch Method: EPA 3050B Analysis Description: 6010 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92477624001, 92477624002, 92477624003

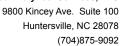
METHOD BLANK: 2889241 Matrix: Solid

Associated Lab Samples: 92477624001, 92477624002, 92477624003

		Blank	Reporting			
Parameter	Units	Result	Limit	MDL	Analyzed	Qualifiers
Antimony	mg/kg	ND	0.50	0.39	05/26/20 17:20	
Arsenic	mg/kg	ND	1.0	0.50	05/26/20 17:20	
Barium	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Beryllium	mg/kg	ND	0.10	0.050	05/26/20 17:20	
Boron	mg/kg	ND	5.0	2.5	05/26/20 17:20	
Cadmium	mg/kg	ND	0.10	0.050	05/26/20 17:20	
Calcium	mg/kg	11.8	10.0	5.0	05/26/20 17:20	P8
Chromium	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Cobalt	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Copper	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Lead	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Molybdenum	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Selenium	mg/kg	ND	1.0	0.50	05/26/20 17:20	
Thallium	mg/kg	ND	1.0	0.50	05/26/20 17:20	
√anadium	mg/kg	ND	0.50	0.25	05/26/20 17:20	
Zinc	mg/kg	ND	1.0	0.50	05/26/20 17:20	

BORATORY CONTROL SAMPLE:	2889242	Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
timony	mg/kg	50	48.8	98	80-120	
senic	mg/kg	50	49.3	99	80-120	
rium	mg/kg	50	49.3	99	80-120	
yllium	mg/kg	50	49.4	99	80-120	
ron	mg/kg	50	45.2	90	80-120	
dmium	mg/kg	50	48.2	96	80-120	
cium	mg/kg	500	485	97	80-120	
omium	mg/kg	50	49.5	99	80-120	
alt	mg/kg	50	50.1	100	80-120	
per	mg/kg	50	50.3	101	80-120	
d	mg/kg	50	48.9	98	80-120	
/bdenum	mg/kg	50	51.5	103	80-120	
enium	mg/kg	50	46.5	93	80-120	
llium	mg/kg	50	46.7	93	80-120	
adium	mg/kg	50	49.5	99	80-120	
	mg/kg	50	46.9	94	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

MATRIX SPIKE & MATRIX	SPIKE DUPLIC	CATE: 2889	243 MS	MSD	2889244							
	9:	2476778001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	mg/kg	2.0	134	166	105	132	77	78	75-125	23	20	R1
Arsenic	mg/kg	ND	134	166	139	164	103	99	75-125	17	20	
Barium	mg/kg	274	134	166	403	418	96	86	75-125	3	20	
Beryllium	mg/kg	ND	134	166	135	164	100	99	75-125	20	20	
Boron	mg/kg	ND	134	166	135	161	91	89	75-125	18	20	
Cadmium	mg/kg	0.79	134	166	132	160	98	96	75-125	19	20	
Calcium	mg/kg	12000	1340	1660	11700	11400	-24	-37	75-125	2	20	M1
Chromium	mg/kg	30.8	134	166	166	193	100	98	75-125	15	20	
Cobalt	mg/kg	3.1	134	166	136	163	99	96	75-125	18	20	
Copper	mg/kg	203	134	166	351	370	110	100	75-125	5	20	
Lead	mg/kg	20.8	134	166	148	176	95	93	75-125	17	20	
Molybdenum	mg/kg	11.4	134	166	148	177	102	100	75-125	18	20	
Selenium	mg/kg	6.6	134	166	138	161	98	93	75-125	16	20	
Thallium	mg/kg	ND	134	166	120	147	89	88	75-125	20	20	
Vanadium	mg/kg	10.9	134	166	144	172	99	97	75-125	17	20	
Zinc	mg/kg	892	134	166	1190	1030	224	84	75-125	15	20	M1



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 634081 Analysis Method: EPA 6010
QC Batch Method: EPA 3050 Analysis Description: 6010 MET Solid

Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 92477624001, 92477624002, 92477624003

METHOD BLANK: 3448189 Matrix: Solid

Associated Lab Samples: 92477624001, 92477624002, 92477624003

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Lithium mg/kg ND 25.8 3.3 05/20/20 08:00 N2

LABORATORY CONTROL SAMPLE: 3448190

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units Lithium 636 668 105 N2 mg/kg

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 3448191 3448192

MSD MS 35549095001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Result Conc. 3.0U 607 101 N2 Lithium mg/kg 603 607 623 103 3

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 544416 Analysis Method: EPA 6010D

QC Batch Method: EPA 3010A Analysis Description: 6010 MET SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92477624001, 92477624002, 92477624003

METHOD BLANK: 2894106 Matrix: Water

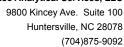
Associated Lab Samples: 92477624001, 92477624002, 92477624003

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Antimony	mg/L	 ND	0.0050	0.0030	06/04/20 23:31	
Arsenic	mg/L	ND	0.010	0.0047	06/04/20 23:31	
Barium	mg/L	ND	0.050	0.0035	06/04/20 23:31	
Beryllium	mg/L	ND	0.0010	0.00070	06/04/20 23:31	
Boron	mg/L	ND	0.20	0.032	06/04/20 23:31	
Cadmium	mg/L	ND	0.0010	0.00040	06/04/20 23:31	
Calcium	mg/L	ND	1.0	0.094	06/05/20 14:13	
Chromium	mg/L	ND	0.0050	0.0037	06/04/20 23:31	
Cobalt	mg/L	ND	0.0050	0.0036	06/04/20 23:31	
_ead	mg/L	ND	0.0050	0.0045	06/04/20 23:31	
Molybdenum	mg/L	ND	0.0050	0.0039	06/04/20 23:31	
Selenium	mg/L	ND	0.010	0.0047	06/04/20 23:31	
Thallium	mg/L	ND	5.5	0.0081	06/04/20 23:31	

LABORATORY CONTROL SAMPLE:	2899161					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	mg/L	0.5	0.53	107	80-120	
Arsenic	mg/L	0.5	0.54	107	80-120	
Barium	mg/L	0.5	0.52	103	80-120	
Beryllium	mg/L	0.5	0.52	104	80-120	
Boron	mg/L	0.5	0.51	102	80-120	
Cadmium	mg/L	0.5	0.53	107	80-120	
Calcium	mg/L	5	4.8	97	80-120	
Chromium	mg/L	0.5	0.50	100	80-120	
Cobalt	mg/L	0.5	0.53	105	80-120	
Lead	mg/L	0.5	0.53	106	80-120	
Molybdenum	mg/L	0.5	0.52	104	80-120	
Selenium	mg/L	0.5	0.56	112	80-120	
Thallium	mg/L	0.5	0.51J	102	80-120	

MATRIX SPIKE & MATRIX SF	PIKE DUPL	.ICATE: 2899	162		2899163	i						
		92477107001	MS Spike	MSD Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	mg/L	ND	0.5	0.5	0.54	0.55	109	110	75-125	1	20	
Arsenic	mg/L	ND	0.5	0.5	0.51	0.51	102	101	75-125	1	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

MATRIX SPIKE & MATRIX	SPIKE DUPLIC	CATE: 2899		1400	2899163							
Parameter	9 Units	2477107001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qua
Barium	mg/L	0.27	0.5	0.5	0.78	0.78	102	103	75-125	0	20	
Beryllium	mg/L	ND	0.5	0.5	0.50	0.50	99	100	75-125	0	20	
Boron	mg/L	0.23	0.5	0.5	0.76	0.76	106	106	75-125	0	20	
Cadmium	mg/L	ND	0.5	0.5	0.54	0.55	109	109	75-125	1	20	
Calcium	mg/L	1490	5	5	1510	1510	400	340	75-125	0	20	M6
Chromium	mg/L	0.012	0.5	0.5	0.50	0.49	97	96	75-125	0	20	
Cobalt	mg/L	ND	0.5	0.5	0.49	0.49	97	98	75-125	1	20	
Lead	mg/L	0.0092	0.5	0.5	0.49	0.49	96	97	75-125	1	20	
Molybdenum	mg/L	0.046	0.5	0.5	0.56	0.56	103	104	75-125	1	20	
Selenium	mg/L	0.042	0.5	0.5	0.60	0.61	112	113	75-125	1	20	
Thallium	mg/L	ND	0.5	0.5	0.44J	0.44J	86	87	75-125		20	



Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

QC Batch: 544417 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET SPLP

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92477624001, 92477624002, 92477624003

METHOD BLANK: 2894106 Matrix: Water

Associated Lab Samples: 92477624001, 92477624002, 92477624003

Blank Reporting
Parameter Units Result Limit MDL Analyzed Qualifiers

Lithium ug/L ND 2.5 0.39 06/02/20 02:35

LABORATORY CONTROL SAMPLE: 2899164

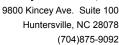
Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units Lithium ug/L 51.9 104 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2899165 2899166

MS MSD

92477624001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Result 104 20 Lithium ug/L 3.5 50 50 55.6 53.7 100 75-125

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

SAMPLE DUPLICATE: 3448611

Date: 07/09/2020 03:40 PM

QC Batch: 634111 Analysis Method: ASTM D2974-87

QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture

Laboratory: Pace Analytical Services - Ormond Beach

Associated Lab Samples: 92477624001, 92477624002, 92477624003

92477624001 Dup Max RPD RPD Parameter Units Result Result Qualifiers 26.3 Percent Moisture 27.5 10 SAMPLE DUPLICATE: 3448612 35550516005 Dup Max

ParameterUnitsResultResultRPDRPDQualifiersPercent Moisture%9.88.71110D6

 SAMPLE DUPLICATE:
 3448613

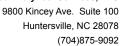
 35550516014 Dup Max

 Parameter
 Units Result Result RPD RPD Qualifiers

 Percent Moisture
 %
 0.16
 0.17
 6
 10

SAMPLE DUPLICATE: 3448614 35550569002 Dup Max Parameter Units Result Result **RPD RPD** Qualifiers 10.1 % 9.9 2 10 Percent Moisture

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

QC Batch: 541656 Analysis Method: ASTM D2974-87

QC Batch Method: ASTM D2974-87 Analysis Description: Dry Weight/Percent Moisture

Laboratory: Pace Analytical Services - Charlotte

Associated Lab Samples: 92477624001, 92477624002, 92477624003

SAMPLE DUPLICATE: 2886494

 Parameter
 Units
 92477458003 Result
 Dup Result
 Max RPD
 RPD
 Qualifiers

 Percent Moisture
 %
 26.9
 27.0
 1
 25

SAMPLE DUPLICATE: 2886495

Date: 07/09/2020 03:40 PM

		92477681008	Dup		Max	
Parameter	Units	Result	Result	RPD	RPD	Qualifiers
Percent Moisture	%	20.2	21.1	4	25	



### **QUALIFIERS**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

RPD value was outside control limits.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **ANALYTE QUALIFIERS**

R1

Date: 07/09/2020 03:40 PM

D3	Sample was diluted due to the presence of high levels of non-target analytes or other matrix interference.
D6	The precision between the sample and sample duplicate exceeded laboratory control limits.
M1	Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.
M6	Matrix spike and Matrix spike duplicate recovery not evaluated against control limits due to sample dilution.
N2	The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.
P8	Analyte was detected in the method blank. All associated samples had concentrations of at least ten times greater than the blank or were below the reporting limit.



### **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH ASH SAMPLING

Pace Project No.: 92477624

Date: 07/09/2020 03:40 PM

12477624001 ASH-1 EPA 3050 634081 EPA 6010 634176 12477624002 ASH-2 EPA 3050B 542256 EPA 6010D 542387 12477624002 ASH-3 EPA 3050 634081 EPA 6010 634176 12477624003 ASH-3 EPA 3050B 542256 EPA 6010D 542387 12477624003 ASH-3 EPA 3050B 542256 EPA 6010D 542387 12477624003 ASH-3 EPA 3050B 542256 EPA 6010D 542387 12477624001 ASH-1 EPA 3010A 544416 EPA 6010D 544445 12477624002 ASH-2 EPA 3010A 544416 EPA 6010D 544445 12477624003 ASH-3 EPA 3010A 544416 EPA 6010D 544445 12477624001 ASH-1 EPA 3010A 544416 EPA 6010D 544445 12477624001 ASH-1 EPA 3010A 544417 EPA 6020B 544446 12477624002 ASH-2 EPA 3010A 544417 EPA 6020B 544446 12477624003 ASH-3 EPA 3010A 544417 EPA 6020B 544446 12477624001 ASH-1 EPA 7470A 544421 EPA 7470A 544463 12477624001 ASH-1 EPA 7470A 544424 EPA 7470A 544463 12477624001 ASH-1 EPA 7471B 542309 EPA 7471B 542361 12477624001 ASH-1 ASHM D2974-87 541656 12477624001 ASH-1 ASHM D2974-87 634111 12477624001 ASH-1 ASHM D2974-87 634111 12477624002 ASH-2 EPA 7471B 542309 EPA 7471B 542361 12477624001 ASH-1 ASHM D2974-87 634111 12477624001 ASH-1 ASHM D2974-87 634111 12477624002 ASH-2 ASHM D2974-87 541656	Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
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	2477624003	ASH-3	ASTM D2974-87	634111		

# Pace Analytical\*

## Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

Lai	boratory receiving samples: Asheville	Greenwood 🗌	Hunters	/	Raleigh 🗌	Mechanicsville	
	Sample Condition Client Name: Upon Receipt	LDR	Projec	. #: WO:	#:9247	'7624 ⊪	
0.000	ourler: Fed Ex  Commercial Pace	UPS USPS Other:	Client	92477			
Cust	tody Seal Present? Yes No	Seals Intact? Yes	No	Date/init	lals Person Examining (	Contents: FF 5/10	9/20
	king Material: Bubble Wrap	Bubble Bags None	Other		Biological Tissue		
1116	IR Gun ID: 92T061	Type of Ice:	et Blue	□None			
Coo	OA Regulated Soil (C):			Samples on Samples of		nples on Ice, cooling process	
Did :	samples originate in a quarantine zone within the	ne United States: CA, NY, or SC (	check maps)?	including Hawall	inate from a forelgn so and Puerto Rico)? Y	es No	
[					Comments/Discrepa		-
	Chain of Custody Present?	☑Yes □No	□N/A 1.				
	Samples Arrived within Hold Time?	Yes \Q\no	□N/A · 2.			<u> </u>	
-	Short Hold Time Analysis (<72 hr.)?		□N/A 3.				
	Rush Turn Around Time Requested?	□Yes □No	□N/A 4.				
	Sufficient Volume?	√Yes □No	□N/A 5.				
	Correct Containers Used? -Pace Containers Used?	□Yes □No	□n/A 6.				
_	Containers Intact?	☐Yes ☐No	□N/A 7.				
	Dissolved analysis: Samples Field Filtered?	7	DN/A 8.				
	Sample Labels Match COC?		□N/A 9.				
	-Includes Date/Time/ID/Analysis Matrix:_	SL					
	Headspace in VOA Vials (>5-6mm)?		□N/A 10.				
	Trip Blank Present?	□Yes □No	□N/A 11.				
	Trip Blank Custody Seals Present?	□Yes □No /	□N/A				ا
C	OMMENTS/SAMPLE DISCREPANCY		9		field Data i	Required? Yes No	
		,	Lo	t ID of split cons	tainers:		_
cīī	ENT NOTIFICATION/RESOLUTION						_
_							
P	Person contacted:		Date/Time:				_
	Project Manager SCURF Review:			Date:			
	Project Manager SRF Review:		1	Date:		-	



### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

W0#:92477624

PM: KLH1

Due Date: 05/22/20

CLIENT: 92-HDR

Remit	BP4U-125 mL Plastic Unpreserved (N/A) (Cl-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP42-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (Cl-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	<b>АG1H-1</b> liter Amber HCl (рн < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG15-1 liter Amber H2SO4 (pH < 2)	AG35-250 mL Amber H2SO4 (pH < 2)	AG3A[DG3A]-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HC! (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SPST-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)		BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AG0U-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	
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pH Adjustment Log for Preserved Samples											
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #					

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.

# Section A

# CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

				i, Sb, As, Ba,		12	=	10	9	œ	7	6	5	4	3	2	-	ITEM#			Requeste	Phone:	Email:	Address:	Company:
				Li, Sb, As, Ba, Be, B, Cd, Ca, Cr, Co, Pb, Mo, Se, Tl, Hg	ADDITIONAL COMMENTS										RSH-3	854 Z	ASFI	SAMPLE ID One Character per box. (A-Z, 0-91, -) Sample lds must be unique			Requested Due Date:	Fax	Suite 900, Raleigh, NC 27601 Email:	550 Fayetteville Street	Company: HDR
																		Waster Wilpe Air Other Tissue	MATRIX Drinking Water		Pr :	0 0		0	R. R
		1	XXV		REL								_		9	C1	C	TS T AR P P W	CODE		Project #:	Purchase Order #:			Report To: log to
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Appendix C – Boring Logs, Well Completion Record (MW-11) and Survey Data (MW-11)



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# BORING NUMBER MW-2D PAGE 1 OF 3

L7		
	~	HDR, Inc.

CLIEN	IT <u>Chara</u>	ah-Brickhaven		PROJECT NAME Monitoring We	II Installation
		IBER 10021146		PROJECT LOCATION Brickhave	
DATE	STARTE	<b>D</b> 3/4/20	COMPLETED 3/5/20	GROUND ELEVATION N/A	HOLE SIZE 6" - 8 1/4" inches
DRILL	ING CON	TRACTOR Geole	ogic Exploration	GROUND WATER LEVELS:	
DRILL	ING MET	HOD Air Rotary		AT TIME OF DRILLING _DF	RY
LOGG	ED BY	R. Mull	CHECKED BY J. Ruffing	AT END OF DRILLING DR	Y
NOTE	S Monito	oring well abandor	ned because location was dry	AFTER DRILLING DRY	
DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		REMARKS
	) j	9			
			(ML) silt, red (2.5YR 4/6), dry, fine gr	avel up to 0.2"	
					0.4/48
5 -					8 1/4" air rotary
3					
5	ML				
	IVIL				
10_		0 0 10.0			
			(ML) silt with clay, reddish brown (2.5	YR 5/4), dry	
707					
<u> </u>	ML				
  -  -					
15		15.0		5) (5 5/2)	
2 }	ML		(ML) clayey silt with gravel, brown (7. dry	5YR 5/3), partially weathered rock u	p to 0.5",
5 2					
일			pale red (2.5YR 6/2), partially weather	rea rock up to 0.25, ary	
20			weak red (2.5YR 5/2)		
			1341 134 (2.011 0/2)		
-					
<u>-</u>					
25					
-					
<u>-</u>		6 4 6	reddish brown (2.5YR 4/3)		
- 1			, ,		
30					
30			reddish brown(2.5YR 4/4)		
<u>-</u>					
<u>-</u> -					
35					

# BORING NUMBER MW-2D PAGE 2 OF 3

<b>FOS</b>	IDR, Inc
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		rah-Brickhave			PROJECT NAME _Monitoring Well Installation	
PROJ	ECT NUI	MBER _1002	1146		PROJECT LOCATION Brickhaven, NC	
(#) 35	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION		REMARKS
	ML		37.0	(ML) clayey silt and gravel, reddish bro	wn(2.5YR 4/4), partially weathered rock, dry	
  40	GM			(GM) silty gravel, dark reddish brown(2 dark reddish gray (5YR 4/2)	.5YR 3/3), partially weathered rock, dry	
			40.0	gray (7.5YR 5/1)		
0.850 0.850	GC		43.0 45.0	(GC) clayey gravel, black (7.5YR 2.5/1	), partially weathered rock, dry	
GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 7/10/20 10:18 - C./USERSIRMULL\()DESKTOPIPROJECTS\()CHARAH\()2020 03 WELL INSTALLATION\()BORING LOGS. GPJ           G         Q           G         G           G	GM		65.0	(GM) silty gravel, light gray (2.5Y 7/1), reddish gray (5YR 5/2)	partially weathered rock, dry	8" conductor casing installed to depth of 55' 6" air rotary
GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 0.0		× × × × × × × × × × × × × × × × × × ×		Siltstone, gray (2.5Y 6/1), dry  dark reddish brown (5YR 3/3)		



# BORING NUMBER MW-2D PAGE 3 OF 3

	CLIEN	T Chara	h-Brickhaven		PROJECT NAME Monitoring Well Installation	
	PROJI	ECT NUM	BER _1002114	6	PROJECT LOCATION Brickhaven, NC	
	DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		REMARKS
	75			07/1	0.00	
GENERAL BH / TP / WELL - GINT STD US LAB.GDT - 7/10/20 10:18 - C./USERS\RMULL\DESKTOP\PROJECTS\CHARAH\2020 03 WELL INSTALLATION\BORING LOGS.GPJ	75 80 85 90			Siltstone, dark reddish brown (2.5YR weak red (2.5YR 5/2)  reddish gray (2.5YR 5/1)  weak red (2.5YR 4/2)  Bottom o	f borehole at 90.0 feet.	Insufficient water produced to install well
GENE						

ŀ	<b>.</b> )?	HDR, Inc.		BORI	NG NUMBER MW-9 PAGE 1 OF 1
PROJ DATE DRILL	ECT NUM STARTE LING COM		completed 3/2/20 plogic Exploration	PROJECT LOCATION Brickhaven, NC GROUND ELEVATION N/A	
	_		CHECKED BY J. Ruffing oned because location was dry	AT END OF DRILLING DRY  AFTER DRILLING 30.35'	
O DEPTH (ft)	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION		REMARKS
	CL- ML	5	(CL-ML) silty clay, reddish brown (5Y	'R 4/4), moist, soft	
3 WELL INSTALLATION/BO	ML		soft	.5YR 2.5/3), with trace gravel up to 0.5", mo	pist,
OP/PROJECTS/CHARAH/2020 0	CL- ML		(CL-ML) clayey silt, reddish brown (2 dark reddish brown (5YR 3/3), moist		
0 09:38 - C:\USERS\RM\UL\DESK1			dark reddish brown (5YR 3/4), dry to	moist	
GENERAL BH 7 TP / WELL - GINT STD US LAB. GDT - 7/10/20 09:38 - C. (USERS/RMULL/DES/TOP/PROJECT/S/CHARAH/2020 03 WELL INSTALLATION/BORING LOGS.GPJ	- ML	23	(ML) silt, dark reddish gray (5YR 4/2	), with trace gravel, dry to moist	
30 30 30	- ML	31	(ML) silt, reddish gray (2.5YR 5/1), so Auger refusal at 31'	oft, dry	Insufficient water produced to install well
SENERAL E		<u>, , , , , , , , , , , , , , , , , , , </u>	Refu	usal at 31.0 feet. borehole at 31.0 feet.	·

	<b>HDR</b>	HDR, Inc.		BORING NUMBER MW-10 PAGE 1 OF 1					
		rah-Brickhave							
				GROUND ELEVATION N/A HOLE	SIZE 4 1/4" inches				
- 1			Geologic Exploration						
		THOD Solid		AT TIME OF DRILLING DRY					
			CHECKED BY J. Ruffing	<del></del>					
			pandoned because location was dry						
			National Beedles Teedlest that dry	74 12 ( S. ( 12 ) ( 12					
DEPTH		GRAPHIC LOG	MATERIAL DESCRIPTION	N	REMARKS				
	)		(ML) silt, dusky red (10R 3/4), dry, s	soft					
- GINT STD US LAB.GDT - 7/10/20 09:27 - C:\USERS\RMULL\DESKTOP\PROJECTS\CHARAH2020 03 WELL INSTALLATION\BORN\GLOGS.GPJ   1	-		dark reddish gray (2.5YR 3/1)  13.0  (CL-ML) silty clay - clay, brown (7.5	VR 4/4) dry soft					
NRMULL\DESKTOP\PROJE	5 CL- ML		18.0						
09:27 - C:\USERS	0 ML		(ML) silt, yellowish brown (10YR 5/4						
- 7/10/20	-		brownish yellow (10YR 6/6), trace g	gravel					
LAB.GDT	_		dark brown (7.5YR 3/3), partially we	eathered rock, moist					
SU CTS T	- GM		(GM) silty gravel, dark reddish brow	n (5YR 3/4), partially weathered rock, moist, loose	-				
AELL - GIN	-		reddish brown (5YR 4/3), partially w	veathered rock, dry to moist, loose					
<sup>8</sup> / <sub>4</sub> / <sub>−</sub> 3(	0				Insufficient water produced to install well				
GENERAL BH / TP / WELL	•			efusal at 30.0 feet. of borehole at 30.0 feet.	•				

F	)	<b>}</b>	IDR	, Ind	c.		WELL N	UMBER MW-11 PAGE 1 OF 1				
CLIEN							PROJECT NAME Monitoring Well Installation					
PROJI	ECT N	UMBE	R _	100	21146		PROJECT LOCATION Brickhaven, NC					
DRILL	ING C	ONTR	AC1	ΓOF	Geolo	ogic Exploration						
DRILL	ING M	ETHO	D _	Sol	id Stem	Auger	$\triangle$ AT TIME OF DRILLING <u>35.00'</u>					
LOGG	ED BY	_R. I	Mull			CHECKED BY J. Ruffing	▼ AT END OF DRILLING 31.00'					
NOTE	s											
ОЕРТН (#)	U.S.C.S.		GRAPHIC LOG			MATERIAL DESCRIPTION	DN	WELL DIAGRAM				
0	CL				5.0	(CL) clay with gravel, very dusky red	(2.5YR 2.5/2), subangular gravel up to 1", moist	Grout				
	МН				5.0_	(MH) clayey silt, yellowish red (5YR 5	/6), dry, soft, medium plasticity					
-  -  -		Щ	Ш	Ш	8.0	brownish yellow (10YR 6/6), dry to me (ML) clayey silt, brown (7.5YR 5/3), d						
5 5 10 15 20 25 35 35	ML					yellow (10YR 7/6)		<b>←</b> Bentonite				
20						brownish yellow (10YR 6/6)		-2" SCH 40 PVC				
30	ML				30.0 <u>▼</u> 35.0 <u>▽</u>		ow (2.5Y 6/6), subangular-angular gravel 0.5"-1", dry	GP #2 Sand  0.010" Slot Size in 2" SCH 40 PVC				
<u> </u>					_	(CH) silty clay, yellowish brown (10YF	R 5/5), moist to wet, stiff, high plasticity					
40	СН				40.0		ry to moist, soft, partially weathered rock					
J						Botton	of borehole at 40.0 feet.					

### 1. Well Contractor Information: 14. WATER ZONES FROM DESCRIPTION ft. Well Contractor Name ft. ft. 15. OUTER CASING (for multi-cased wells) OR LINER (if applicable) NC Well Contractor Certification Number DIAMETER 16. INNER CASING OR TUBING (geothermal closed-loop) Company Name FROM MATERIAL TO DIAMETER THICKNESS 2. Well Construction Permit #: \_ ft. ft. List all applicable well construction permits (i.e. County, State, Variance, etc.) ft. in. ft. 3. Well Use (check well use): 17. SCREEN DIAMETER SLOT SIZE THICKNESS MATERIAL Water Supply Well: ft. ft. □Agricultural ☐Municipal/Public ft. ft. in. □Geothermal (Heating/Cooling Supply) □Residential Water Supply (single) 18. GROUT □Industrial/Commercial □Residential Water Supply (shared) MATERIAL EMPLACEMENT METHOD & AMOUNT □Irrigation Non-Water Supply Well: ft. ft. □Monitoring □Recovery ft. ft. **Injection Well:** 19. SAND/GRAVEL PACK (if applicable) □Aquifer Recharge □Groundwater Remediation EMPLACEMENT METHOD FROM MATERIAL TO □Aquifer Storage and Recovery □Salinity Barrier ft. ft. □Aquifer Test □Stormwater Drainage ft. ft. □Experimental Technology □Subsidence Control 20. DRILLING LOG (attach additional sheets if necessary) □Geothermal (Closed Loop) □Tracer DESCRIPTION (color, hardness, soil/rock type, grain size, etc.) □Geothermal (Heating/Cooling Return) □Other (explain under #21 Remarks) ft. ft. 4. Date Well(s) Completed: Well ID# ft. 5a. Well Location: ft. ft. ft. ft. Facility/Owner Name Facility ID# (if applicable) ft. ft. ft. ft. Physical Address, City, and Zip 21. REMARKS Parcel Identification No. (PIN) 5b. Latitude and Longitude in degrees/minutes/seconds or decimal degrees: 22. Certification: Johns Bun (if well field, one lat/long is sufficient) Signature of Certified Well Contractor Date 6. Is (are) the well(s): □Permanent or □Temporary By signing this form, I hereby certify that the well(s) was (were) constructed in accordance with 15A NCAC 02C .0100 or 15A NCAC 02C .0200 Well Construction Standards and that a copy of this record has been provided to the well owner. 7. Is this a repair to an existing well: $\Box$ Yes or $\Box$ No If this is a repair, fill out known well construction information and explain the nature of the 23. Site diagram or additional well details: repair under #21 remarks section or on the back of this form. You may use the back of this page to provide additional well site details or well construction details. You may also attach additional pages if necessary. 8. Number of wells constructed: For multiple injection or non-water supply wells ONLY with the same construction, you can SUBMITTAL INSTUCTIONS submit one form. 24a. For All Wells: Submit this form within 30 days of completion of well 9. Total well depth below land surface: \_ (ft.) For multiple wells list all depths if different (example- 3@200' and 2@100') construction to the following: Division of Water Quality, Information Processing Unit, 10. Static water level below top of casing: \_ (ft.) 1617 Mail Service Center, Raleigh, NC 27699-1617 If water level is above casing, use "+ 24b. For Injection Wells: In addition to sending the form to the address in 24a 11. Borehole diameter: above, also submit a copy of this form within 30 days of completion of well construction to the following: 12. Well construction method: (i.e. auger, rotary, cable, direct push, etc.) Division of Water Quality, Underground Injection Control Program, 1636 Mail Service Center, Raleigh, NC 27699-1636 FOR WATER SUPPLY WELLS ONLY: 24c. For Water Supply & Injection Wells: In addition to sending the form to \_\_\_ Method of test: 13a. Yield (gpm) \_\_\_\_ the address(es) above, also submit one copy of this form within 30 days of

For Internal Use ONLY:

13b. Disinfection type:

WELL CONSTRUCTION RECORD

This form can be used for single or multiple wells

where constructed.

completion of well construction to the county health department of the county





## Brickhaven No.2 Mine Tract Monitoring Well Location

Description	Northing	Easting	Top Concrete Elev.	Top Well Casing
MW	670446.2530	1993476.5690	216.53	219.23

Notes: Well observations were take on 07/16/2020
Bearings for this survey are based on NAD 83
Elevations for this survey are based on NAVD 88



The John R. McAdams Company, Inc.

Raleigh / Durham, NC 2905 Meridian Parkway Durham, North Carolina 27713 (919) 361-5000

Charlotte, NC 3436 Toringdon Way Suite 110 Charlotte, North Carolina 28277 (704) 527-0800





D

Appendix D – Slug Test Data (MW-11)

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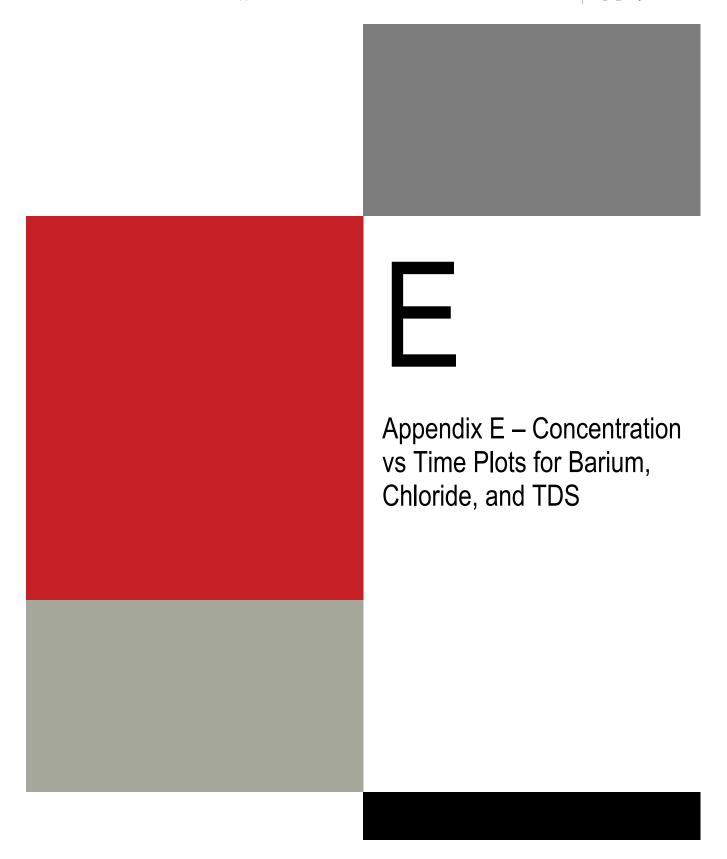
WELL ID: MW-11

VVELL IL	). IVIVV-1 I		Reduced Data	
	Local ID: S-1292		Time,	Water
INPUT	Date: 8/14/1997	Entry	Hr:Min:Sec	Level
Construction:	Time: 8:39	1	8:39:21.3	12.42
Casing dia. (d <sub>c</sub> ) 0.35166 Inch		2	8:39:22.6	12.41
Annulus dia. (d <sub>w</sub> ) 1 Inch	↓ →	3	8:39:23.9	12.41
Screen Length (L) 15 Feet	↑ DTW ↑	4	8:39:25.3	12.40
	↑ <b>                                    </b>	5	8:39:26.8	12.39
Depths to:	TOS V	6	8:39:28.4	12.40
water level (DTW) 28.94 Feet	L DTB	7	8:39:30.1	12.39
top of screen (TOS) 25 Feet		8	8:39:31.9	12.38
Base of Aquifer (DTB) 40 Feet		9	8:39:33.7	12.39
	$d_{w}$	10	8:39:35.8	12.38
Annular Fill:	Base of Aquifer	11	8:39:37.9	12.38
across screen Coarse Sand		12	8:39:40.1	12.38
above screen Bentonite	1.00 Adjust slope of line to estimate K	13 14	8:39:42.5 8:39:45.0	12.37 12.37
Aquifer Material Silt, Loess		15	8:39:47.6	12.37
Aquilei Material Siit, Loess		16	8:39:50.5	12.36
COMPUTED		17	8:39:53.5	12.35
L <sub>wetted</sub> 11.06 Feet	<del>-</del>	18	8:39:56.6	12.34
D = 11.06 Feet	<b>8</b>	19	8:40:00.0	12.34
H = 11.06 Feet		20	8:40:03.6	12.33
$L/r_w = 530.88$		21	8:40:07.2	12.33
$y_{0-DISPLACEMENT} = 0.75 \text{ Feet}$	0	22	8:40:11.4	12.32
y <sub>0-SLUG</sub> = 0.81 Feet	0	23	8:40:15.6	12.32
From look-up table using L/r <sub>w</sub>	\$0.10	24	8:40:19.8	12.31
Trem reak up table doing Livy	<u> </u>	25	8:40:24.6	12.30
		26	8:40:30.0	12.30
Fully penetrate C = 10.863		27	8:40:34.8	12.29
ln(Re/rw) = 5.108		28	8:40:40.8	12.28
Re = 3.44 Feet		29	8:40:46.8	12.28
	0	30	8:40:52.8	12.26
Slope = $0.001015 \log_{10}/\text{sec}$		31	8:40:59.4	12.25
$t_{90\%}$ recovery = 985 sec		32	8:41:06.6	12.25
Input is consistent.	_	33	8:41:14.4	12.24
	0.01 00:00 07:12 14:24 21:36	34	8:41:22.2	12.23
K = 0.01 Feet/Day	00.00 07.12 14.24 21.30	35	8:41:30.6	12.22
		36	8:41:39.6	12.21
	TIME, Minute:Second	37	8:41:49.4	12.20
		38	8:41:58.8	12.19
DEMARKS.	Pourson and Disc analysis of alux test MDD 4070	39 40	8:42:09.6	12.17
REMARKS:	Bouwer and Rice analysis of slug test, WRR 1976	40 41	8:42:21.0 8:42:33.0	12.16 12.16
		41	8:42:45.6	12.16
		43	8:42:58.8	12.14
		44	8:43:13.2	12.12
		45	8:43:28.2	12.10

Reduced Data

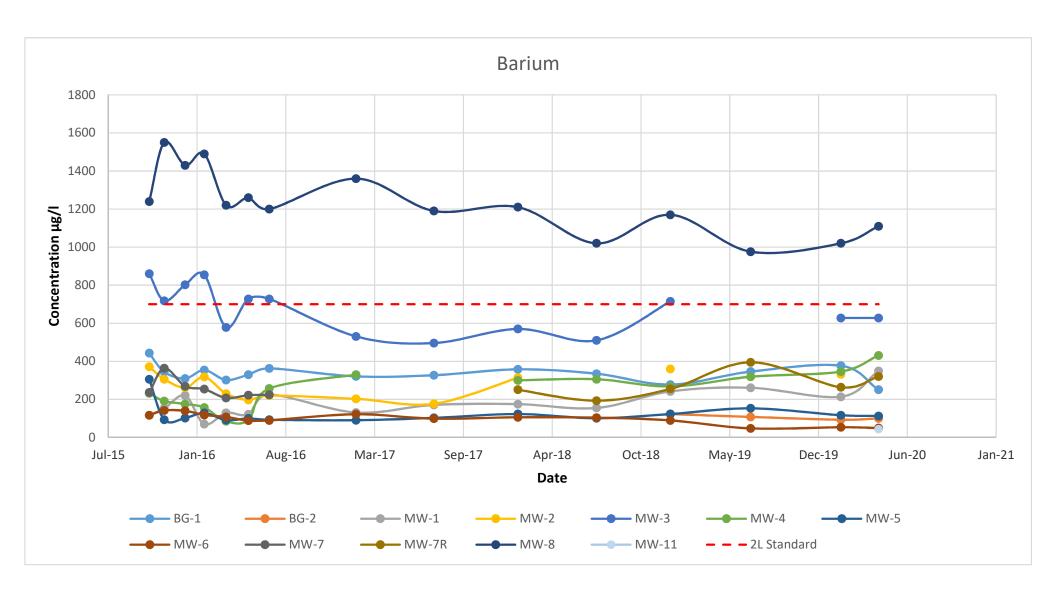


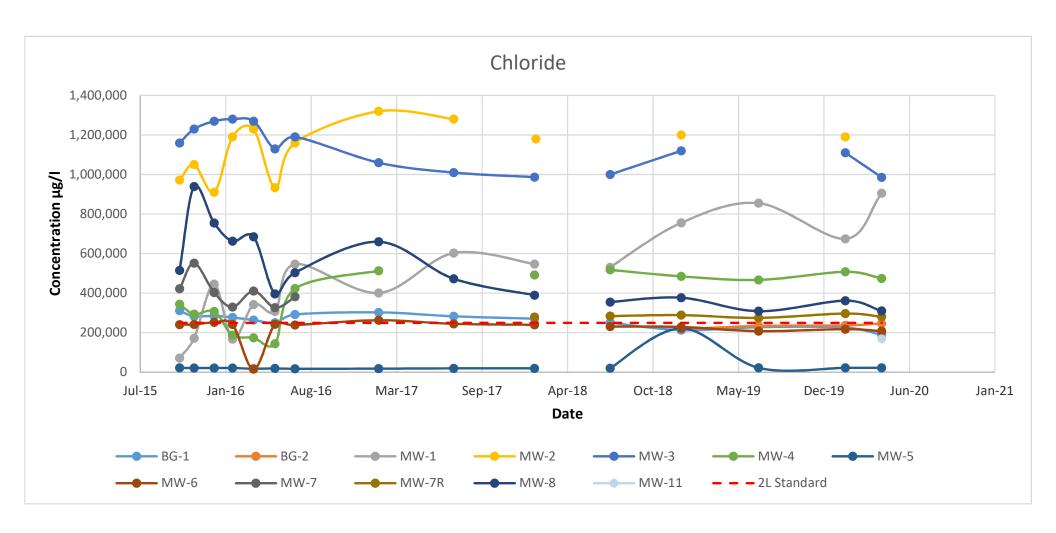


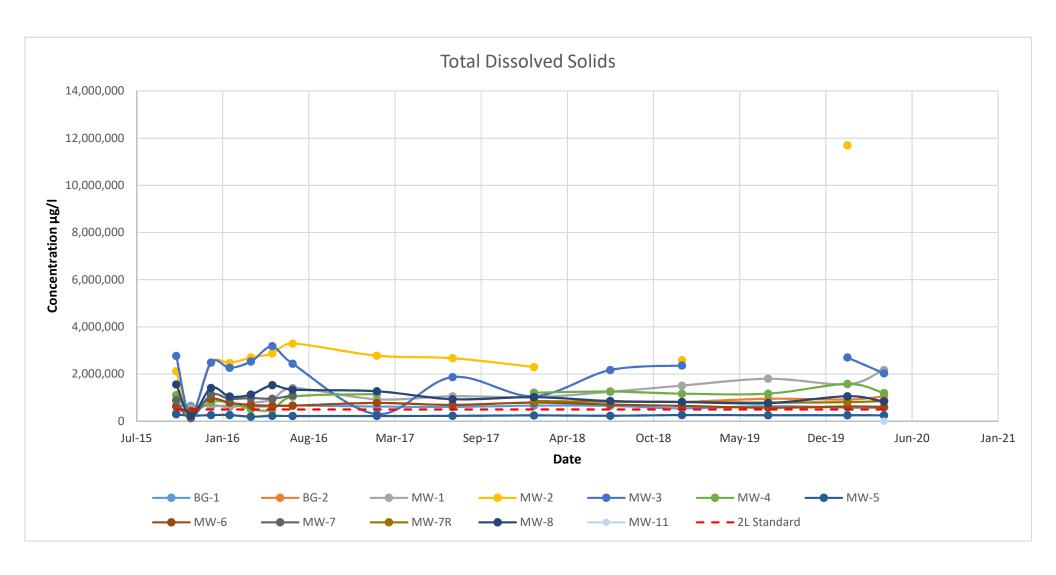




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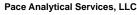


F

Appendix F – Groundwater and Surface Water Laboratory Report (April 2020)



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9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

May 12, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH GW

Pace Project No.: 92474285

### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on April 17, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- · Pace Analytical Services Asheville
- Pace Analytical Services Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kevin Herring

kevin.herring@pacelabs.com

Kein Slern

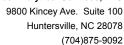
1(704)875-9092

**HORIZON** Database Administrator

**Enclosures** 

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing







### **CERTIFICATIONS**

Project: CHARAH GW Pace Project No.: 92474285

### Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

ANAB DOD-ELAP Rad Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

**Arkansas Certification** 

California Certification #: 04222CA Colorado Certification #: PA01547 Connecticut Certification #: PH-0694

Delaware Certification EPA Region 4 DW Rad

Florida/TNI Certification #: E87683 Georgia Certification #: C040

**Guam Certification** 

Florida: Cert E871149 SEKS WET

Hawaii Certification Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: KY90133 KY WW Permit #: KY0098221 KY WW Permit #: KY0000221

Louisiana DHH/TNI Certification #: LA180012 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: 2017020 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457 Michigan/PADEP Certification #: 9991 Montana Certification #: Cert0082 Nebraska Certification #: NE-OS-29-14 Nevada Certification #: PA014572018-1 New Hampshire/TNI Certification #: 297617

New Jersey/TNI Certification #: PA051 New Mexico Certification #: PA01457 New York/TNI Certification #: 10888 North Carolina Certification #: 42706 North Dakota Certification #: R-190 Ohio EPA Rad Approval: #41249

Missouri Certification #: 235

Oregon/TNI Certification #: PA200002-010 Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification
Tennessee Certification #: 02867

Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C

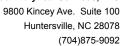
Wisconsin Approve List for Rad Wyoming Certification #: 8TMS-L

### Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222





### **SAMPLE SUMMARY**

Project: CHARAH GW Pace Project No.: 92474285

Lab ID	Sample ID	Matrix	Date Collected	Date Received
92474285001	MW-11	Water	04/16/20 11:45	04/17/20 16:14



### **SAMPLE ANALYTE COUNT**

Project: CHARAH GW Pace Project No.: 92474285

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92474285001	MW-11	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	S00	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 9040C	SMK	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A

PASI-A = Pace Analytical Services - Asheville PASI-PA = Pace Analytical Services - Greensburg



### **SUMMARY OF DETECTION**

Project: CHARAH GW Pace Project No.: 92474285

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92474285001	MW-11					
EPA 6010D	Antimony	7.7	ug/L	5.0	04/29/20 06:48	
EPA 6010D	Barium	43.6	ug/L	5.0	04/29/20 06:48	
EPA 6010D	Calcium	23800	ug/L	100	04/29/20 06:48	
EPA 6010D	Zinc	14.5	ug/L	10.0	04/29/20 06:48	BC
EPA 6020B	Lithium	9.4	ug/L	2.5	04/21/20 21:43	
EPA 903.1	Radium-226	0.137 ± 0.380 (0.738) C:NA T:95%	pCi/L		05/11/20 16:40	
EPA 904.0	Radium-228	0.473 ± 0.416 (0.845) C:72% T:92%	pCi/L		05/08/20 14:55	
Total Radium Calculation	Total Radium	0.610 ± 0.796 (1.58)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	` 465	mg/L	25.0	04/20/20 18:02	
EPA 9040C	pH at 25 Degrees C	6.7	Std. Units	0.10	04/22/20 15:07	H3
EPA 300.0 Rev 2.1 1993	Chloride	169	mg/L	4.0	04/21/20 18:20	M1
EPA 300.0 Rev 2.1 1993	Fluoride	0.13	mg/L	0.10	04/21/20 04:46	
EPA 300.0 Rev 2.1 1993	Sulfate	3.6	mg/L	1.0	04/21/20 04:46	

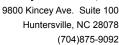


### **ANALYTICAL RESULTS**

Project: CHARAH GW
Pace Project No.: 92474285

Date: 05/12/2020 01:14 PM

Sample: MW-11	Lab ID: 92	474285001	Collected:	04/16/2	0 11:45	Received: 04	/17/20 16:14 N	Matrix: Water	
Parameters	Results	Units	Report	Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Me	thod: EPA 60	10D Prepara	ation Me	thod: EF	PA 3010A			
	Pace Analytic	al Services -	Asheville						
Antimony	7.7	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-36-0	
Arsenic	ND	ug/L		10.0	1		04/29/20 06:48		
Barium	43.6	ug/L		5.0	1		04/29/20 06:48		
Beryllium	ND	ug/L		1.0	1	04/21/20 02:50	04/29/20 06:48	7440-41-7	
Cadmium	ND	ug/L		1.0	1	04/21/20 02:50	04/29/20 06:48	7440-43-9	
Calcium	23800	ug/L		100	1		04/29/20 06:48		
Chromium	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-47-3	
Cobalt	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-48-4	
Copper	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-50-8	
_ead	ND	ug/L		5.0	1	04/21/20 02:50	05/02/20 18:39	7439-92-1	
Molybdenum	ND	ug/L		5.0	1	04/21/20 02:50	05/02/20 18:39	7439-98-7	
Nickel	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-02-0	
Selenium	ND	ug/L		10.0	1	04/21/20 02:50	05/02/20 18:39	7782-49-2	
Silver	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-22-4	
/anadium	ND	ug/L		5.0	1	04/21/20 02:50	04/29/20 06:48	7440-62-2	
Zinc	14.5	ug/L		10.0	1	04/21/20 02:50	04/29/20 06:48	7440-66-6	ВС
6020 MET ICPMS	Analytical Me	thod: EPA 60	20B Prepara	ation Me	thod: EF	PA 3010A			
	Pace Analytic	al Services -	Asheville						
Boron	ND	ug/L		25.0	1	04/21/20 01:48	04/21/20 21:43	7440-42-8	
₋ithium	9.4	ug/L		2.5	1	04/21/20 01:48	04/21/20 21:43	7439-93-2	
Γhallium	ND	ug/L		0.10	1	04/21/20 01:48	04/21/20 21:43	7440-28-0	
7470 Mercury	Analytical Me	thod: EPA 74	70A Prepara	ation Me	thod: EF	PA 7470A			
	Pace Analytic	al Services -	Asheville						
Mercury	ND	ug/L		0.20	1	04/22/20 09:29	04/23/20 11:34	7439-97-6	
2540C Total Dissolved Solids	Analytical Me Pace Analytic								
Total Dissolved Solids	465	mg/L		25.0	1		04/20/20 18:02		
2040 14	Analytical Me	-	MOC						
9040 pH	Pace Analytic								
oH at 25 Degrees C	6.7	Std. Units		0.10	1		04/22/20 15:07		НЗ
300.0 IC Anions 28 Days	Analytical Me Pace Analytic			1993					
Chloride	169	mg/L		4.0	4		04/21/20 18:20	16887-00-6	M1
Fluoride	0.13	mg/L		0.10	1		04/21/20 04:46		141 1
Sulfate	3.6	mg/L		1.0	1		04/21/20 04:46		
Junato	5.0	mg/L		1.0	'		0-7/2 1/20 UT.40	1-000-13-0	





Project: CHARAH GW Pace Project No.: 92474285

QC Batch: 537507 Analysis Method: EPA 7470A QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474285001

METHOD BLANK: 2866412 Matrix: Water

Associated Lab Samples: 92474285001

Date: 05/12/2020 01:14 PM

Blank Reporting
Parameter Units Result Limit Analyzed Qualifiers

Mercury ug/L ND 0.20 04/23/20 11:29

LABORATORY CONTROL SAMPLE: 2866413

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units Mercury ug/L 2.5 2.8 112 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2866414 2866415

MSD MS 92474285001 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Result ND 101 25 Mercury ug/L 2.5 2.5 2.7 2.6 100 75-125 2

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH GW Pace Project No.: 92474285

QC Batch: 537276
QC Batch Method: EPA 3010A

Analysis Method: EPA 6010D
Analysis Description: 6010 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474285001

METHOD BLANK: 2865473

Date: 05/12/2020 01:14 PM

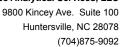
Matrix: Water

Associated Lab Samples: 92474285001

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Antimony	ug/L	ND	5.0	04/29/20 06:18	
Arsenic	ug/L	ND	10.0	04/29/20 06:18	
Barium	ug/L	ND	5.0	04/29/20 06:18	
Beryllium	ug/L	ND	1.0	04/29/20 06:18	
Cadmium	ug/L	ND	1.0	04/29/20 06:18	
Calcium	ug/L	ND	100	04/29/20 06:18	
Chromium	ug/L	ND	5.0	04/29/20 06:18	
Cobalt	ug/L	ND	5.0	04/29/20 06:18	
Copper	ug/L	ND	5.0	04/29/20 06:18	
Lead	ug/L	ND	5.0	04/30/20 15:24	
Molybdenum	ug/L	ND	5.0	04/29/20 06:18	
Nickel	ug/L	ND	5.0	04/29/20 06:18	
Selenium	ug/L	ND	10.0	04/29/20 06:18	
Silver	ug/L	ND	5.0	04/29/20 06:18	
Vanadium	ug/L	ND	5.0	04/29/20 06:18	
Zinc	ug/L	ND	10.0	04/29/20 06:18	

LABORATORY CONTROL SAMP	LE: 2865474					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	ug/L	500	508	102	80-120	
Arsenic	ug/L	500	501	100	80-120	
Barium	ug/L	500	504	101	80-120	
Beryllium	ug/L	500	495	99	80-120	
Cadmium	ug/L	500	497	99	80-120	
Calcium	ug/L	5000	4940	99	80-120	
Chromium	ug/L	500	504	101	80-120	
Cobalt	ug/L	500	497	99	80-120	
Copper	ug/L	500	501	100	80-120	
_ead	ug/L	500	497	99	80-120	
Molybdenum	ug/L	500	521	104	80-120	
Nickel	ug/L	500	492	98	80-120	
Selenium	ug/L	500	502	100	80-120	
Silver	ug/L	250	252	101	80-120	
Vanadium	ug/L	500	502	100	80-120	
Zinc	ug/L	500	493	99	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH GW Pace Project No.: 92474285

Date: 05/12/2020 01:14 PM

MATRIX SPIKE & MATRIX	SPIKE DUPL	LICATE: 2865			2865476							
			MS	MSD								
		92473556003	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Antimony	ug/L	9.1	500	500	550	532	108	105	75-125	3	20	
Arsenic	ug/L	ND	500	500	534	518	106	103	75-125	3	20	
Barium	ug/L	41.3	500	500	567	550	105	102	75-125	3	20	
Beryllium	ug/L	ND	500	500	527	508	105	102	75-125	4	20	
Cadmium	ug/L	ND	500	500	516	499	103	100	75-125	3	20	
Calcium	ug/L	6500	5000	5000	11800	11500	106	101	75-125	2	20	
Chromium	ug/L	ND	500	500	524	507	104	101	75-125	3	20	
Cobalt	ug/L	ND	500	500	521	502	103	100	75-125	4	20	
Copper	ug/L	5.5	500	500	531	517	105	102	75-125	3	20	
Lead	ug/L	ND	500	500	520	506	103	100	75-125	3	20	
Molybdenum	ug/L	ND	500	500	536	519	107	103	75-125	3	20	
Nickel	ug/L	ND	500	500	516	501	103	100	75-125	3	20	
Selenium	ug/L	ND	500	500	553	542	109	107	75-125	2	20	
Silver	ug/L	ND	250	250	263	256	105	102	75-125	3	20	
Vanadium	ug/L	ND	500	500	530	513	105	102	75-125	3	20	
Zinc	ug/L	56.9	500	500	567	552	102	99	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project:

**CHARAH GW** 

Pace Project No.:

92474285

QC Batch:

537278

QC Batch Method: **EPA 3010A**  Analysis Method:

EPA 6020B

Analysis Description:

6020 MET

Laboratory:

Pace Analytical Services - Asheville

Qualifiers

Associated Lab Samples:

Date: 05/12/2020 01:14 PM

92474285001

METHOD BLANK:

Matrix: Water

Associated Lab Samples: 92474285001

Blank Reporting Parameter Units Result Limit Analyzed Boron ND 25.0 04/21/20 17:53 ug/L ug/L

ug/L

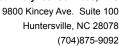
Lithium Thallium ND 2.5 04/21/20 17:53 ND 0.10 04/21/20 17:53

LABORATORY CONTROL SAMPLE: 2865482

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers Boron 50 51.8 104 80-120 ug/L Lithium 51.0 102 ug/L 50 80-120 Thallium ug/L 10 10.1 101 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2865484 MS MSD 92474285001 MSD MSD Spike Spike MS MS % Rec Max Qual Parameter Conc. Result Result % Rec % Rec **RPD** RPD Units Result Conc. Limits ug/L ND 50 71.5 20 Boron 50 72.1 106 107 75-125 1 Lithium ug/L 9.4 50 50 62.2 62.1 106 105 75-125 0 20 Thallium ND ug/L 10 10 10.4 10.4 104 104 75-125 0 20

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **QUALITY CONTROL DATA**

Project: **CHARAH GW** Pace Project No.: 92474285

QC Batch: 537216

QC Batch Method: SM 2540C-2011 Analysis Method: SM 2540C-2011

Analysis Description: Laboratory: Pace Analytical Services - Asheville

2540C Total Dissolved Solids

Associated Lab Samples: 92474285001

METHOD BLANK: 2865298 Matrix: Water

Associated Lab Samples: 92474285001

> Blank Reporting Qualifiers Parameter Units Result Limit Analyzed

Total Dissolved Solids ND 25.0 04/20/20 18:00 mg/L

LABORATORY CONTROL SAMPLE: 2865299

Spike LCS LCS % Rec Conc. Result % Rec Limits Qualifiers Parameter Units **Total Dissolved Solids** mg/L 251 256 102 90-110

SAMPLE DUPLICATE: 2865300

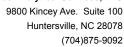
92474288001 Dup Max Parameter Units Result Result **RPD RPD** Qualifiers 574 **Total Dissolved Solids** mg/L 570 25

SAMPLE DUPLICATE: 2865301

Date: 05/12/2020 01:14 PM

92474285001 Dup Max RPD RPD Parameter Units Result Result Qualifiers Total Dissolved Solids 465 469 25 mg/L 1

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **QUALITY CONTROL DATA**

Project: CHAI

CHARAH GW

Pace Project No.:

92474285

QC Batch:
QC Batch Method:

537531

EPA 9040C

Analysis Method:

EPA 9040C

Analysis Description:

9040 pH

Laboratory:

Pace Analytical Services - Asheville

0

Associated Lab Samples: 92474285001

Parameter

SAMPLE DUPLICATE: 2866472

92473345001 Result

Dup Result

RPD

Max RPD

Qualifiers

pH at 25 Degrees C

Date: 05/12/2020 01:14 PM

Units
Std. Units

4.3

4.3

НЗ

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALITY CONTROL DATA**

Project: CHARAH GW Pace Project No.: 92474285

QC Batch: 537260

QC Batch Method:

EPA 300.0 Rev 2.1 1993

Analysis Method:

EPA 300.0 Rev 2.1 1993

300.0 IC Anions

Analysis Description: Laboratory:

Pace Analytical Services - Asheville

Associated Lab Samples: 92474285001

METHOD BLANK: 2865416

Date: 05/12/2020 01:14 PM

Matrix: Water

Associated Lab Samples: 92474285001

Blank Reporting Parameter Units Result Limit Analyzed Qualifiers Chloride ND 1.0 04/21/20 04:04 mg/L Fluoride ND 0.10 04/21/20 04:04 mg/L Sulfate ND 04/21/20 04:04 mg/L 1.0

LABORATORY CONTROL SAMPLE: 2865417 Spike LCS LCS % Rec Qualifiers Parameter Units Conc. Result % Rec Limits Chloride 50 54.0 108 90-110 mg/L Fluoride 2.5 mg/L 2.7 109 90-110 Sulfate mg/L 50 54.6 109 90-110

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2865418 2865419 MS MSD 92474285001 MSD Spike Spike MS MS MSD % Rec Max Qual Parameter Conc. Result % Rec % Rec **RPD** RPD Units Result Conc. Result Limits Chloride 169 50 50 213 214 88 90 90-110 0 10 M1 mg/L Fluoride mg/L 0.13 2.5 2.5 2.9 2.9 109 109 90-110 0 10 Sulfate mg/L 3.6 50 50 54.8 54.7 102 102 90-110 0 10

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2865420 2865421 MS MSD 92474288010 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Chloride mg/L 70.8 50 50 74.4 112 7 82 90-110 40 10 M1,R1 Fluoride mg/L ND 2.5 2.5 2.9 2.8 113 108 90-110 4 10 M1 Sulfate mg/L 7.1 50 50 60.3 58.4 106 103 90-110 3 10

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **ANALYTICAL RESULTS - RADIOCHEMISTRY**

Project: CHARAH GW Pace Project No.: 92474285

Sample: MW-11 PWS:	Lab ID: 9247 Site ID:	<b>4285001</b> Collected: 04/16/20 11:45 Sample Type:	Received:	04/17/20 16:14 N	Natrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.137 ± 0.380 (0.738) C:NA T:95%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.473 ± 0.416 (0.845) C:72% T:92%	pCi/L	05/08/20 14:55	15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.610 ± 0.796 (1.58)	pCi/L	05/12/20 08:57	7440-14-4	





### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: **CHARAH GW** 

Pace Project No.: 92474285

QC Batch: 393308 QC Batch Method: EPA 903.1 Analysis Method: Analysis Description: EPA 903.1

903.1 Radium-226

Laboratory:

Pace Analytical Services - Greensburg

Associated Lab Samples: 92474285001

METHOD BLANK: 1905209

Matrix: Water

Associated Lab Samples: 92474285001

Parameter

Act ± Unc (MDC) Carr Trac

Units

Analyzed

Qualifiers

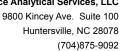
Radium-226

0.000 ± 0.376 (0.780) C:NA T:88%

pCi/L

05/11/20 16:24

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH GW

Pace Project No.: 92474285

QC Batch: 393309 Analysis Method: EPA 904.0

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92474285001

METHOD BLANK: 1905210 Matrix: Water

Associated Lab Samples: 92474285001

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 0.865 ± 0.375 (0.599) C:80% T:96%
 pCi/L
 05/08/20 14:56

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



### **QUALIFIERS**

Project: CHARAH GW Pace Project No.: 92474285

### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### **ANALYTE QUALIFIERS**

Date: 05/12/2020 01:14 PM

BC	The same analyte was detected in an associated blank at a concentration above 1/2 the reporting limit but below the
	laboratory reporting limit

H3 Sample was received or analysis requested beyond the recognized method holding time.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

R1 RPD value was outside control limits.



### **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH GW Pace Project No.: 92474285

Date: 05/12/2020 01:14 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92474285001	MW-11	EPA 3010A	537276	EPA 6010D	537296
92474285001	MW-11	EPA 3010A	537278	EPA 6020B	537289
92474285001	MW-11	EPA 7470A	537507	EPA 7470A	537548
92474285001	MW-11	EPA 903.1	393308		
92474285001	MW-11	EPA 904.0	393309		
92474285001	MW-11	Total Radium Calculation	395862		
92474285001	MW-11	SM 2540C-2011	537216		
92474285001	MW-11	EPA 9040C	537531		
92474285001	MW-11	EPA 300.0 Rev 2.1 1993	537260		

# Pace Analytical®

Project Manager SRF Review:

### Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

Lab	oratory receiving samples: Asheville Eden	Greenwood [		Hui	ntersvil	CS-OH-	Raleigh 🗌	Mechanics ville	
	Client Name: Upon Receipt  HDR  urler:	USPS		F	Project #		: 9247 		
	Commercial Pace  ody Seal Present? Yes No Sea	Other:_	Yes	□Ño		924742	85		D
Ther	mometer:  □IR Gun ID: 92T061	ubble Bags Type of Ice: or: Add/Subtract		Wet □B		None  mp should be  ☐Samples o	Blological Tissu  Yes No  above freezing to	□N/A	1
	A Regulated Soil ( N/A, water sample) amples originate in a quarantine zone within the Ur	sitad States: CA N	/ or 50	lchack mar	osta Ui	has begun	nate from a foreign so	ource (internationally,	
Control of	Yes No	illed States. CA, N	, 01 30	Teneck map			and Puerto Rico)?  Comments/Discrep	Yes No	
	Chain of Custody Present?	☐Ŷes [	]No	□n/a	1.				
	Samples Arrived within Hold Time?	<b>☑</b> Yes	No	□N/A	2.				
	Short Hold Time Analysis (<72 hr.)?	□Yes	No	□N/A	3.				
	Rush Turn Around Time Requested?	□Yes [	No	□N/A	4.				
	Sufficient Volume?	Yes [	□No	□n/a	5.				
	Correct Containers Used? -Pace Containers Used?	The state of the s	□No □No	□n/a □n/a	6.				
	Containers Intact?	Yes	ΪNο	□N/A	7.				
	Dissolved analysis: Samples Field Filtered?	□Yes [	□No	□N/A	8.				
	Sample Labels Match COC?	☐Yes [	No	□n/a	9.				
	-Includes Date/Time/ID/AnalysIs Matrix:	WT							
	Headspace in VOA Vials (>5-6mm)?	□Yes [	No	⊡N/A	10.				
	Trip Blank Present?	□Yes [	No	□N/A	11.				
L	Trip Blank Custody Seals Present?	□Yes [	No	□N/A					
co	MMENTS/SAMPLE DISCREPANCY						Field Data	Required? Yes No	
_					Lot ID	of split cont	alners:		
CLIE	NT NOTIFICATION/RESOLUTION								
– Pe	rson contacted:			Date/Tir	ne:				
F	Project Manager SCURF Review:					Date:			
F	Project Manager SRF Review:	4	П	52mmy 11 147		Date:			



## Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

> Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project #

WO#:92474285

PM: KLH1

Due Date: 04/24/20

CLIENT: 92-HDR

_	BP4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	BP2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (CI-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP42-125 mL Plastic ZN Acetate & NaOH (>9)	BP4C-125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCl (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG15-1 liter Amber H2SO4 (pH < 2)	AG35-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SPST-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mt Sterile Plastic (N/A – lab)	BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AG0U-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	
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pH Adjustment Log for Preserved Samples												
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #						
		are a character and a constant of the constant										

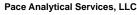
Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.



# CHAIN-OF-CUSTODY / Analytical Request Document The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

						12	4	10	9	8	7	6	σı	4	ω	2	1	ITEM#			Requeste	Email: 1	Suite 900	Address:	Required (
					ADDITIONAL COMMENTS												35-1	SAMPLE ID One Character per box. (A-Z, 0-9 /, -) Sample lds must be unique			Requested Due Date:	mo	Suite 900, Charlotte, NC 28202	440 S. Church St	Section A Required Client Information:
				20	RE													Water Water W/W Water Water W/W Product P Soli/Solid SL Oil Oil Wipe WP Air AR Other OT Tissue TS	MATRIX CODE		Project #:	Purchase Order #:		Report To: Mark Filardi / Charles Gruenberg Copy To:	Section B  Required Project Information:
				1	LINQUIS												4	MATRIX CODE (see valid code SAMPLETYPE (G=GRAB C=		$\left  \cdot \right _{i}$		#:		Mark Fil	ject Info
				2	SHED BY												2026	ST			Charah GW			lardi / CI	ormatio
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9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

May 12, 2020

Mark Filardi HDR 440 S. Church St Suite 900 Charlotte, NC 28202

RE: Project: CHARAH

Pace Project No.: 92474288

### Dear Mark Filardi:

Enclosed are the analytical results for sample(s) received by the laboratory on April 17, 2020. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services Asheville
- Pace Analytical Services Greensburg

If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Kein Share

Kevin Herring

kevin.herring@pacelabs.com

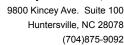
1(704)875-9092

**HORIZON** Database Administrator

**Enclosures** 

cc: Charles Gruenberg Mike Plummer, HDR Jacob Ruffing







### **CERTIFICATIONS**

Project: CHARAH
Pace Project No.: 92474288

### Pace Analytical Services Pennsylvania

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601

ANAB DOD-ELAP Rad Accreditation #: L2417

Alabama Certification #: 41590 Arizona Certification #: AZ0734

**Arkansas Certification** 

California Certification #: 04222CA Colorado Certification #: PA01547 Connecticut Certification #: PH-0694

Delaware Certification EPA Region 4 DW Rad

Florida/TNI Certification #: E87683 Georgia Certification #: C040

**Guam Certification** 

Florida: Cert E871149 SEKS WET

Hawaii Certification Idaho Certification Illinois Certification Indiana Certification Iowa Certification #: 391

Kansas/TNI Certification #: E-10358 Kentucky Certification #: KY90133 KY WW Permit #: KY0098221 KY WW Permit #: KY0000221

Louisiana DHH/TNI Certification #: LA180012 Louisiana DEQ/TNI Certification #: 4086

Maine Certification #: 2017020 Maryland Certification #: 308

Massachusetts Certification #: M-PA1457 Michigan/PADEP Certification #: 9991 Montana Certification #: Cert0082
Nebraska Certification #: NE-OS-29-14
Nevada Certification #: PA014572018-1
New Hampshire/TNI Certification #: 297617
New Jersey/TNI Certification #: PA051

New Mexico Certification #: PA01457 New York/TNI Certification #: 10888 North Carolina Certification #: 42706 North Dakota Certification #: R-190 Ohio EPA Rad Approval: #41249

Missouri Certification #: 235

Oregon/TNI Certification #: PA200002-010 Pennsylvania/TNI Certification #: 65-00282 Puerto Rico Certification #: PA01457 Rhode Island Certification #: 65-00282

South Dakota Certification
Tennessee Certification #: 02867

Texas/TNI Certification #: T104704188-17-3
Utah/TNI Certification #: PA014572017-9
USDA Soil Permit #: P330-17-00091
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 9526
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C

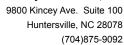
Wisconsin Approve List for Rad Wyoming Certification #: 8TMS-L

### Pace Analytical Services Asheville

2225 Riverside Drive, Asheville, NC 28804 Florida/NELAP Certification #: E87648 Massachusetts Certification #: M-NC030

North Carolina Drinking Water Certification #: 37712

North Carolina Wastewater Certification #: 40 South Carolina Certification #: 99030001 Virginia/VELAP Certification #: 460222





### **SAMPLE SUMMARY**

Project: CHARAH
Pace Project No.: 92474288

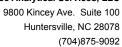
Lab ID	Sample ID	Matrix	Date Collected	Date Received
92474288001	BG-1	Water	04/14/20 13:35	04/17/20 16:14
92474288002	BG-2	Water	04/14/20 14:55	04/17/20 16:14
92474288003	LEACHATE	Water	04/14/20 15:20	04/17/20 16:14
92474288004	MW-6	Water	04/15/20 13:17	04/17/20 16:14
92474288005	MW-7R	Water	04/16/20 09:15	04/17/20 16:14
92474288006	MW-8	Water	04/15/20 16:00	04/17/20 16:14
92474288007	DUP-1	Water	04/15/20 00:00	04/17/20 16:14
92474288008	MW-3	Water	04/16/20 08:05	04/17/20 16:14
92474288009	MW-5	Water	04/16/20 09:00	04/17/20 16:14
92474288010	SW-2	Water	04/16/20 09:30	04/17/20 16:14
92474288011	SW-1	Water	04/16/20 10:00	04/17/20 16:14
92474288012	MW-1	Water	04/16/20 11:30	04/17/20 16:14
92474288013	MW-4	Water	04/17/20 07:50	04/17/20 16:14



### **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92474288

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
92474288001	BG-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	S00	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
92474288002	BG-2	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
92474288003	LEACHATE	EPA 6010D	RDT, SH1	16	PASI-A
		EPA 6020B	BG2, JOR	3	PASI-A
		EPA 7470A	S00	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
92474288004	MW-6	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	BG2	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
92474288005	MW-7R	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	S00	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA





### **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92474288

_ab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288006	MW-8	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288007	DUP-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288008	MW-3	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288009	MW-5	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	soo	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288010	SW-2	EPA 6010D	SH1	16	PASI-A
			JOR		PASI-A

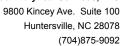


### **SAMPLE ANALYTE COUNT**

Project: CHARAH
Pace Project No.: 92474288

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
		EPA 7470A		1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288011	SW-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288012	MW-1	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A
2474288013	MW-4	EPA 6010D	SH1	16	PASI-A
		EPA 6020B	JOR	3	PASI-A
		EPA 7470A	SOO	1	PASI-A
		EPA 903.1	MK1	1	PASI-PA
		EPA 904.0	VAL	1	PASI-PA
		Total Radium Calculation	CMC	1	PASI-PA
		SM 2540C-2011	RED	1	PASI-A
		EPA 300.0 Rev 2.1 1993	BRJ	3	PASI-A

PASI-A = Pace Analytical Services - Asheville PASI-PA = Pace Analytical Services - Greensburg





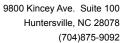
Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
92474288001	BG-1					
EPA 6010D	Barium	251	ug/L	5.0	04/29/20 06:51	
EPA 6010D	Calcium	21100	ug/L	100	04/29/20 06:51	
EPA 6010D	Vanadium	6.8	ug/L	5.0	04/29/20 06:51	
EPA 6020B	Lithium	19.1	ug/L	2.5	04/22/20 14:04	
EPA 903.1	Radium-226	0.158 ± 0.489	pCi/L		05/11/20 16:40	
EPA 904.0	Radium-228	(0.947) C:NA T:79% 0.608 ±	pCi/L		05/08/20 14:56	
		0.483 (0.967) C:74% T:83%	<b>,</b> 0			
Total Radium Calculation	Total Radium	0.766 ± 0.972 (1.91)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	574	mg/L	50.0	04/20/20 18:00	
EPA 300.0 Rev 2.1 1993	Chloride	190	mg/L		04/21/20 19:48	
EPA 300.0 Rev 2.1 1993	Fluoride	0.22	mg/L	0.10		
EPA 300.0 Rev 2.1 1993	Sulfate	23.5	mg/L		04/21/20 05:28	
2474288002	BG-2		3			
EPA 6010D	Barium	99.8	ug/L	5.0	04/29/20 06:54	
EPA 6010D	Calcium	114000	ug/L		04/30/20 15:34	
			-			
EPA 6010D	Molybdenum	8.1	ug/L	5.0		
EPA 6020B	Lithium	17.3	ug/L	2.5		
EPA 903.1	Radium-226	0.134 ± 0.372 (0.721)	pCi/L		05/11/20 16:40	
		C:NA T:86%				
EPA 904.0	Radium-228	0.915 ± 0.519	pCi/L		05/08/20 14:56	
		(0.949) C:71% T:79%				
Total Radium Calculation	Total Radium	1.05 ± 0.891 (1.67)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	(1.67) 1050	mg/L	50.0	04/20/20 18:00	
			-			
EPA 300.0 Rev 2.1 1993	Chloride	247	mg/L	5.0		
EPA 300.0 Rev 2.1 1993	Fluoride	0.20	mg/L		04/21/20 05:42	
EPA 300.0 Rev 2.1 1993	Sulfate	136	mg/L	5.0	04/21/20 20:02	
2474288003	LEACHATE					
EPA 6010D	Arsenic	28.2	ug/L		04/29/20 06:57	
EPA 6010D	Barium	70.4	ug/L	5.0	04/29/20 06:57	
EPA 6010D	Calcium	329000	ug/L	500	05/04/20 11:57	
PA 6010D	Molybdenum	249	ug/L	5.0	04/30/20 15:43	
PA 6010D	Nickel	6.8	ug/L	5.0	04/29/20 06:57	
PA 6010D	Vanadium	6.6	ug/L	5.0	04/29/20 06:57	
EPA 6010D	Zinc	11.1	ug/L	10.0	04/29/20 06:57	BC
EPA 6020B	Boron	3430	ug/L	2500		



Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID Method	Client Sample ID Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
			Office	_ Troport Limit	Analyzed	Qualificis
92474288003	LEACHATE					
EPA 6020B	Lithium	53.0	ug/L		04/21/20 19:34	
EPA 6020B	Thallium	0.33	ug/L	0.10	04/21/20 19:34	
EPA 903.1	Radium-226	0.193 ± 0.335 (0.598) C:NA T:92%	pCi/L		05/11/20 16:51	
EPA 904.0	Radium-228	0.319 ± 0.427 (0.915) C:78% T:92%	pCi/L		05/08/20 14:56	
Total Radium Calculation	Total Radium	0.512 ± 0.762 (1.51)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	1520	mg/L	125	04/20/20 18:01	
EPA 300.0 Rev 2.1 1993	Chloride	18.4	mg/L		04/21/20 05:56	
EPA 300.0 Rev 2.1 1993	Fluoride	0.26	mg/L		04/21/20 05:56	
EPA 300.0 Rev 2.1 1993	Sulfate	597	mg/L		04/21/20 20:16	
2474288004	MW-6					
EPA 6010D	Barium	49.6	ug/L	5.0	04/29/20 07:06	
EPA 6010D	Calcium	35700	ug/L	100	04/29/20 07:06	
EPA 6020B	Lithium	27.3	ug/L	2.5	04/22/20 14:30	
EPA 903.1	Radium-226	0.224 ± 0.440 (0.805) C:NA T:86%	pCi/L		05/11/20 16:40	
EPA 904.0	Radium-228	0.202 ± 0.420 (0.927) C:71% T:88%	pCi/L		05/08/20 14:56	
Total Radium Calculation	Total Radium	0.426 ± 0.860 (1.73)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	` 610	mg/L	50.0	04/20/20 18:01	
EPA 300.0 Rev 2.1 1993	Chloride	208	mg/L	4.0	04/21/20 20:31	
EPA 300.0 Rev 2.1 1993	Fluoride	0.37	mg/L	0.10	04/21/20 06:10	
EPA 300.0 Rev 2.1 1993	Sulfate	25.4	mg/L	1.0	04/21/20 06:10	
2474288005	MW-7R					
EPA 6010D	Barium	320	ug/L	5.0	04/29/20 07:09	
EPA 6010D	Calcium	98500	ug/L		04/29/20 07:09	
EPA 6010D	Chromium	5.1	ug/L	5.0		
EPA 6020B	Lithium	33.8	ug/L		04/21/20 20:20	
EPA 903.1	Radium-226	1.05 ± 0.612	pCi/L	2.0	05/11/20 16:40	
		0.612 (0.651) C:NA T:81%				





Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID	Client Sample ID	Б. "		D (11: "		0 1:5
Method	Parameters —	Result	Units	Report Limit	Analyzed	Qualifiers
2474288005	MW-7R					
EPA 904.0	Radium-228	0.509 ± 0.501 (1.04) C:74% T:83%	pCi/L		05/08/20 14:56	
Total Radium Calculation	Total Radium	1.56 ± 1.11 (1.69)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	` 854	mg/L	50.0	04/20/20 18:02	
PA 300.0 Rev 2.1 1993	Chloride	281	mg/L	6.0	04/21/20 20:46	
EPA 300.0 Rev 2.1 1993	Fluoride	0.11	mg/L	0.10	04/21/20 07:06	
PA 300.0 Rev 2.1 1993	Sulfate	17.5	mg/L	1.0	04/21/20 07:06	
2474288006	MW-8					
PA 6010D	Antimony	5.2	ug/L	5.0	04/29/20 07:12	
EPA 6010D	Barium	1110	ug/L	5.0	04/29/20 07:12	
EPA 6010D	Calcium	103000	ug/L	500	04/30/20 15:50	BC
EPA 6010D	Copper	6.4	ug/L	5.0	04/29/20 07:12	
PA 6010D	Zinc	11.4	ug/L	10.0	04/29/20 07:12	BC
PA 6020B	Lithium	24.3	ug/L	2.5	04/21/20 20:31	
PA 903.1	Radium-226	0.768 ±	pCi/L		05/11/20 16:40	
EPA 904.0	Radium-228	0.444 (0.174) C:NA T:92% 1.04 ±	pCi/L		05/08/20 14:56	
		0.522 (0.933) C:77% T:83%	r -			
otal Radium Calculation	Total Radium	1.81 ± 0.966 (1.11)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	842	mg/L	50.0	04/20/20 18:01	
PA 300.0 Rev 2.1 1993	Chloride	310	mg/L	7.0	04/21/20 21:00	
PA 300.0 Rev 2.1 1993	Sulfate	7.8	mg/L	1.0	04/21/20 07:20	
2474288007	DUP-1					
PA 6010D	Barium	49.9	ug/L	5.0	04/29/20 07:15	
PA 6010D	Calcium	36300	ug/L	100	04/29/20 07:15	
PA 6020B	Lithium	25.5	ug/L	2.5	04/21/20 20:36	
PA 903.1	Radium-226	-0.210 ± 0.320	pCi/L		05/11/20 17:05	
EPA 904.0	Radium-228	(0.839) C:NA T:87% 0.302 ±	pCi/L		05/08/20 14:56	
		0.334 (0.696) C:77% T:89%				
otal Radium Calculation	Total Radium	0.302 ± 0.654 (1.54)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	618	mg/L	50.0	04/20/20 18:01	
EPA 300.0 Rev 2.1 1993	Chloride	209	mg/L	4.0	04/21/20 21:15	

### **REPORT OF LABORATORY ANALYSIS**

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Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2474288007	DUP-1					
EPA 300.0 Rev 2.1 1993	Fluoride	0.38	mg/L	0.10	04/21/20 07:34	
EPA 300.0 Rev 2.1 1993	Sulfate	25.3	mg/L	1.0	04/21/20 07:34	
2474288008	MW-3					
EPA 6010D	Barium	628	ug/L	5.0	04/29/20 07:18	
EPA 6010D	Calcium	174000	ug/L	500	04/30/20 15:53	BC
EPA 6010D	Chromium	5.8	ug/L	5.0	04/29/20 07:18	
EPA 6010D	Molybdenum	7.6	ug/L	5.0	05/02/20 18:57	
EPA 6010D	Nickel	5.8	ug/L	5.0	04/29/20 07:18	
EPA 6010D	Vanadium	6.9	ug/L	5.0	04/29/20 07:18	
EPA 6010D	Zinc	13.5	ug/L	10.0	04/29/20 07:18	BC
EPA 6020B	Lithium	65.2	ug/L	5.0	04/21/20 20:46	
EPA 903.1	Radium-226	1.23 ± 0.572 (0.176) C:NA T:93%	pCi/L		05/11/20 17:05	
EPA 904.0	Radium-228	1.22 ± 0.476 (0.725) C:77% T:89%	pCi/L		05/08/20 14:56	
otal Radium Calculation	Total Radium	2.45 ± 1.05 (0.901)	pCi/L		05/12/20 08:57	
SM 2540C-2011	Total Dissolved Solids	2030	mg/L	250	04/20/20 18:02	
EPA 300.0 Rev 2.1 1993	Chloride	986	mg/L	100	04/21/20 21:28	
EPA 300.0 Rev 2.1 1993	Fluoride	0.47	mg/L	0.10	04/21/20 07:48	
EPA 300.0 Rev 2.1 1993	Sulfate	48.7	mg/L	1.0	04/21/20 07:48	
2474288009	MW-5					
EPA 6010D	Barium	113	ug/L	5.0	04/29/20 07:21	
EPA 6010D	Calcium	12600	ug/L	100	04/29/20 07:21	
EPA 6010D	Copper	8.0	ug/L	5.0	04/29/20 07:21	
EPA 6010D	Zinc	13.1	ug/L	10.0	04/29/20 07:21	BC
EPA 6020B	Lithium	9.6	ug/L	2.5	04/21/20 20:56	
PA 903.1	Radium-226	0.211 ± 0.323	pCi/L		05/11/20 17:05	
EPA 904.0	Radium-228	(0.519) C:NA T:82% 0.154 ±	pCi/L		05/08/20 14:56	
otal Radium Calculation	Total Radium	0.423 (0.947) C:76% T:77% 0.365 ± 0.746	pCi/L		05/12/20 08:57	
		(1.47)			0.100.10= 1= 1=	
SM 2540C-2011	Total Dissolved Solids	249	mg/L	25.0		
PA 300.0 Rev 2.1 1993	Chloride	22.4	mg/L		04/21/20 08:02	
PA 300.0 Rev 2.1 1993	Fluoride	0.61	mg/L	0.10		
EPA 300.0 Rev 2.1 1993	Sulfate	3.6	mg/L	1.0	04/21/20 08:02	



Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID	Client Sample ID					
Method	Parameters	Result	Units	Report Limit	Analyzed	Qualifiers
2474288010	SW-2					
EPA 6010D	Barium	154	ug/L	5.0	04/29/20 07:24	
EPA 6010D	Calcium	12600	ug/L	100	04/29/20 07:24	
EPA 6010D	Chromium	5.8	ug/L	5.0	04/29/20 07:24	
EPA 6010D	Copper	6.0	ug/L	5.0	04/29/20 07:24	
EPA 6010D	Vanadium	15.6	ug/L	5.0	04/29/20 07:24	
EPA 6010D	Zinc	22.2	ug/L	10.0	04/29/20 07:24	ВС
EPA 903.1	Radium-226	0.222 ±	pCi/L	10.0	05/11/20 17:05	20
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		0.435	P 0		00/11/20 11100	
		(0.795)				
		C:NA T:79%				
EPA 904.0	Radium-228	0.297 ±	pCi/L		05/08/20 14:56	
		0.604				
		(1.33)				
		C:75% T:53%				
Total Radium Calculation	Total Radium	0.519 ±	pCi/L		05/12/20 08:57	
Total Nadidili Calculation	Total Madidili	1.04 (2.13)	poi/L		03/12/20 00.3/	
SM 2540C-2011	Total Dissolved Solids	374	mg/L	25.0	04/20/20 18:02	
EPA 300.0 Rev 2.1 1993	Chloride	70.8	mg/L	1.0	04/21/20 08:16	M1,R1
EPA 300.0 Rev 2.1 1993	Sulfate	7.1	mg/L	1.0	04/21/20 08:16	,
2474288011	SW-1		mg/L	1.0	0 1/2 1/20 00:10	
		454	,,	- 0	0.4/0.0/0.0 0.7 0.7	
EPA 6010D	Barium	454	ug/L		04/29/20 07:27	
EPA 6010D	Calcium	6760	ug/L	100	04/29/20 07:27	
EPA 6010D	Chromium	18.4	ug/L	5.0	04/29/20 07:27	
EPA 6010D	Cobalt	15.6	ug/L	5.0	04/29/20 07:27	
EPA 6010D	Copper	19.8	ug/L	5.0	04/29/20 07:27	
EPA 6010D	Lead	32.3	ug/L	5.0	05/02/20 19:12	
EPA 6010D	Nickel	14.8	ug/L	5.0	04/29/20 07:27	
EPA 6010D	Vanadium	63.1	ug/L	5.0	04/29/20 07:27	
EPA 6010D	Zinc	84.5	ug/L	10.0	04/29/20 07:27	BC
EPA 6020B	Lithium	7.5	ug/L	5.0	04/21/20 21:07	
EPA 903.1	Radium-226	0.428 ±	pCi/L		05/11/20 17:05	
		0.874	•			
		(1.55) C:NA				
	D !! 000	T:71%	0.4		0=100100 1 1 =0	
EPA 904.0	Radium-228	0.894 ± 0.530	pCi/L		05/08/20 14:56	
		(0.975)				
		C:72%				
		T:70%				
Total Radium Calculation	Total Radium	1.32 ± 1.40	pCi/L		05/12/20 08:57	
		(2.53)	•			
SM 2540C-2011	Total Dissolved Solids	450	mg/L	125	04/20/20 18:03	
EPA 300.0 Rev 2.1 1993	Chloride	4.0	mg/L	1.0	04/21/20 08:58	
EPA 300.0 Rev 2.1 1993	Fluoride	0.23	mg/L	0.10	04/21/20 08:58	
EPA 300.0 Rev 2.1 1993	Sulfate	1.5	mg/L	1.0	04/21/20 08:58	
2474288012	MW-1					
PA 6010D	Barium	349	ug/L	5.0	04/29/20 07:30	
			ug/L		04/30/20 15:56	



Project: CHARAH
Pace Project No.: 92474288

Lab Sample ID	Client Sample ID	<b>5</b>				0 115
Method	Parameters —	Result	Units	Report Limit	Analyzed	Qualifiers
92474288012	MW-1					
EPA 6010D	Zinc	10.2	ug/L	10.0	04/29/20 07:30	BC
EPA 6020B	Lithium	42.8	ug/L	2.5	04/21/20 21:22	
EPA 903.1	Radium-226	0.327 ± 0.342 (0.482)	pCi/L		05/12/20 11:23	
EPA 904.0	Radium-228	C:NA T:88% 0.735 ± 0.401 (0.722) C:81%	pCi/L		05/08/20 11:41	
Total Radium Calculation	Total Radium	T:83% 1.06 ± 0.743 (1.20)	pCi/L		05/12/20 12:16	
SM 2540C-2011	Total Dissolved Solids	2170	mg/L	250	04/20/20 18:03	
EPA 300.0 Rev 2.1 1993	Chloride	905	mg/L	100	04/21/20 23:01	
EPA 300.0 Rev 2.1 1993	Fluoride	0.17	mg/L	0.10	04/21/20 09:12	
EPA 300.0 Rev 2.1 1993	Sulfate	7.2	mg/L	1.0	04/21/20 09:12	
2474288013	MW-4					
PA 6010D	Antimony	7.0	ug/L	5.0	04/29/20 07:33	
PA 6010D	Barium	431	ug/L	5.0	04/29/20 07:33	
PA 6010D	Calcium	67200	ug/L	100	04/29/20 07:33	
PA 6010D	Chromium	8.6	ug/L	5.0	04/29/20 07:33	
PA 6010D	Cobalt	21.8	ug/L	5.0	04/29/20 07:33	
EPA 6010D	Copper	7.6	ug/L	5.0	04/29/20 07:33	
PA 6010D	Nickel	11.5	ug/L	5.0	04/29/20 07:33	
PA 6010D	Vanadium	10.7	ug/L	5.0	04/29/20 07:33	
PA 6010D	Zinc	47.2	ug/L	10.0	04/29/20 07:33	BC
PA 6020B	Lithium	25.2	ug/L	5.0	04/21/20 21:32	
PA 903.1	Radium-226	0.604 ± 0.518 (0.702)	pCi/L		05/12/20 11:23	
PA 904.0	Radium-228	C:NA T:80% 0.643 ± 0.384 (0.720)	pCi/L		05/08/20 11:41	
otal Radium Calculation	Total Radium	C:82% T:92% 1.25 ±	pCi/L		05/12/20 12:16	
		0.902 (1.42)	·			
SM 2540C-2011	Total Dissolved Solids	1200	mg/L		04/20/20 18:03	
PA 300.0 Rev 2.1 1993	Chloride	475	mg/L		04/21/20 23:15	
PA 300.0 Rev 2.1 1993	Fluoride	0.35	mg/L	0.10	04/21/20 10:09	
EPA 300.0 Rev 2.1 1993	Sulfate	11.8	mg/L	1.0	04/21/20 10:09	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: BG-1	Lab ID: 924	74288001	Collected: 04/14/2	0 13:35	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	010D Preparation Me	thod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 06:51	7440-38-2	
Barium	251	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	7440-43-9	
Calcium	21100	ug/L	100	1	04/21/20 02:50	04/29/20 06:5	7440-70-2	
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:51	7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7440-50-8	
_ead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:42	2 7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:42	2 7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:51	7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:42	2 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:51	7440-22-4	
/anadium	6.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7440-62-2	
Zinc	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 06:5	7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation Me	thod: EF	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/22/20 14:04	1 7440-42-8	
_ithium	19.1	ug/L	2.5	1	04/21/20 01:48			
Thallium	ND	ug/L	0.10	1	04/21/20 01:48	04/22/20 14:04	7440-28-0	
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation Me	thod: EF	PA 7470A			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 10:52	2 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 25	40C-2011					
	Pace Analytica	l Services -	Asheville					
Total Dissolved Solids	574	mg/L	50.0	1		04/20/20 18:00	)	
300.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	00.0 Rev 2.1 1993					
·	Pace Analytica	l Services -	Asheville					
Chloride	190	mg/L	4.0	4		04/21/20 19:48	3 16887-00-6	
Fluoride	0.22	mg/L	0.10	1		04/21/20 05:28		
Sulfate	23.5	mg/L	1.0	1		04/21/20 05:28		



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: BG-2	Lab ID: 924	74288002	Collected: 04/14/	20 14:55	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50			
Barium	99.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-43-9	
Calcium	114000	ug/L	500	5	04/21/20 02:50	04/30/20 15:3	4 7440-70-2	
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-50-8	
_ead	ND	ug/L	5.0	1	04/21/20 02:50	04/30/20 15:3	0 7439-92-1	
Molybdenum	8.1	ug/L	5.0	1	04/21/20 02:50	04/30/20 15:3	0 7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	04/30/20 15:3	0 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-22-4	
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-62-2	
Zinc	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 06:5	4 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/22/20 14:1	4 7440-42-8	
_ithium	17.3	ug/L	2.5	1	04/21/20 01:48			
Thallium	ND	ug/L	0.10	1	04/21/20 01:48			
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
•	Pace Analytica							
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 10:5	4 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 25	10C-2011					
	Pace Analytica							
Total Dissolved Solids	1050	mg/L	50.0	1		04/20/20 18:0	0	
800.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
	Pace Analytica	l Services -	Asheville					
Chloride	247	mg/L	5.0	5		04/21/20 20:0	2 16887-00-6	
Fluoride	0.20	mg/L	0.10	1			2 16984-48-8	
	136	mg/L	0.10	5		5 ./ <b>2</b> ./ <b>2</b> 5 5 5 . ¬	2 14808-79-8	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: LEACHATE	Lab ID: 924	74288003	Collected: 04/14/	20 15:20	Received: 04	/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: E	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-36-0	
Arsenic	28.2	ug/L	10.0	1	04/21/20 02:50			
Barium	70.4	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-43-9	
Calcium	329000	ug/L	500	5	04/21/20 02:50	05/04/20 11:5	7 7440-70-2	
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-50-8	
ead	ND	ug/L	5.0	1	04/21/20 02:50	04/30/20 15:4	3 7439-92-1	
Molybdenum	249	ug/L	5.0	1	04/21/20 02:50	04/30/20 15:4	3 7439-98-7	
lickel	6.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	04/30/20 15:4	3 7782-49-2	
Bilver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-22-4	
/anadium	6.6	ug/L	5.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-62-2	
linc	11.1	ug/L	10.0	1	04/21/20 02:50	04/29/20 06:5	7 7440-66-6	ВС
020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: E	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	3430	ug/L	2500	100	04/21/20 01:48	04/22/20 14:2	4 7440-42-8	
Lithium	53.0	ug/L	2.5	1	04/21/20 01:48			
<sup>-</sup> hallium	0.33	ug/L	0.10	1	04/21/20 01:48	04/21/20 19:3	4 7440-28-0	
470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: E	PA 7470A			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 10:5	6 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	10C-2011					
	Pace Analytica							
Total Dissolved Solids	1520	mg/L	125	1		04/20/20 18:0	1	
300.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
-	Pace Analytica	l Services -	Asheville					
Chloride	18.4	mg/L	1.0	1		04/21/20 05:5	6 16887-00-6	
Fluoride	0.26	mg/L	0.10	1			6 16984-48-8	
Sulfate	597	mg/L	12.0	12			6 14808-79-8	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-6	Lab ID: 924	74288004	Collected: 04/15/	20 13:17	Received: 04	/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50			
Barium	49.6	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-43-9	
Calcium	35700	ug/L	100	1	04/21/20 02:50	04/29/20 07:0	6 7440-70-2	
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-50-8	
₋ead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:4	5 7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:4	5 7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:4	5 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-22-4	
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-62-2	
Zinc	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:0	6 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: EF	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/22/20 14:3	0 7440-42-8	
Lithium	27.3	ug/L	2.5	1	04/21/20 01:48	04/22/20 14:3	0 7439-93-2	
Γhallium	ND	ug/L	0.10	1	04/21/20 01:48	04/22/20 14:3	0 7440-28-0	
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
-	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 10:5	9 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	10C-2011					
	Pace Analytica	l Services -	Asheville					
Total Dissolved Solids	610	mg/L	50.0	1		04/20/20 18:0	1	
300.0 IC Anions 28 Days	Analytical Meth Pace Analytica		0.0 Rev 2.1 1993 Asheville					
Chloride	208	mg/L	4.0	4		04/21/20 20:3	1 16887-00-6	
Fluoride	0.37	mg/L	0.10	1			0 16984-48-8	
Sulfate	25.4	mg/L	1.0	1			0 14808-79-8	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-7R	Lab ID: 924	74288005	Collected: 04/16	20 09:15	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	lethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-38-2	
Barium	320	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-43-9	
Calcium	98500	ug/L	100	1	04/21/20 02:50	04/29/20 07:09	9 7440-70-2	
Chromium	5.1	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-50-8	
_ead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:48	3 7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50			
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:48	3 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-22-4	
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-62-2	
Zinc	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:09	9 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: Ef	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/21/20 20:20	7440-42-8	
_ithium	33.8	ug/L	2.5	1	04/21/20 01:48			
Γhallium	ND	ug/L	0.10	1	04/21/20 01:48			
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
•	Pace Analytica							
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:01	1 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	10C-2011					
	Pace Analytica	l Services -	Asheville					
Total Dissolved Solids	854	mg/L	50.0	1		04/20/20 18:02	2	
300.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
	Pace Analytica	l Services -	Asheville					
Chloride	281	mg/L	6.0	6		04/21/20 20:46	6 16887-00-6	
Fluoride	0.11	mg/L	0.10	1		04/21/20 07:06		
1401140	J	9, ⊏	0.10			0 .72 1720 07 .00	3 10004 40-0	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-8	Lab ID: 924	74288006	Collected: 04/15/	20 16:00	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	5.2	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-36-0	
Arsenic	ND	ug/L	10.0	1		04/29/20 07:1		
Barium	1110	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-43-9	
Calcium	103000	ug/L	500	5	04/21/20 02:50	04/30/20 15:5	0 7440-70-2	ВС
Chromium	ND	ug/L	5.0	1		04/29/20 07:1		
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-48-4	
Copper	6.4	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-50-8	
_ead	ND	ug/L	5.0	1		05/02/20 18:5		
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:5	1 7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:5	1 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-22-4	
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-62-2	
Zinc	11.4	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:1	2 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/21/20 20:3	1 7440-42-8	
_ithium	24.3	ug/L	2.5	1	04/21/20 01:48			
Thallium	ND	ug/L	0.10	1		04/21/20 20:3		
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
·	Pace Analytica							
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:1:	3 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 25	10C-2011					
	Pace Analytica							
Total Dissolved Solids	842	mg/L	50.0	1		04/20/20 18:0	1	
300.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
	Pace Analytica	l Services -	Asheville					
Chloride	310	mg/L	7.0	7		04/21/20 21:0	0 16887-00-6	
Fluoride	ND	mg/L	0.10	1			0 16984-48-8	
luoliuo	ND	mg/L	0.10			5-7/2 1/20 UT.2	0 10007-70-0	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: DUP-1	Lab ID: 924	74288007	Collected: 04/15/	20 00:00	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50			
Barium	49.9	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-43-9	
Calcium	36300	ug/L	100	1	04/21/20 02:50	04/29/20 07:1	5 7440-70-2	
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-50-8	
Lead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:5	4 7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:5	4 7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:5	4 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-22-4	
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-62-2	
Zinc	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:1	5 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation Me	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/21/20 20:3	6 7440-42-8	
_ithium	25.5	ug/L	2.5	1	04/21/20 01:48	04/21/20 20:3	6 7439-93-2	
Γhallium	ND	ug/L	0.10	1	04/21/20 01:48	04/21/20 20:3	6 7440-28-0	
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation Me	ethod: EF	PA 7470A			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:1	5 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 25	10C-2011					
	Pace Analytica	l Services -	Asheville					
Total Dissolved Solids	618	mg/L	50.0	1		04/20/20 18:0	1	
300.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
•	Pace Analytica							
Chloride	209	mg/L	4.0	4		04/21/20 21:1	5 16887-00-6	
Fluoride	0.38	mg/L	0.10	1			4 16984-48-8	
Sulfate	25.3	mg/L	1.0	1			4 14808-79-8	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Lab ID: 924	74288008	Collected: 04/16/	20 08:05	Received: 04	/17/20 16:14	Matrix: Water		
Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua	
Analytical Meth	od: EPA 60	10D Preparation M	ethod: El	PA 3010A				
Pace Analytica	l Services -	Asheville						
ND	ug/L	25.0	5	04/21/20 02:50	04/30/20 15:5	3 7440-36-0		
ND		10.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-38-2		
628	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-39-3		
ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-41-7		
ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-43-9		
174000	ug/L	500	5	04/21/20 02:50	04/30/20 15:5	3 7440-70-2	ВС	
5.8		5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-47-3		
ND		5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-48-4		
ND	_	5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-50-8		
ND		5.0	1	04/21/20 02:50	05/02/20 18:5	7 7439-92-1		
7.6	ug/L	5.0	1	04/21/20 02:50	05/02/20 18:5	7 7439-98-7		
5.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-02-0		
ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 18:5	7 7782-49-2		
ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-22-4		
6.9		5.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-62-2		
13.5	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:1	8 7440-66-6	BC	
Analytical Method: EPA 6020B Preparation Method: EPA 3010A								
Pace Analytica	l Services -	Asheville						
ND	ua/L	50.0	2	04/21/20 01:48	04/21/20 20:4	6 7440-42-8		
ND	ug/L	0.20	2	04/21/20 01:48	04/21/20 20:4	6 7440-28-0		
Analytical Meth	od: EPA 74	70A Preparation M	ethod: EF	PA 7470A				
ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:1	8 7439-97-6		
Analytical Meth	od: SM 254	IOC-2011						
•								
2030	mg/L	250	1		04/20/20 18:0	2		
986	ma/l	100	100		04/21/20 21:2	8 16887-00-6		
	Ū							
U.T/	my/L	0.10	1		5-12 07.4	0 10004-40-0		
	Analytical Mether Pace Analytical Mether Pace Analytical Mether ND	Analytical Method: EPA 60 Pace Analytical Services -  ND ug/L ND ug/L 628 ug/L ND ug/L ND ug/L 174000 ug/L 5.8 ug/L ND ug/L 13.5 ug/L Analytical Method: EPA 60 Pace Analytical Services -  ND ug/L Analytical Method: EPA 74 Pace Analytical Services -  ND ug/L Analytical Method: SM 254 Pace Analytical Services -  2030 mg/L Analytical Method: EPA 30 Pace Analytical Services -	Results	Results	Results	Results	Results	



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-5	Lab ID: 924	74288009	Collected: 04/16/	20 09:00	Received: 04	/17/20 16:14	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua	
6010 MET ICP	Analytical Meth	nod: EPA 60	010D Preparation M	ethod: EF	PA 3010A				
	Pace Analytica	l Services -	Asheville						
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-36-0		
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-38-2		
Barium	113	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-39-3		
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-41-7		
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-43-9		
Calcium	12600	ug/L	100	1	04/21/20 02:50	04/29/20 07:2	1 7440-70-2		
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-47-3		
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-48-4		
Copper	8.0	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-50-8		
-ead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:0	0 7439-92-1		
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:0	0 7439-98-7		
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-02-0		
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 19:0	0 7782-49-2		
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-22-4		
/anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-62-2		
Zinc	13.1	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:2	1 7440-66-6	ВС	
6020 MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A								
	Pace Analytica	l Services -	Asheville						
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/21/20 20:5	6 7440-42-8		
_ithium	9.6	ug/L	2.5	1	04/21/20 01:48				
Γhallium	ND	ug/L	0.10	1	04/21/20 01:48				
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A				
	Pace Analytica	l Services -	Asheville						
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:20	7439-97-6		
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	40C-2011						
	Pace Analytica	l Services -	Asheville						
Total Dissolved Solids	249	mg/L	25.0	1		04/20/20 18:0	2		
300.0 IC Anions 28 Days	Analytical Meth Pace Analytica		00.0 Rev 2.1 1993 Asheville						
Chloride	22.4	mg/L	1.0	1		04/21/20 08:0	2 16887-00-6		
Fluoride	0.61	mg/L	0.10	1			2 16984-48-8		
Sulfate	3.6	mg/L	1.0	1			2 14808-79-8		



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: SW-2	Lab ID: 924	74288010	Collected: 04/16/2	20 09:30	Received: 04	/17/20 16:14 N	latrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qual	
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation Me	ethod: EF	PA 3010A				
	Pace Analytica	l Services -	Asheville						
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-36-0		
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:24	7440-38-2		
Barium	154	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-39-3		
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:24	7440-41-7		
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:24	7440-43-9		
Calcium	12600	ug/L	100	1	04/21/20 02:50	04/29/20 07:24	7440-70-2		
Chromium	5.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-47-3		
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-48-4		
Copper	6.0	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-50-8		
Lead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:09	7439-92-1		
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:09	7439-98-7		
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-02-0		
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 19:09	7782-49-2		
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:24	7440-22-4		
Vanadium	15.6	ug/L	5.0	1		04/29/20 07:24			
Zinc	22.2	ug/L	10.0	1		04/29/20 07:24		ВС	
6020 MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A								
	Pace Analytica	l Services -	Asheville						
Boron	ND	ug/L	50.0	2	04/21/20 01:48	04/21/20 21:02	7440-42-8		
Lithium	ND	ug/L	5.0	2	04/21/20 01:48	04/21/20 21:02	7439-93-2		
Thallium	ND	ug/L	0.20	2	04/21/20 01:48	04/21/20 21:02	7440-28-0		
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation Me	thod: EF	PA 7470A				
	Pace Analytica	l Services -	Asheville						
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:22	7439-97-6		
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	IOC-2011						
	Pace Analytica	l Services -	Asheville						
Total Dissolved Solids	374	mg/L	25.0	1		04/20/20 18:02			
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0 Rev 2.1 1993								
	Pace Analytica	l Services -	Asheville						
Chloride	70.8	mg/L	1.0	1		04/21/20 08:16	16887-00-6	M1,R1	
Fluoride	ND	mg/L	0.10	1		04/21/20 08:16	16984-48-8	M1	
Sulfate	7.1	mg/L	1.0	1		04/21/20 08:16	14808-70-8		



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: SW-1	Lab ID: 924	74288011	Collected: 04/16/2	20 10:00	Received: 04	/17/20 16:14	Matrix: Water		
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua	
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A				
	Pace Analytica	l Services -	Asheville						
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-36-0		
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50				
Barium	454	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-39-3		
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-41-7		
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-43-9		
Calcium	6760	ug/L	100	1	04/21/20 02:50	04/29/20 07:2	7 7440-70-2		
Chromium	18.4	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-47-3		
Cobalt	15.6	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-48-4		
Copper	19.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-50-8		
_ead	32.3	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:1	2 7439-92-1		
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:1	2 7439-98-7		
Nickel	14.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-02-0		
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 19:1	2 7782-49-2		
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-22-4		
/anadium	63.1	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-62-2		
Zinc	84.5	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:2	7 7440-66-6	ВС	
6020 MET ICPMS	Analytical Method: EPA 6020B Preparation Method: EPA 3010A								
	Pace Analytica	l Services -	Asheville						
Boron	ND	ug/L	50.0	2	04/21/20 01:48	04/21/20 21:0	7 7440-42-8		
ithium	7.5	ug/L	5.0	2	04/21/20 01:48				
Thallium	ND	ug/L	0.20	2	04/21/20 01:48	04/21/20 21:0	7 7440-28-0		
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation Me	ethod: EF	PA 7470A				
	Pace Analytica	l Services -	Asheville						
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:2	5 7439-97-6		
2540C Total Dissolved Solids	Analytical Meth	nod: SM 25	10C-2011						
	Pace Analytica	l Services -	Asheville						
Total Dissolved Solids	450	mg/L	125	1		04/20/20 18:0	3		
300.0 IC Anions 28 Days	Analytical Meth Pace Analytica		0.0 Rev 2.1 1993 Asheville						
Chloride	4.0	mg/L	1.0	1		04/21/20 08:5	8 16887-00-6		
Fluoride	0.23	mg/L	0.10	1		04/21/20 08:5	8 16984-48-8		
Sulfate	1.5	mg/L	1.0	1			8 14808-79-8		



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-1	Lab ID: 924	74288012	Collected: 04/16/2	20 11:30	Received: 04	/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation Me	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:30	7440-38-2	
Barium	349	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:30	7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:30	7440-43-9	
Calcium	256000	ug/L	500	5	04/21/20 02:50	04/30/20 15:56	7440-70-2	вс
Chromium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-47-3	
Cobalt	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-48-4	
Copper	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-50-8	
_ead	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:15	7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/02/20 19:15	7439-98-7	
Nickel	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/02/20 19:15	7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-22-4	
√anadium	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:30	7440-62-2	
Zinc	10.2	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:30	7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation Me	thod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	25.0	1	04/21/20 01:48	04/21/20 21:22	2 7440-42-8	
Lithium	42.8	ug/L	2.5	1	04/21/20 01:48	04/21/20 21:22	2 7439-93-2	
Thallium	ND	ug/L	0.10	1	04/21/20 01:48			
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation Me	thod: EF	PA 7470A			
	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/22/20 09:29	04/23/20 11:27	7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	10C-2011					
	Pace Analytica							
Total Dissolved Solids	2170	mg/L	250	1		04/20/20 18:03	3	
300.0 IC Anions 28 Days	Analytical Method: EPA 300.0 Rev 2.1 1993							
·	Pace Analytica							
Chloride	905	mg/L	100	100		04/21/20 23:01	1 16887-00-6	
Fluoride	0.17	mg/L	0.10	1		04/21/20 09:12		
Sulfate	7.2	mg/L	1.0	1		04/21/20 09:12		

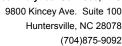


## **ANALYTICAL RESULTS**

Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Sample: MW-4	Lab ID: 924	74288013	Collected: 04/17/	20 07:50	Received: 04	1/17/20 16:14	Matrix: Water	
Parameters	Results	Units	Report Limit	DF	Prepared	Analyzed	CAS No.	Qua
6010 MET ICP	Analytical Meth	nod: EPA 60	10D Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Antimony	7.0	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-36-0	
Arsenic	ND	ug/L	10.0	1	04/21/20 02:50			
Barium	431	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-39-3	
Beryllium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-41-7	
Cadmium	ND	ug/L	1.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-43-9	
Calcium	67200	ug/L	100	1	04/21/20 02:50	04/29/20 07:3	3 7440-70-2	
Chromium	8.6	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-47-3	
Cobalt	21.8	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-48-4	
Copper	7.6	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-50-8	
Lead	ND	ug/L	5.0	1	04/21/20 02:50	05/03/20 09:2	7 7439-92-1	
Molybdenum	ND	ug/L	5.0	1	04/21/20 02:50	05/03/20 09:2	7 7439-98-7	
Nickel	11.5	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-02-0	
Selenium	ND	ug/L	10.0	1	04/21/20 02:50	05/03/20 09:2	7 7782-49-2	
Silver	ND	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-22-4	
/anadium	10.7	ug/L	5.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-62-2	
Zinc	47.2	ug/L	10.0	1	04/21/20 02:50	04/29/20 07:3	3 7440-66-6	ВС
6020 MET ICPMS	Analytical Meth	nod: EPA 60	20B Preparation M	ethod: El	PA 3010A			
	Pace Analytica	l Services -	Asheville					
Boron	ND	ug/L	50.0	2	04/21/20 01:48	04/21/20 21:3	2 7440-42-8	
_ithium	25.2	ug/L	5.0	2	04/21/20 01:48			
Thallium	ND	ug/L	0.20	2	04/21/20 01:48			
7470 Mercury	Analytical Meth	nod: EPA 74	70A Preparation M	ethod: EF	PA 7470A			
•	Pace Analytica	l Services -	Asheville					
Mercury	ND	ug/L	0.20	1	04/23/20 11:52	04/23/20 16:5	4 7439-97-6	
2540C Total Dissolved Solids	Analytical Meth	nod: SM 254	10C-2011					
	Pace Analytica							
Total Dissolved Solids	1200	mg/L	125	1		04/20/20 18:0	3	
800.0 IC Anions 28 Days	Analytical Meth	nod: EPA 30	0.0 Rev 2.1 1993					
	Pace Analytica	l Services -	Asheville					
Chloride	475	mg/L	10.0	10		04/21/20 23:1	5 16887-00-6	
Fluoride	0.35	mg/L	0.10	1			9 16984-48-8	
Sulfate	11.8	mg/L	1.0	1			9 14808-79-8	





Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

QC Batch: 537509 Analysis Method: EPA 7470A
QC Batch Method: EPA 7470A Analysis Description: 7470 Mercury

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012

METHOD BLANK: 2866420 Matrix: Water

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012

Blank Reporting

 Parameter
 Units
 Result
 Limit
 Analyzed
 Qualifiers

 Mercury
 ug/L
 ND
 0.20
 04/23/20 10:14

LABORATORY CONTROL SAMPLE: 2866421

Spike LCS LCS % Rec Parameter Units Conc. Result % Rec Limits Qualifiers Mercury ug/L 2.5 2.6 106 80-120

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2866422 2866423

MS MSD

92472992110 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Result Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual ND 2.5 2.6 105 75-125 25 Mercury 2.5 2.6 104 ug/L

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92474288

QC Batch: 537801 QC Batch Method: EPA 7470A Analysis Method: Analysis Description: EPA 7470A 7470 Mercury

Laboratory:

Pace Analytical Services - Asheville

Associated Lab Samples: 92474288013

METHOD BLANK: 2867674

Date: 05/12/2020 04:47 PM

Matrix: Water

Associated Lab Samples: 92474288013

Parameter Units

Blank Reporting

Limit Analyzed Qualifiers

Mercury ug/L ND 0.20 04/23/20 15:51

LABORATORY CONTROL SAMPLE: 2867675

Spike LCS LCS % Rec Parameter Conc. Result % Rec Limits Qualifiers Units Mercury ug/L 2.5 2.7 107 80-120

Result

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 2867676 2867677

MS MSD

92474395045 Spike Spike MS MSD MS MSD % Rec Max Parameter Units Conc. Conc. Result Result % Rec % Rec Limits **RPD** RPD Qual Result ND 99 25 Mercury ug/L 2.5 2.5 2.5 2.6 104 75-125

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

QC Batch: 537276 Analysis Method: EPA 6010D QC Batch Method: EPA 3010A Analysis Description: 6010 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

METHOD BLANK: 2865473 Matrix: Water

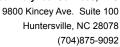
Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

		Blank	Reporting		
Parameter	Units	Result	Limit	Analyzed	Qualifiers
Antimony	ug/L	ND	5.0	04/29/20 06:18	
Arsenic	ug/L	ND	10.0	04/29/20 06:18	
Barium	ug/L	ND	5.0	04/29/20 06:18	
Beryllium	ug/L	ND	1.0	04/29/20 06:18	
Cadmium	ug/L	ND	1.0	04/29/20 06:18	
Calcium	ug/L	ND	100	04/29/20 06:18	
Chromium	ug/L	ND	5.0	04/29/20 06:18	
Cobalt	ug/L	ND	5.0	04/29/20 06:18	
Copper	ug/L	ND	5.0	04/29/20 06:18	
Lead	ug/L	ND	5.0	04/30/20 15:24	
Molybdenum	ug/L	ND	5.0	04/29/20 06:18	
Nickel	ug/L	ND	5.0	04/29/20 06:18	
Selenium	ug/L	ND	10.0	04/29/20 06:18	
Silver	ug/L	ND	5.0	04/29/20 06:18	
Vanadium	ug/L	ND	5.0	04/29/20 06:18	
Zinc	ug/L	ND	10.0	04/29/20 06:18	

LABORATORY CONTROL SAMPL	E: 2865474					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Antimony	ug/L	500	508	102	80-120	
Arsenic	ug/L	500	501	100	80-120	
Barium	ug/L	500	504	101	80-120	
Beryllium	ug/L	500	495	99	80-120	
Cadmium	ug/L	500	497	99	80-120	
Calcium	ug/L	5000	4940	99	80-120	
Chromium	ug/L	500	504	101	80-120	
Cobalt	ug/L	500	497	99	80-120	
Copper	ug/L	500	501	100	80-120	
.ead	ug/L	500	497	99	80-120	
Molybdenum	ug/L	500	521	104	80-120	
Nickel	ug/L	500	492	98	80-120	
Selenium	ug/L	500	502	100	80-120	
Silver	ug/L	250	252	101	80-120	
/anadium	ug/L	500	502	100	80-120	
Zinc	ug/L	500	493	99	80-120	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

MATRIX SPIKE & MATRIX	SPIKE DUPL	ICATE: 2865	475		2865476							
			MS	MSD								
		92473556003	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qua
Antimony	ug/L	9.1	500	500	550	532	108	105	75-125	3	20	
Arsenic	ug/L	ND	500	500	534	518	106	103	75-125	3	20	
Barium	ug/L	41.3	500	500	567	550	105	102	75-125	3	20	
Beryllium	ug/L	ND	500	500	527	508	105	102	75-125	4	20	
Cadmium	ug/L	ND	500	500	516	499	103	100	75-125	3	20	
Calcium	ug/L	6500	5000	5000	11800	11500	106	101	75-125	2	20	
Chromium	ug/L	ND	500	500	524	507	104	101	75-125	3	20	
Cobalt	ug/L	ND	500	500	521	502	103	100	75-125	4	20	
Copper	ug/L	5.5	500	500	531	517	105	102	75-125	3	20	
Lead	ug/L	ND	500	500	520	506	103	100	75-125	3	20	
Molybdenum	ug/L	ND	500	500	536	519	107	103	75-125	3	20	
Nickel	ug/L	ND	500	500	516	501	103	100	75-125	3	20	
Selenium	ug/L	ND	500	500	553	542	109	107	75-125	2	20	
Silver	ug/L	ND	250	250	263	256	105	102	75-125	3	20	
/anadium	ug/L	ND	500	500	530	513	105	102	75-125	3	20	
Zinc	ug/L	56.9	500	500	567	552	102	99	75-125	3	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

QC Batch: 537278 Analysis Method: EPA 6020B
QC Batch Method: EPA 3010A Analysis Description: 6020 MET

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

 $92474288008, \, 92474288009, \, 92474288010, \, 92474288011, \, 92474288012, \, 92474288013$ 

METHOD BLANK: 2865481 Matrix: Water

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

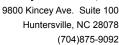
92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Boron	ug/L	ND	25.0	04/21/20 17:53	
Lithium	ug/L	ND	2.5	04/21/20 17:53	
Thallium	ug/L	ND	0.10	04/21/20 17:53	

LABORATORY CONTROL SAMPLE:	2865482					
		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Boron	ug/L	50	51.8	104	80-120	
Lithium	ug/L	50	51.0	102	80-120	
Thallium	ug/L	10	10.1	101	80-120	

MATRIX SPIKE & MATRIX SP	IKE DUPLI	CATE: 2865	483		2865484							
			MS	MSD								
	,	92474285001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Boron	ug/L	ND	50	50	71.5	72.1	106	107	75-125	1	20	
Lithium	ug/L	9.4	50	50	62.2	62.1	106	105	75-125	0	20	
Thallium	ug/L	ND	10	10	10.4	10.4	104	104	75-125	0	20	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





Project: CHARAH
Pace Project No.: 92474288

QC Batch: 537216 Analysis Method: SM 2540C-2011

QC Batch Method: SM 2540C-2011 Analysis Description: 2540C Total Dissolved Solids

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

METHOD BLANK: 2865298 Matrix: Water

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

Blank Reporting

ParameterUnitsResultLimitAnalyzedQualifiersTotal Dissolved Solidsmg/LND25.004/20/20 18:00

LABORATORY CONTROL SAMPLE: 2865299

LCS LCS % Rec Spike Parameter Units Result % Rec Limits Qualifiers Conc. **Total Dissolved Solids** mg/L 251 256 102 90-110

SAMPLE DUPLICATE: 2865300

92474288001 Dup Max **RPD RPD** Parameter Units Result Result Qualifiers 574 570 25 **Total Dissolved Solids** 1 mg/L

SAMPLE DUPLICATE: 2865301

Date: 05/12/2020 04:47 PM

92474285001 Dup Max RPD RPD Parameter Units Result Result Qualifiers **Total Dissolved Solids** mg/L 465 469 1 25

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

QC Batch: 537260 Analysis Method: EPA 300.0 Rev 2.1 1993

QC Batch Method: EPA 300.0 Rev 2.1 1993 Analysis Description: 300.0 IC Anions

Laboratory: Pace Analytical Services - Asheville

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

 $92474288008, \, 92474288009, \, 92474288010, \, 92474288011, \, 92474288012, \, 92474288013$ 

METHOD BLANK: 2865416 Matrix: Water

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011, 92474288012, 92474288013

Parameter	Units	Blank Result	Reporting Limit	Analyzed	Qualifiers
Chloride	mg/L	ND	1.0	04/21/20 04:04	
Fluoride	mg/L	ND	0.10	04/21/20 04:04	
Sulfate	mg/L	ND	1.0	04/21/20 04:04	

		Spike	LCS	LCS	% Rec	
Parameter	Units	Conc.	Result	% Rec	Limits	Qualifiers
Chloride	mg/L		54.0	108	90-110	
Fluoride	mg/L	2.5	2.7	109	90-110	
Sulfate	mg/L	50	54.6	109	90-110	

MATRIX SPIKE & MATRIX SP	IKE DUPLI	CATE: 2865	418		2865419							
			MS	MSD								
		92474285001	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	169	50	50	213	214	88	90	90-110	0	10	M1
Fluoride	mg/L	0.13	2.5	2.5	2.9	2.9	109	109	90-110	0	10	
Sulfate	mg/L	3.6	50	50	54.8	54.7	102	102	90-110	0	10	

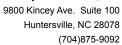
MATRIX SPIKE & MATRIX SP	IKE DUPL	ICATE: 2865	420		2865421							
			MS	MSD								
		92474288010	Spike	Spike	MS	MSD	MS	MSD	% Rec		Max	
Parameter	Units	Result	Conc.	Conc.	Result	Result	% Rec	% Rec	Limits	RPD	RPD	Qual
Chloride	mg/L	70.8	50	50	74.4	112	7	82	90-110	40	10	M1,R1
Fluoride	mg/L	ND	2.5	2.5	2.9	2.8	113	108	90-110	4	10	M1
Sulfate	mg/L	7.1	50	50	60.3	58.4	106	103	90-110	3	10	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



Project: CHARAH
Pace Project No.: 92474288

Sample: BG-1 PWS:	Lab ID: 92474 Site ID:	4288001 Collected: 04/14/20 13:35 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.158 ± 0.489 (0.947) C:NA T:79%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.608 ± 0.483 (0.967) C:74% T:83%	pCi/L	05/08/20 14:56	5 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.766 ± 0.972 (1.91)	pCi/L	05/12/20 08:57	7 7440-14-4	





Project: CHARAH
Pace Project No.: 92474288

Sample: BG-2 PWS:	Lab ID: 9247 Site ID:	<b>4288002</b> Collected: 04/14/20 14:55 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.134 ± 0.372 (0.721) C:NA T:86%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.915 ± 0.519 (0.949) C:71% T:79%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.05 ± 0.891 (1.67)	pCi/L	05/12/20 08:5	7 7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: LEACHATE PWS:	Lab ID: 92474 Site ID:	288003 Collected: 04/14/20 15:20 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical S	Services - Greensburg				
Radium-226	EPA 903.1	0.193 ± 0.335 (0.598) C:NA T:92%	pCi/L	05/11/20 16:51	13982-63-3	
	Pace Analytical S	Services - Greensburg				
Radium-228	EPA 904.0	0.319 ± 0.427 (0.915) C:78% T:92%	pCi/L	05/08/20 14:56	5 15262-20-1	
	Pace Analytical S	Services - Greensburg				
Total Radium	Total Radium Calculation	0.512 ± 0.762 (1.51)	pCi/L	05/12/20 08:57	7 7440-14-4	



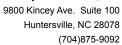
Project: CHARAH
Pace Project No.: 92474288

Sample: MW-6 PWS:	Lab ID: 9247 Site ID:	<b>4288004</b> Collected: 04/15/20 13:17 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.224 ± 0.440 (0.805) C:NA T:86%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.202 ± 0.420 (0.927) C:71% T:88%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.426 ± 0.860 (1.73)	pCi/L	05/12/20 08:5	7 7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: MW-7R PWS:	Lab ID: 9247 Site ID:	<b>4288005</b> Collected: 04/16/20 09:15 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	1.05 ± 0.612 (0.651) C:NA T:81%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.509 ± 0.501 (1.04) C:74% T:83%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.56 ± 1.11 (1.69)	pCi/L	05/12/20 08:5	7 7440-14-4	





Project: CHARAH
Pace Project No.: 92474288

Sample: MW-8 PWS:	Lab ID: 9247 Site ID:	<b>'4288006</b> Collected: 04/15/20 16:00 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg		,		
Radium-226	EPA 903.1	0.768 ± 0.444 (0.174) C:NA T:92%	pCi/L	05/11/20 16:40	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	1.04 ± 0.522 (0.933) C:77% T:83%	pCi/L	05/08/20 14:5	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.81 ± 0.966 (1.11)	pCi/L	05/12/20 08:5	7 7440-14-4	



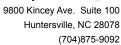
Project: CHARAH
Pace Project No.: 92474288

Sample: DUP-1 PWS:	Lab ID: 9247 Site ID:	<b>4288007</b> Collected: 04/15/20 00:00 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	-0.210 ± 0.320 (0.839) C:NA T:87%	pCi/L	05/11/20 17:05	5 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.302 ± 0.334 (0.696) C:77% T:89%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	0.302 ± 0.654 (1.54)	pCi/L	05/12/20 08:5	7 7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: MW-3 PWS:	Lab ID: 92474 Site ID:	1288008 Collected: 04/16/20 08:05 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg		,		
Radium-226	EPA 903.1	1.23 ± 0.572 (0.176) C:NA T:93%	pCi/L	05/11/20 17:05	5 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	1.22 ± 0.476 (0.725) C:77% T:89%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	2.45 ± 1.05 (0.901)	pCi/L	05/12/20 08:5	7 7440-14-4	





Project: CHARAH
Pace Project No.: 92474288

Sample: MW-5 PWS:	Lab ID: 9247 Site ID:	4288009 Collected: 04/16/20 09:00 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.211 ± 0.323 (0.519) C:NA T:82%	pCi/L	05/11/20 17:05	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.154 ± 0.423 (0.947) C:76% T:77%	pCi/L	05/08/20 14:56	3 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	$0.365 \pm 0.746  (1.47)$	pCi/L	05/12/20 08:57	7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: SW-2 PWS:	Lab ID: 92474 Site ID:	2288010 Collected: 04/16/20 09:30 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical S	Services - Greensburg				
Radium-226	EPA 903.1	0.222 ± 0.435 (0.795) C:NA T:79%	pCi/L	05/11/20 17:05	5 13982-63-3	
	Pace Analytical S	Services - Greensburg				
Radium-228	EPA 904.0	0.297 ± 0.604 (1.33) C:75% T:53%	pCi/L	05/08/20 14:56	6 15262-20-1	
	Pace Analytical S	Services - Greensburg				
Total Radium	Total Radium Calculation	0.519 ± 1.04 (2.13)	pCi/L	05/12/20 08:57	7 7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: SW-1 PWS:	<b>Lab ID: 9247428</b> Site ID:	8011 Collected: 04/16/20 10:00 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical Ser	vices - Greensburg				
Radium-226	EPA 903.1	0.428 ± 0.874 (1.55) C:NA T:71%	pCi/L	05/11/20 17:05	13982-63-3	
	Pace Analytical Ser	vices - Greensburg				
Radium-228	EPA 904.0	0.894 ± 0.530 (0.975) C:72% T:70%	pCi/L	05/08/20 14:56	5 15262-20-1	
	Pace Analytical Ser	vices - Greensburg				
Total Radium	Total Radium Calculation	1.32 ± 1.40 (2.53)	pCi/L	05/12/20 08:57	7 7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: MW-1 PWS:	Lab ID: 9247 Site ID:	<b>4288012</b> Collected: 04/16/20 11:30 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg		•		
Radium-226	EPA 903.1	0.327 ± 0.342 (0.482) C:NA T:88%	pCi/L	05/12/20 11:23	13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.735 ± 0.401 (0.722) C:81% T:83%	pCi/L	05/08/20 11:41	15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.06 ± 0.743 (1.20)	pCi/L	05/12/20 12:16	7440-14-4	



Project: CHARAH
Pace Project No.: 92474288

Sample: MW-4 PWS:	Lab ID: 9247 Site ID:	<b>4288013</b> Collected: 04/17/20 07:50 Sample Type:	Received:	04/17/20 16:14	Matrix: Water	
Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
	Pace Analytical	Services - Greensburg				
Radium-226	EPA 903.1	0.604 ± 0.518 (0.702) C:NA T:80%	pCi/L	05/12/20 11:23	3 13982-63-3	
	Pace Analytical	Services - Greensburg				
Radium-228	EPA 904.0	0.643 ± 0.384 (0.720) C:82% T:92%	pCi/L	05/08/20 11:4	1 15262-20-1	
	Pace Analytical	Services - Greensburg				
Total Radium	Total Radium Calculation	1.25 ± 0.902 (1.42)	pCi/L	05/12/20 12:10	6 7440-14-4	



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#### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92474288

QC Batch: 393308 Analysis Method: EPA 903.1

QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011

METHOD BLANK: 1905209 Matrix: Water

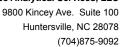
Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-226
 0.000 ± 0.376 (0.780) C:NA T:88%
 pCi/L
 05/11/20 16:24

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





#### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92474288

QC Batch: 393311 Analysis Method: EPA 904.0

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92474288012, 92474288013

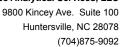
METHOD BLANK: 1905212 Matrix: Water

Associated Lab Samples: 92474288012, 92474288013

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 -0.0341 ± 0.306 (0.729) C:81% T:77%
 pCi/L
 05/08/20 11:43

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





#### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92474288

QC Batch: 393310

QC Batch Method: EPA 903.1

Analysis Method: EPA 903.1

Analysis Description: 903.1 Radium-226

Laboratory:

Pace Analytical Services - Greensburg

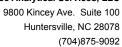
Associated Lab Samples: 92474288012, 92474288013

METHOD BLANK: 1905211 Matrix: Water

Associated Lab Samples: 92474288012, 92474288013

ParameterAct  $\pm$  Unc (MDC) Carr TracUnitsAnalyzedQualifiersRadium-226 $0.0500 \pm 0.325$  (0.656) C:NA T:85%pCi/L05/12/20 11:23

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.





#### **QUALITY CONTROL - RADIOCHEMISTRY**

Project: CHARAH
Pace Project No.: 92474288

QC Batch: 393309 Analysis Method: EPA 904.0

QC Batch Method: EPA 904.0 Analysis Description: 904.0 Radium 228

Laboratory: Pace Analytical Services - Greensburg

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011

METHOD BLANK: 1905210 Matrix: Water

Associated Lab Samples: 92474288001, 92474288002, 92474288003, 92474288004, 92474288005, 92474288006, 92474288007,

92474288008, 92474288009, 92474288010, 92474288011

 Parameter
 Act ± Unc (MDC) Carr Trac
 Units
 Analyzed
 Qualifiers

 Radium-228
 0.865 ± 0.375 (0.599) C:80% T:96%
 pCi/L
 05/08/20 14:56

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.



9800 Kincey Ave. Suite 100 Huntersville, NC 28078 (704)875-9092

#### **QUALIFIERS**

Project: CHARAH
Pace Project No.: 92474288

#### **DEFINITIONS**

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

**DUP - Sample Duplicate** 

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

Acid preservation may not be appropriate for 2 Chloroethylvinyl ether.

A separate vial preserved to a pH of 4-5 is recommended in SW846 Chapter 4 for the analysis of Acrolein and Acrylonitrile by EPA Method 8260.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

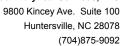
#### **ANALYTE QUALIFIERS**

Date: 05/12/2020 04:47 PM

BC The same analyte was detected in an associated blank at a concentration above 1/2 the reporting limit but below the laboratory reporting limit.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

R1 RPD value was outside control limits.



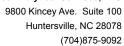


## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytic Batch
92474288001	BG-1	EPA 3010A	537276	EPA 6010D	537296
2474288002	BG-2	EPA 3010A	537276	EPA 6010D	537296
2474288003	LEACHATE	EPA 3010A	537276	EPA 6010D	537296
2474288004	MW-6	EPA 3010A	537276	EPA 6010D	537296
2474288005	MW-7R	EPA 3010A	537276	EPA 6010D	537296
2474288006	MW-8	EPA 3010A	537276	EPA 6010D	537296
2474288007	DUP-1	EPA 3010A	537276	EPA 6010D	537296
2474288008	MW-3	EPA 3010A	537276	EPA 6010D	537296
2474288009	MW-5	EPA 3010A	537276	EPA 6010D	537296
2474288010	SW-2	EPA 3010A	537276	EPA 6010D	537296
2474288011	SW-1	EPA 3010A	537276	EPA 6010D	537296
2474288012	MW-1	EPA 3010A	537276	EPA 6010D	537296
2474288013	MW-4	EPA 3010A	537276	EPA 6010D	537296
2474288001	BG-1	EPA 3010A	537278	EPA 6020B	537289
2474288002	BG-2	EPA 3010A	537278	EPA 6020B	537289
2474288003	LEACHATE	EPA 3010A	537278	EPA 6020B	537289
2474288004	MW-6	EPA 3010A	537278	EPA 6020B	537289
2474288005	MW-7R	EPA 3010A	537278	EPA 6020B	537289
2474288006	MW-8	EPA 3010A	537278	EPA 6020B	537289
2474288007	DUP-1	EPA 3010A	537278	EPA 6020B	537289
2474288008	MW-3	EPA 3010A	537278	EPA 6020B	537289
2474288009	MW-5	EPA 3010A	537278	EPA 6020B	537289
2474288010	SW-2	EPA 3010A	537278	EPA 6020B	537289
2474288011	SW-1	EPA 3010A	537278	EPA 6020B	537289
2474288012	MW-1	EPA 3010A EPA 3010A	537278	EPA 6020B	537289
2474288013	MW-4	EPA 3010A EPA 3010A	537278	EPA 6020B	537289
2474288001	BG-1	EPA 7470A	537509	EPA 7470A	537545
2474288002	BG-2	EPA 7470A	537509	EPA 7470A	537545
2474288003	LEACHATE	EPA 7470A	537509	EPA 7470A	537545
2474288004	MW-6	EPA 7470A	537509	EPA 7470A	537545
2474288005	MW-7R	EPA 7470A	537509	EPA 7470A	537545
2474288006	MW-8	EPA 7470A	537509	EPA 7470A	537545
2474288007	DUP-1	EPA 7470A	537509	EPA 7470A	537545
2474288008	MW-3	EPA 7470A	537509	EPA 7470A	537545
2474288009	MW-5	EPA 7470A	537509	EPA 7470A	537545
2474288010	SW-2	EPA 7470A	537509	EPA 7470A	537545
2474288011	SW-1	EPA 7470A	537509	EPA 7470A	537545
2474288012	MW-1	EPA 7470A	537509	EPA 7470A	537545
2474288013	MW-4	EPA 7470A	537801	EPA 7470A	537849
2474288001	BG-1	EPA 903.1	393308		
2474288002	BG-2	EPA 903.1	393308		
2474288003	LEACHATE	EPA 903.1	393308		
2474288004	MW-6	EPA 903.1	393308		
2474288005	MW-7R	EPA 903.1	393308		
2474288006	MW-8	EPA 903.1	393308		
2474288007	DUP-1	EPA 903.1	393308		
2474288008	MW-3	EPA 903.1	393308		



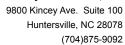


## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

92474288009 MW-5 EPA 903.1 393308 92474288010 SW-2 EPA 903.1 393308 92474288011 SW-1 EPA 903.1 393308 92474288012 MW-1 EPA 903.1 393308 92474288012 MW-1 EPA 903.1 393310 92474288013 MW-4 EPA 903.1 393310 92474288001 BG-1 EPA 904.0 393309 92474288002 BG-2 EPA 904.0 393309 92474288004 MW-6 EPA 904.0 393309 9247428806 MW-7R EPA 904.0 393309 9247428806 MW-8 EPA 904.0 393309 9247428807 DUP-1 EPA 904.0 393309 9247428808 MW-3 EPA 904.0 393309 9247428800 MW-8 EPA 904.0 393309 9247428801 SW-1 EPA 904.0 393311 92474288001 MW-4 EPA 904.0 393311 92474288003 BG-1 Total Radium Calculation 395862 92474288004 BG-1 Total Radium Calculation 395862 92474288005 MW-7 Total Radium Calculation 395862 92474288006 MW-8 Total Radium Calculation 395862 92474288006 MW-8 Total Radium Calculation 395862 92474288006 MW-9 Total Radium Calculation 395862 92474288006 MW-9 Total Radium Calculation 395862 92474288001 SW-1 Total Radium Calculation 395862 92474288006 MW-8 Total Radium Calculation 395862 92474288007 DUP-1 Total Radium Calculation 395862 92474288008 MW-8 Total Radium Calculation 395862 92474288001 SW-1 Total Radium Calculation 395862 92474288001 SW-1 Total Radium Calculation 395862 92474288001 SW-1 Total Radium Calculation 395862 92474288000 MW-1 Total Radium Calculation 395862 92474288001 SW-1 Total Radium	Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytica Batch
1247428801	2474288009	MW-5	EPA 903.1	393308		
2474288011						
247428801 BG-1 EPA 904.0 393309 247428802 BG-2 EPA 904.0 393309 247428803 LEACHATE EPA 904.0 393309 2474288004 MW-6 EPA 904.0 393309 2474288005 MW-7R EPA 904.0 393309 2474288006 MW-8 EPA 904.0 393309 247428800 MW-5 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393309 247428801 SW-2 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393311 247428802 MW-4 EPA 904.0 393311 247428803 LEACHATE Total Radium Calculation 393862 247428804 BG-2 Total Radium Calculation 395862 247428805 MW-8 Total Radium Calculation 395862 247428806 MW-8 Total Radium Calculation 395862 247428807 DUP-1 Total Radium Calculation 395862 247428808 MW-8 Total Radium Calculation 395862 247428800 MW-9 Total Radium						
247428801 BG-1 EPA 904.0 393309 247428802 BG-2 EPA 904.0 393309 247428803 LEACHATE EPA 904.0 393309 2474288004 MW-6 EPA 904.0 393309 2474288005 MW-7R EPA 904.0 393309 2474288006 MW-8 EPA 904.0 393309 2474288006 MW-8 EPA 904.0 393309 2474288006 MW-8 EPA 904.0 393309 247428800 MW-8 EPA 904.0 393309 247428800 MW-5 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393309 247428801 SW-2 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393309 247428801 SW-1 EPA 904.0 393311 247428801 BG-1 Total Radium Calculation 393802 247428802 BG-2 Total Radium Calculation 395862 247428800 MW-8 Total Radium Calculation 395862 247428800 MW-9 Tot	2474288012	MW-1	FPA 903 1	393310		
LEACHATE						
2474288002         BG-2         EPA 904.0         393309           2474288003         LEACHATE         EPA 904.0         393309           2474288004         MW-6         EPA 904.0         393309           2474288005         MW-7R         EPA 904.0         393309           2474288006         MW-8         EPA 904.0         393309           2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288013         SW-1         EPA 904.0         393309           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R	2474288001	BG-1	EPA 904.0	393309		
22474288003         LEACHATE         EPA 904.0         393309           22474288004         MW-6         EPA 904.0         393309           22474288005         MW-7R         EPA 904.0         393309           2474288006         MW-8         EPA 904.0         393309           2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           247428802         BG-1         Total Radium Calculation         395862           247428803         LEACHATE         Total Radium Calculation         395862           247428804         MW-6         Total Radium Calculation         395862           247428805         MW-7R         Total Radium Calculation         395862           247428806         MW-8         Total Radium Calculation         395862           247428807	2474288002					
2474288004         MW-6         EPA 904.0         393309           2474288005         MW-7R         EPA 904.0         393309           2474288006         MW-8         EPA 904.0         393309           2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007	2474288003	LEACHATE	EPA 904.0	393309		
2474288066         MW-8         EPA 904.0         393309           2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           247428803         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862 <td>2474288004</td> <td>MW-6</td> <td>EPA 904.0</td> <td>393309</td> <td></td> <td></td>	2474288004	MW-6	EPA 904.0	393309		
2474288066         MW-8         EPA 904.0         393309           2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           247428803         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         393311           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         39586	2474288005	MW-7R	EPA 904.0	393309		
2474288007         DUP-1         EPA 904.0         393309           2474288008         MW-3         EPA 904.0         393309           2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393309           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288020         BG-1         Total Radium Calculation         395862           2474288030         LEACHATE         Total Radium Calculation         395862           247428804         MW-6         Total Radium Calculation         395862           247428805         MW-7R         Total Radium Calculation         395862           247428806         MW-7R         Total Radium Calculation         395862           247428807         DUP-1         Total Radium Calculation         395862           247428808         MW-3         Total Radium Calculation         395862           247428809         MW-5         Total Radium Calculation         395862           247428801         SW-2         Total Radium Calculation         395862 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
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2474288099         MW-5         EPA 904.0         393309           2474288011         SW-2         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288013         MW-1         Total Radium Calc						
2474288010         SW-2         EPA 904.0         393309           2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         To						
2474288011         SW-1         EPA 904.0         393309           2474288012         MW-1         EPA 904.0         393311           2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288009         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         MW-4         Total Radium Calculation         395862           2474288010         SW-1						
2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         SW-1         Total Radium Calculation         395929           2474288013         MW-4         Total Radium Calculation         395929           2474288010         BG-1         SM 2540C-2011         537216           2474288001						
2474288013         MW-4         EPA 904.0         393311           2474288001         BG-1         Total Radium Calculation         395862           2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288013         SW-1         Total Radium Calculation         395862           2474288014         W-1         Total Radium Calculation         395862           2474288013         MW-1         Total Radium Calculation         395862           2474288014         SW-1         Total Radium Calculation         395929           24742880	2474288012	MW-1	EPA 904.0	393311		
2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         MW-4         Total Radium Calculation         395929           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-2         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7						
2474288002         BG-2         Total Radium Calculation         395862           2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288080         MW-3         Total Radium Calculation         395862           247428801         SW-2         Total Radium Calculation         395862           247428801         SW-1         Total Radium Calculation         395862           247428801         SW-1         Total Radium Calculation         395862           247428801         SW-1         Total Radium Calculation         395862           247428801         MW-1         Total Radium Calculation         395862           247428801         MW-1         Total Radium Calculation         395862           247428801         MW-1         Total Radium Calculation         395862           247428801         BG-1         SM 2540C-2011         537216           247428800 </td <td>2474288001</td> <td>BG-1</td> <td>Total Radium Calculation</td> <td>395862</td> <td></td> <td></td>	2474288001	BG-1	Total Radium Calculation	395862		
2474288003         LEACHATE         Total Radium Calculation         395862           2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         MW-4         Total Radium Calculation         395862           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-2         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7R         SM 2540C-2011         537216           2474288006         MW-8	2474288002		Total Radium Calculation	395862		
2474288004         MW-6         Total Radium Calculation         395862           2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288010         SW-2         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         MW-4         Total Radium Calculation         395862           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-1         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7R         SM 2540C-2011         537216           2474288006         MW-8         SM 2540C-2011         537216           2474288007         DUP-1         SM 254						
2474288005         MW-7R         Total Radium Calculation         395862           2474288006         MW-8         Total Radium Calculation         395862           2474288007         DUP-1         Total Radium Calculation         395862           2474288008         MW-3         Total Radium Calculation         395862           2474288019         MW-5         Total Radium Calculation         395862           2474288011         SW-1         Total Radium Calculation         395862           2474288012         MW-1         Total Radium Calculation         395862           2474288013         MW-4         Total Radium Calculation         395929           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-2         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7R         SM 2540C-2011         537216           2474288006         MW-8         SM 2540C-2011         537216           2474288007         DUP-1         SM 2540C-2011         537216           2474288009         MW-5         SM 2540C-2011 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>						
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2474288011       SW-1       Total Radium Calculation       395862         2474288012       MW-1       Total Radium Calculation       395929         2474288013       MW-4       Total Radium Calculation       395929         2474288001       BG-1       SM 2540C-2011       537216         2474288002       BG-2       SM 2540C-2011       537216         2474288003       LEACHATE       SM 2540C-2011       537216         2474288004       MW-6       SM 2540C-2011       537216         2474288005       MW-7R       SM 2540C-2011       537216         2474288006       MW-8       SM 2540C-2011       537216         2474288007       DUP-1       SM 2540C-2011       537216         2474288008       MW-3       SM 2540C-2011       537216         2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288013         MW-4         Total Radium Calculation         395929           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-2         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7R         SM 2540C-2011         537216           2474288006         MW-8         SM 2540C-2011         537216           2474288007         DUP-1         SM 2540C-2011         537216           2474288008         MW-3         SM 2540C-2011         537216           2474288010         SW-2         SM 2540C-2011         537216           2474288011         SW-1         SM 2540C-2011         537216           2474288012         MW-1         SM 2540C-2011         537216           2474288013         MW-4         SM 2540C-2011         537216						
2474288013         MW-4         Total Radium Calculation         395929           2474288001         BG-1         SM 2540C-2011         537216           2474288002         BG-2         SM 2540C-2011         537216           2474288003         LEACHATE         SM 2540C-2011         537216           2474288004         MW-6         SM 2540C-2011         537216           2474288005         MW-7R         SM 2540C-2011         537216           2474288006         MW-8         SM 2540C-2011         537216           2474288007         DUP-1         SM 2540C-2011         537216           2474288008         MW-3         SM 2540C-2011         537216           2474288010         SW-2         SM 2540C-2011         537216           2474288011         SW-1         SM 2540C-2011         537216           2474288012         MW-1         SM 2540C-2011         537216           2474288013         MW-4         SM 2540C-2011         537216	2474288012	MW-1	Total Radium Calculation	395929		
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2474288003       LEACHATE       SM 2540C-2011       537216         2474288004       MW-6       SM 2540C-2011       537216         2474288005       MW-7R       SM 2540C-2011       537216         2474288006       MW-8       SM 2540C-2011       537216         2474288007       DUP-1       SM 2540C-2011       537216         2474288008       MW-3       SM 2540C-2011       537216         2474288009       MW-5       SM 2540C-2011       537216         2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
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2474288006       MW-8       SM 2540C-2011       537216         2474288007       DUP-1       SM 2540C-2011       537216         2474288008       MW-3       SM 2540C-2011       537216         2474288009       MW-5       SM 2540C-2011       537216         2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288007         DUP-1         SM 2540C-2011         537216           2474288008         MW-3         SM 2540C-2011         537216           2474288009         MW-5         SM 2540C-2011         537216           2474288010         SW-2         SM 2540C-2011         537216           2474288011         SW-1         SM 2540C-2011         537216           2474288012         MW-1         SM 2540C-2011         537216           2474288013         MW-4         SM 2540C-2011         537216						
2474288008       MW-3       SM 2540C-2011       537216         2474288009       MW-5       SM 2540C-2011       537216         2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288009       MW-5       SM 2540C-2011       537216         2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288010       SW-2       SM 2540C-2011       537216         2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288011       SW-1       SM 2540C-2011       537216         2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
2474288012       MW-1       SM 2540C-2011       537216         2474288013       MW-4       SM 2540C-2011       537216						
<b>2474288013 MW-4</b> SM 2540C-2011 537216						
2 <b>2474288001 BG-1</b> FPA 300 0 Rev 2 1 1993 537260	2474288001	BG-1	EPA 300.0 Rev 2.1 1993	537260		





## **QUALITY CONTROL DATA CROSS REFERENCE TABLE**

Project: CHARAH
Pace Project No.: 92474288

Date: 05/12/2020 04:47 PM

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
92474288002	BG-2	EPA 300.0 Rev 2.1 1993	537260		
92474288003	LEACHATE	EPA 300.0 Rev 2.1 1993	537260		
92474288004	MW-6	EPA 300.0 Rev 2.1 1993	537260		
92474288005	MW-7R	EPA 300.0 Rev 2.1 1993	537260		
92474288006	MW-8	EPA 300.0 Rev 2.1 1993	537260		
92474288007	DUP-1	EPA 300.0 Rev 2.1 1993	537260		
92474288008	MW-3	EPA 300.0 Rev 2.1 1993	537260		
92474288009	MW-5	EPA 300.0 Rev 2.1 1993	537260		
92474288010	SW-2	EPA 300.0 Rev 2.1 1993	537260		
92474288011	SW-1	EPA 300.0 Rev 2.1 1993	537260		
92474288012	MW-1	EPA 300.0 Rev 2.1 1993	537260		
92474288013	MW-4	EPA 300.0 Rev 2.1 1993	537260		

# Pace Analytical\*

## Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06 Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

La	boratory receiving samples: Asheville	Greenwood	Huntersvi	ille 🗌	Raleigh [	Mechanics ville	
	Sample Condition Client Name: Upon Receipt		Project	WO#	:9247	4288	
	Upon Receipt HDR						
	urler: Fed Ex UPS Commercial Pace	USPS Other:	Client	924742	<b>                                      </b>		
Cust	tody Seal Present? Yes No Sea	lls Intact? Yes	No	Date/Initia	ils Person Examining C	Contents: 4-20-20 AM	P
Pacl	king Material: Bubble Wrap	ubble Bags None	Other		Biological Tissue		
The	rmometer:	Type of Ice:	t 🗆 Blue	None	□Yes □No □	]N/A	
	□IR Gun ID: 92T061			<del></del>			
Coo	ler Temp (°C): \3/0.5/0.4 Correction Fact ler Temp Corrected (°C): \19/0.6 0.7 / \(\)	or: Add/Subtract (°C)+	0.1 т		above freezing to 6 It of temp criteria. San	°C oples on ice, cooling process	
	samples originate in a quarantine zone within the Ur	nited States: CA, NY, or SC (ch			nate from a foreign so		
١	Yes No		i		and Puerto Rico)? Y Comments/Discrepa		
	Chain of Custody Proceed?	☐Yes ☐No ☐	]N/A 1.				
	Chain of Custody Present?				· · · · · · · · · · · · · · · · · · ·		
	Samples Arrived within Hold Time?		]N/A 2. ]N/A 3.				
Œ	Short Hold Time Analysis (<72 hr.)?		]N/A 4.			*	
	Rush Turn Around Time Requested?						
	Sufficient Volume?		]n/A 5. ]n/A 6.				
	Correct Containers Used? -Pace Containers Used?		_N/A   0. _N/A				
	Containers Intact?		]N/A 7.				
20	Dissolved analysis: Samples Field Filtered?		IN/A 8.				
	Sample Labels Match COC?		]N/A 9.				
	-Includes Date/Time/ID/Analysis Matrix:	WT				¥	
	Headspace in VOA Vials (>5-6mm)?		N/A 10.				
	Trip Blank Present?	□Yes □No □	]N/A 11.				
	Trip Blank Custody Seals Present?	□Yes □No □	]N/A				
c	OMMENTS/SAMPLE DISCREPANCY				Field Data F	lequired? Yes No	
<del>-</del>			Lot i	D of split conta	ilners:		
cū	ENT NOTIFICATION/RESOLUTION	,		-			
- P	erson contacted:		Date/Time:				
***							
	Project Manager SCURF Review:			vale			
	Project Manager SRF Review:			Date: _			



## Document Name: Sample Condition Upon Receipt(SCUR)

Document No.: F-CAR-CS-033-Rev.06

Document Revised: February 7, 2018 Page 1 of 2

Issuing Authority: Pace Carolinas Quality Office

\*Check mark top half of box if pH and/or dechlorination is verified and within the acceptance range for preservation samples.

Exceptions: VOA, Coliform, TOC, Oil and Grease, DRO/8015 (water) DOC, LLHg

\*\*Bottom half of box is to list number of bottle

Project # W0#:92474288

PM: KLH1

Due Date: 04/24/20

CLIENT: 92-HDR

	Item#	8P4U-125 mL Plastic Unpreserved (N/A) (CI-)	BP3U-250 mL Plastic Unpreserved (N/A)	8P2U-500 mL Plastic Unpreserved (N/A)	BP1U-1 liter Plastic Unpreserved (N/A)	BP4S-125 mL Plastic H2SO4 (pH < 2) (Cl-)	BP3N-250 mL plastic HNO3 (pH < 2)	BP42-125 mL Plastic ZN Acetate & NaOH (>9)	<b>BP4C-</b> 125 mL Plastic NaOH (pH > 12) (CI-)	WGFU-Wide-mouthed Glass jar Unpreserved	AG1U-1 liter Amber Unpreserved (N/A) (CI-)	AG1H-1 liter Amber HCI (pH < 2)	AG3U-250 mL Amber Unpreserved (N/A) (CI-)	AG1S-1 liter Amber H2SO4 (pH < 2)	AG35-250 mL Amber H2SO4 (pH < 2)	AG3A(DG3A)-250 mL Amber NH4Cl (N/A)(Cl-)	DG9H-40 mL VOA HCI (N/A)	VG9T-40 mL VOA Na2S2O3 (N/A)	VG9U-40 mL VOA Unp (N/A)	DG9P-40 mL VOA H3PO4 (N/A)	VOAK (6 vials per kit)-5035 kit (N/A)	V/GK (3 vials per kit)-VPH/Gas kit (N/A)	SPST-125 mL Sterile Plastic (N/A – lab)	SP2T-250 mL Sterile Plastic (N/A – lab)	BPH. BPIN	BP3A-250 mL Plastic (NH2)2SO4 (9.3-9.7)	AG0U-100 mL Amber Unpreserved vials (N/A)	VSGU-20 mL Scintillation vials (N/A)	DG9U-40 mL Amber Unpreserved vials (N/A)	
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		pH Ad	justment Log for Pres	erved Samples		
Sample ID	Type of Preservative	pH upon receipt	Date preservation adjusted	Time preservation adjusted	Amount of Preservative added	Lot #
31						

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e. Out of hold, incorrect preservative, out of temp, incorrect containers.



CHAIN-OF-CUSTODY / Analytical Request Document
The Chain-of-Custody is a LEGAL DOCUMENT. All relevant fields must be completed accurately.

	Cus Seal Coo (Y/N	******	TEM	20	04/16/2020		DATE Signed:	DAT		\	/	5	4	/	5	(	.χ. (:	AMPLE	SIGNATURE of SAMPLER:	SIGNAT									
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																	TUR	SIGNA	SAMPLER NAME AND SIGNATURE	APLER N	SAA								
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Appendix G – April 2020 Electronic Data Deliverables (electronic delivery only)



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H

Appendix H – Groundwater Flow Model Report

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## Groundwater Flow Model

Brickhaven No. 2 Mine Tract "A" Structural Fill

Charah Solutions, Inc.

Moncure, Chatham County, NC July 24, 2020



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## Acronyms

3-D three-dimensional

CCP coal combustion product CCR coal combustion residuals

USEPA U.S. Environmental Protection Agency

Ft feet

GIS geographic information systems

gpd gallons per day

Charah Solutions, Inc.

WQMP Water Quality Monitoring Plan

NCDENR North Carolina Department of Environment and Natural Resources

TDS Total Dissolved Solids
PWR Partially Weathered Rock



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## 1 Introduction

The purpose of this *Groundwater Flow Model Report* is to summarize the development and results of a groundwater flow model prepared for the Brickhaven No. 2 Mine Tract "A" Structural Fill (Site) located at 1315 Moncure-Flatwood Road in Moncure, Chatham County, North Carolina. The groundwater model was developed to evaluate potential migration of coal combustion product (CCP) constituents in groundwater and surface water in the vicinity of the Site.

In accordance with the Water Quality Monitoring Plan (WQMP) approved by the North Carolina Department of Environmental and Natural Resources (NCDENR) in 2014, and operating under Facility Permit #1910-STRUT-2015, Charah Solutions, Inc. (Charah) is required to monitor groundwater and surface water quality at 10 monitoring wells (MW-1 through MW-6, MW-7R, MW-8, BG-1, and BG-2) and two surface water locations (SW-1 and SW-2). Groundwater samples are analyzed for constituents listed in the North Carolina Department of Environmental Quality (NCDEQ) Solid Waste Appendix I and II, 40 CFR 257 Appendix III, and 40 CFR 257 Appendix IV.

Charah began monitoring groundwater and surface water quality in August 2015, prior to placement of CCP into the lined Structural Fill. One additional sampling event was conducted in October 2015 prior to CCP placement in November 2015. Subsequent to the October 2015 event, Charah conducted six additional background sampling events. From January 2017 through July 2019, Charah conducted five semi-annual detection monitoring events.

On June 21, 2019, Charah received correspondence from the NCDEQ Solid Waste Section that requested Charah submit an Assessment Monitoring Work Plan (Plan) in accordance with 15A NCAC 02L .0106 and 15A NCAC 02B .0211 and .0216. NCDEQ cited exceedances of groundwater quality standards for barium, chloride, chromium, cobalt, total dissolved solids (TDS), and vanadium, and exceedances of surface water quality standards for arsenic, cobalt, copper, lead, TDS, and zinc as cause for needing the Plan. Charah submitted a *Groundwater and Surface Water Assessment Work Plan* in August 2019, which was approved by NCDEQ in correspondence dated October 4, 2019. As part of the Plan, Charah proposed to conduct groundwater flow modeling to evaluate the extent that CCP could potentially travel through the groundwater system since CCP was placed at the Site in November 2015.

#### 1.1 General Setting and Background

The Brickhaven property is located in Chatham County, approximately 4 miles southwest of Moncure, North Carolina. The Site is also located approximately 4 miles southwest of the Shearon Harris Nuclear Power Plant located in adjacent Wake County along the banks of the Shearon Harris Reservoir. The area immediately surrounding the Site primarily consists of rural residential, industrial, wooded and agricultural property.



The Site is approximately 301 acres; of which 145 acres is permitted for structural fill placement of CCP in a lined storage facility. The Site was previously owned by General Shale, which operated a clay mine for offsite brick manufacturing beginning in 1985.

Charah began CCP placement in the first composite lined containment system on October 23, 2015 with CCP placement occurring in cells 1, 2, 6A, 6B and 6C. Approximately 7.3 million tons of CCP material has been placed in the Structural Fill. The CCP material includes fly ash, bottom ash, boiler slag, and/or flue gas desulfurization materials.



## 2 Flow Model Inputs and Assumptions

The following inputs and assumptions were used in the initial groundwater flow model for the Site. More detailed descriptions of how these inputs and assumptions were used are provided in **Sections 3 through 7**.

Model Input	Description
Domain Boundaries	<ul> <li>The model represents Buckhorn Creek-Cape Fear River watershed, B. Everett Jordan Lake and Cape Fear River</li> <li>Three geologic provinces are found and simulated in the model domain—Triassic Basin, Raleigh Belt and Coastal Plain</li> <li>The north-northeastern boundary is B. Everett Jordan Lake</li> <li>The western boundary is the Cape Fear River</li> <li>The eastern boundary is the topographic divide of the watershed, which is a minimum of 10 miles from the RSFS.</li> </ul>
Hydrostratigraphic Layers	Triassic Basin:  Layer 1 – Residuum  Layer 2 – Saprolite  Layer 3 – Transition zone  Layer 4 – Partially weathered bedrock  Layer 5 – Competent fractured bedrock Raleigh Belt and Coastal Plain:  Layer 1 – Overburden (Piedmont), Sandy (Coastal Plain)  Layer 2 – Saprolite  Layer 3 – Transition zone  Layer 4 and 5 – Rock
Recharge	<ul> <li>Triassic Basin – 2.19 inches per year based (Cunningham, 2001)</li> <li>Raleigh Belt and Coastal Plain – 8.76 inches per year based on Daniel, Smith, and Eimers (1997)</li> </ul>
Calibration Targets	Flow model: mean water levels in 10 monitoring wells measured between August 2015 and October 2019
Boundary Conditions	<ul> <li>Constant head: B. Everett Jordan Lake</li> <li>River Cell: The Cape Fear River, Shearon Harris Reservoir and on-site ponds</li> <li>Drain Cell: streams within the model domain. All streams identified by the National Hydrography Dataset in the model domain were included.</li> </ul>
MT3D Simulation Period	Circa 2015 through 2020



## 3 Model Hydrogeological Framework

The groundwater flow model was constructed using geologic and hydrogeologic data obtained for the Site and surrounding areas. The information was gathered from previous investigations and existing sources, including:

- PZM-1 through PZM-20 borings from around the Site defining the local stratigraphy to depths up to 55 feet.
- Regional geology using the USGS Mineral Resources Online Spatial Data Viewer (USGS, https://mrdata.usgs.gov/);
- Water levels measured at the Structural Fill from 2015 until 2019;
- Slug testing conducted by Buxton Environmental in 2014 (Klingman, 2014);
- Ground surface topography based on DEM data from North Carolina; (http://ned.usgs.gov/)
- Stream flow measurements taken by HDR at steams near the Structural Fill in 2020;
- USGS stream flow measurements at Cape Fear River, NC (NWIS, 2020); and
- B. Everett Jordan Lake stages from USGS stream flow gage at HWY 64 at Wilsonville, North Carolina (NWIS, 2020).

### 3.1 Geology and Hydrogeology

The site is located within the Piedmont Physiographical Province of North Carolina, which is northeast-southwest trending region extending from New York to Alabama.

The geology in the area of Site and model domain is divided into three physiographic areas: Triassic Basin, Raleigh Belt and Coastal Plain. The Site is located in the Deep River Basin of the Triassic Basin of the Piedmont Physiographic Province (USGS, <a href="https://mrdata.usgs.gov/">https://mrdata.usgs.gov/</a>), which covers approximately 70,000 acres of the model domain. The majority of the Site is located within the Sanford Formation (TRcs), which is composed of conglomerate, fanglomerate, sandstone, and mudstone. The northwestern portion of the Site is located in the Cummock Formation (TRcc), which is composed of sandstone, mudstone, gray and black coal and carbonaceous shale. On a larger scale, the model domain is underlain by Triassic Basin sediments in the north, Raleigh Belt metamorphics in the central portion, and Coastal Plain sediments (Middendorf Formation (Km)) in the far southeast portion. Triassic Basin and Coastal Plain sediments are generally characterized as sand, sandstone, mudstone, and conglomerate/fanglomerates, while the Raleigh Belt materials are characterized as biotite gneiss and schist intruded by numerous sills and dikes of granite, granite pegmatite, and aplite (Nicholson, 2005).

Four materials were encountered on-site during geotech drilling in 2014:



- (1) Residuum characterized as mottled yellowish, brown, orange, and red silty clay and clayey silt, formed from the continued weathering and biologic reworking of saprolite.
- (2) Saprolite comprised of mottled (black and gray) red and reddish brown sandy silty clay with infrequent quartz gravel and cobbles. It characteristically fissile and often breaks in horizontal sheets. Saprolite generally retains the remnant texture, structure and mineral content of the rock from which it was formed.
- (3) Partially Weathered Rock (PWR) comprised of mottled (light green and purple) brown, reddish gray, and weak red silty clay and weathered mudstone, which are often fissile.
- (4) Bedrock layered rock that is horizontally oriented and relatively thin intermittent layers. Groundwater flow is found mostly in fractures.

Groundwater is expected to be found in the residuum, saprolite, PWR and bedrock. Each geologic material has a unique range of hydrogeologic properties. The geotechnical borings and slug tests performed in piezometers PZM-1 through PZM-20 show the distribution of material types vertically and horizontally, and provide local hydrogeologic property values, respectively.

#### 3.2 Hydrostratigraphic Material Development

The following materials were simulated in the groundwater flow model:

Residuum – silty clay and clayey silt. This is formed from the continued weathering of and biologic reworking of saprolite. It is approximately 2 to 25 ft thick.

<u>Saprolite</u> –sandy silty clay with infrequent quartz gravel and cobbles. The saprolite is generally found between the residuum and PWR and is approximately 5 to 20 ft thick.

<u>Transition Zone</u> – a more transmissive zone between the saprolite and PWR. It is approximately 10 ft thick, when present, and found in both the Triassic Basin and Raleigh Belt.

<u>PWR</u> – silty clay and weathered mudstone. Based on slug test data, the PWR has low hydraulic conductivity.

Overburden – Coastal Plain sediments with sand, sandstone and mudstone.

<u>Layered Rock</u> – horizontally oriented and relatively thin intermittent layers. The layered rock contains horizontal to near vertical fracturing.

#### 3.3 Groundwater Flow System

Groundwater recharge occurs from precipitation infiltrating into the subsurface where the ground surface is permeable. After infiltrating the ground surface, water in the unsaturated zone percolates downward to the unconfined water table, defining the top of the groundwater system. From the water table, groundwater moves both downward and laterally through the geologic



material, discharging to local surface water bodies (streams, drainages, and the Cape Fear River).

#### 3.4 Domain Boundary Conditions

Groundwater within the Buckhorn Creek-Cape Fear River watershed is assumed to flow from areas of recharge at topographic highs towards areas of discharge at streams and the Cape Fear River. Thus, the watershed divides that define the domain on the east and northeast, were chosen as no-flow boundaries. Areas assumed to receive discharge within the model domain (i.e., B. Everett Jordan Lake and Cape Fear River) were modelled as constant head and river package boundaries to the northwest and west, respectively. The model domain and boundary conditions are shown on **Figure 3.1**. The boundary conditions are described in greater detail in **Section 5**.

#### 3.5 Sources and Sinks

Recharge from precipitation is the primary source of water for the local groundwater system. The net recharge for the Triassic Basin is estimated to be 2.19 inches per year, based on low-flow stream measurements from nearby streams and from Cunningham (2001). Net recharge for the Raleigh Belt and Coastal Plain was taken from Daniel, Smith, and Eimers (1997) to be 8.76 inches per year. The difference in recharge between the Triassic Basin, Raleigh Belt and Coastal Plain is likely a function of differing geology and how easily the water percolates into the subsurface.

Water leaves the domain through discharge to streams, B. Everett Jordan Lake and the Cape Fear River. The location of streams, drainages, ponds, and the Cape Fear River are shown on **Figure 3.1**.

#### 3.6 Water Balance

#### 3.6.1 Current Groundwater System

Recharge occurs when some of the precipitation that falls permeates into the subsurface and is added to the groundwater. The majority of precipitation is lost to evapotranspiration or run-off to surface water, with the remaining recharging the groundwater system. The net recharge entering the groundwater system accounts for approximately 2.3 x 10<sup>9</sup> gallons per year in the Triassic Basin and 1.26 x 10<sup>10</sup> gallons per year in the Raleigh Belt and Coastal Plain. Water that enters the system as recharge will eventually discharge to local surface water bodies.



## 4 Modeling Software

The groundwater model was developed using the groundwater modeling pre- and post-processing software Groundwater Modeling System (GMS) 10.3.4 (Aquaveo; <a href="https://www.aquaveo.com/software/gms-groundwater-modeling-system-introduction">https://www.aquaveo.com/software/gms-groundwater-modeling-system-introduction</a>) as well as ArcMap 10.4.1 (ESRI; <a href="https://www.esri.com/en-us/arcgis/products/index">https://www.esri.com/en-us/arcgis/products/index</a>). For the groundwater flow model, MODFLOW-2005 (Harbaugh 2005; <a href="https://pubs.usgs.gov/tm/2005/tm6A16/">https://pubs.usgs.gov/tm/2005/tm6A16/</a>) was used to solve the groundwater-flow equations that quantify the flow of groundwater in three dimensions. Steady-state and transient flow conditions can be simulated with MODFLOW, as can confined and water-table conditions. Additional components of the hydrological cycle affecting groundwater can be considered including: pumping wells, recharge, evapotranspiration, rivers, streams, seeps, and lakes, among others.

Information compiled in the site model framework in GMS and ArcMap is translated into its numerical equivalent to generate inputs for MODFLOW. MODFLOW uses a numerical finite difference solution to iteratively estimate 3-dimensional (3-D) groundwater hydraulic head and groundwater movement within the model domain, while conserving the mass of water. The MODFLOW output is read into GMS for post-processing. Post-processing includes creating contour and color-flood maps, comparing output to calibration targets, and particle tracking using the USGS particle tracking software MODPATH (Pollock 1994).

Contaminant fate and transport modeling is performed within GMS by running the U.S. Army Corps of Engineers software MT3DMS (Zheng and Wang 1999). This software is able to simulate advection, dispersion, and chemical reactions of dissolved constituents in groundwater systems. It is used in conjunction with MODFLOW in a two-step flow and transport simulation where the heads and cell by cell flux terms are computed by MODFLOW and then read by MT3DMS and utilized as the flow filed for the transport portion of the simulation. Simulating MT3DMS without chemical reactions (aka conservative tracer) can allow MT3DMS to act similar to a particle tracker.



## 5 Groundwater Flow Model Development

The flow model for the study was developed through a multi-step and iterative process. First, a 3-D geological model of the site hydrostratigraphy was developed based on information described above with data sources cited in **Section 3.0**. The model domain was determined based on the natural flow boundaries for the hydrogeologic system where the Structural Fill resides. The model grid was created, boundary conditions assigned, and material types were assigned to the grid. These material types define the hydrogeologic parameters of the aquifer materials simulated in the model. The model was then run, and the resulting predicted groundwater levels (hydraulic heads) were compared to the mean groundwater levels measured in monitoring wells around the Structural Fill.

#### 5.1 Model Domain

The model domain was chosen to coincide with the Buckhorn Creek-Cape Fear River watershed, Cape Fear River and the B. Everett Jordan Lake. As described above, the eastern and northeastern boundaries are simulated as no-flow boundaries, the western boundary (Cape Fear River) is simulated using a river package and the northwestern boundary (B. Everett Jordan Lake) is simulated using a constant head boundary with heads assigned equaling the stage of the reservoir based on USGS water levels (USGS, 2020). **Figure 3.1** shows the model domain

#### 5.2 Model Discretization

The model domain is approximately 62,000 feet east to west, by 90,000 feet north to south. The domain was divided into five layers with 444 rows and 400 columns, with the grid oriented north-south/east-west. Rows and columns are variable in width and length ranging from 50 by 50 feet in the area of the Structural Fill, grading up to 500 by 500 feet farther away from the site. The resulting grid has 684,635 active grid cells in the model domain. **Figure 5.1** shows the active model grid. The more finely-resolved grid cells appear as dark stripes in **Figure 5.1**.

#### 5.3 Hydrostratigraphic Units Simulated

As described above, the hydrogeologic materials simulated include:

#### **Triassic Basin:**

- Layer 1 Residuum with a horizontal hydraulic conductivity ranging from 5.7 to 0.001 feet per day and a horizontal to vertical anisotropy ratio of 3.
- Layer 2 Saprolite with a horizontal hydraulic conductivity ranging from 10 to 0.02 feet per day and a horizontal to vertical anisotropy ratio of 3.
- Layer 3 Transition Zone with a horizontal hydraulic conductivity ranging from 0.005 to 12 feet per day and a horizontal to vertical anisotropy ratio of X.
- Layer 4 PWR with a horizontal hydraulic conductivity of 0.05 feet per day and a horizontal to vertical anisotropy ratio of 1.



Layer 5 – Fractured Bedrock with a horizontal hydraulic conductivity 0.06 feet per day and a horizontal to vertical anisotropy ratio of 1.

#### Raleigh Belt and Coastal Plain:

- Layer 1 Overburden and Coastal with a horizontal hydraulic conductivity ranging from 10 to 2 feet per day and a horizontal to vertical anisotropy ratio of 3.
- Layer 2 Saprolite with a horizontal hydraulic conductivity of 1 feet per day and a horizontal to vertical anisotropy ratio of 2.
- Layer 3 Transition Zone with a horizontal hydraulic conductivity of 2 feet per day and a horizontal to vertical anisotropy ratio of 2.
- Layer 4 and 5 Rock with a horizontal hydraulic conductivity of 0.25 feet per day and a horizontal to vertical anisotropy ratio of 1.

Slug tests were performed on many of the piezometers (PZMs) installed during the hydrogeologic investigation in 2014. Hydraulic conductivities ranged from 1.5 x 10<sup>-4</sup> to 3.8 x 10<sup>-8</sup> feet per day. This is in line with the values used for the model. **Figure 5.5** shows the distribution of the materials simulated in the model with variations between the Triassic Basin, Raleigh Belt and Coastal Plain, as well as vertically in each region and the material breakdown by layer.

#### 5.4 Boundary Conditions Simulated

This section describes how hydrologic stresses are setup to be simulated with MODFLOW. The specific terminology used within the MODFLOW code, and further descriptions about conceptual and/or technical details about the stresses simulated with MODFLOW packages, are presented in the documentation for MODFLOW-2005 (Harbaugh 2005). The eastern boundary of the model is simulated as no-flow boundaries. These boundaries are remote from the site and serve only to complete the water balance. Using no-flow boundaries is a good estimation of the actual condition. **Figure 3.1** shows the locations of boundary conditions within the model domain—no-flow boundaries are the lateral boundary type assigned along the edge of the model domain except where the Cape Fear River, B. Everett Jordan Lake and Shearon Harris Reservoir are present.

#### 5.4.1 The Cape Fear River

The Cape Fear River is simulated in the model as a river package with a head-dependent flux boundary in Layer 1. The boundary condition is given a bottom and surface elevation and a conductance. The surface elevation is based on the river's surface from the DEM and the bottom elevation is 5 feet below the surface. This boundary conditions allows for water to be exchanged between the river and the groundwater.

#### 5.4.2 B. Everett Jordan Lake

B. Everett Jordan Lake is simulated in the model as a constant head boundary condition in Layer 1. It is located in the north-northeast portion of the domain. The boundary elevation was derived from the surface DEM and USGS stage data (NWIS, 2020). **Figure 3.1** depicts the location and extent of the constant head boundary conditions.



#### 5.4.3 Shearon Harris Reservoir

Shearon Harris Reservoir is a body of water found in the middle of the domain east of the Structural Fill. The reservoir was simulated using the river package with the top elevation being derived from the DEM and USGS stage data (NWIS, 2020). The bottom elevation is set to 10 feet below the surface elevation.

#### 5.4.4 Interior streams

Streams located in the interior of the model domain are simulated using the drain boundaries, which remove water from the domain at a specific elevation at a rate proportional to a specified conductance. Elevations were chosen from the DEM. The conductance values are based on adjustments that improve the match to the observed groundwater levels. Drains were chosen in an attempt to conceptualize the stream flow in as simple a way as possible considering the limited data and current understanding of the hydrologic functions.

#### **5.4.5** Ponds

Ponds were simulated using river boundaries where stage, bottom elevation, and bottom conductance are used to control the amount of water that enters (or exits) the model domain. These parameters were taken from elevation DEMs and the conductance values were estimated and adjusted during calibration.

#### 5.4.6 Recharge

As discussed earlier, groundwater recharge for the Triassic Basin is simulated to equal 2.19 inches per year and 8.76 inches per year for the Raleigh Belt and Coastal Plain. Recharge was set to 0 inches per year for the lined Structural Fill.



## 6 Model Calibration to Current Conditions

Model calibration is the process of adjusting hydraulic parameters, hydrologic stresses, and boundary conditions within reasonable ranges to achieve an acceptable match between modeled and observed calibration targets. The flow model was calibrated to the mean water levels measured in 10 monitoring wells at the Structural Fill between August 2015 and October 2019. Calibrating to mean water levels, instead of to water levels measured on a specific date, creates a model that simulates the mean conditions of the aquifer, which therefore provides an estimated (simulated) quantitative representation of the most common groundwater flow pattern and water budget. Steady-state simulation of groundwater movement based on the mean condition will show where water is most likely to go, with the variability of the system not explicitly represented. Constraining the calibration effort to match only the mean conditions also allows the use of average input of the hydrologic stresses, including the net recharge and stages for the Cape Fear River, B. Everett Jordan Lake and Shearon Harris Reservoir.

Water levels in 8 of the 10 monitoring wells were measured 18 times between August 2015 and October 2019. The other two monitoring wells (BG-2 and MW-7R) were measured 3 and 8 times between July 2017 and October 2019. The mean water levels for these measurement points were used as calibration targets for the steady-state model. For the calibration process, a Model-Independent Parameter Estimation and Uncertainty Analysis (PEST) was performed. PEST is a parameter estimation tool that is able to compare values computed by the model to observed measurements and adjust the input values until they compare well with those observed. This method was chosen to more accurately account for the high variability in the geology surrounding the site. Polygons were created around each calibration target in the layer where they are screened (see **Table 6.1**) and a single large polygon encompassed the rest of the Triassic Basin that was not associated with a calibration target. This was done for all 5 layers. A range of 0.00001 to 10 feet per day was given to constrain PEST. **Figure 6.1a-c** depicts the polygons created to run PEST and **Table 6.1** breaks down the resulting hydraulic conductivity estimations.

The standard deviation of the calibration target water levels was used to evaluate the level of calibration as compared to the observed conditions in the aquifer, and as a metric for assessing the variability of water levels overall. The current level of calibration of the flow model is assessed using the following statistics:

Mean Residual -1.86 feet
Mean Absolute Residual 2.91 feet
Root Mean Squared Residual (RMSE) 5.18 feet

The root mean squared of two standard deviations for the observed data (standard deviation in each monitoring well's dataset) is 7.35 feet. Having the RMSE lower than the root mean square of two standard deviations for the observed data indicates that the calibrated model is within the variability of the observed dataset, and is approaching the mean condition. **Figure 6.2** shows the computed versus mean observed water levels with an R<sup>2</sup> of 0.87. **Figure 6.3** is a map of the calibrated water levels showing the error associated with each measurement point (the whiskers indicate a 95 percent confidence interval, or about two standard deviations about the mean).



The whisker plots and the high R<sup>2</sup> value indicate that there is not a systematic bias in the residuals, and that predicted water levels are generally slightly higher than observed, but all residuals are less than the variability of the observed data set. **Table 6.2** presents the groundwater calibration targets, statistics, and residuals for the 10 monitoring wells. Given that the calibration shows that the groundwater movement at the Structural Fill is approximated fairly well by the model, the model can be used for predictive simulations (with consideration of the models limitations described in **Section 8**).



## 7 MT3D – Particle Tracking

The calibrated model was used as the flow basis to simulate particle movement in groundwater using MT3DMS. This is the equivalent of simulating a conservative tracer and expressing the farthest extent the plume could possibly travel within the period of CCP placement in the Structural Fill. A point source, which is a continual source, was added in Layer 2 under the capped fill. A source term of 1 (mg/L) was chosen to view the extent of the plume as a percentage of the original.

The MT3DMS simulation used one stress period from January 2014 to May 2020 (2338 days). This time frame matches the length of time the Structural Fill contained CCP constituents. The particles were simulated with advection and dispersion. Advection is based on the flow fields generated by MODFLOW and used the third order TVD scheme (ULTIMATE). Dispersion was set at 10 (ft) horizontal and the ratio of transverse to longitudinal dispersivity is 0.1 in the horizontal direction and 0.01 in the vertical.

The simulation indicates particles would remain on-site and be found mostly in the Residuum, Transition Zone and Partially Weathered Rock. **Figure 7.1** depicts the extent of the plume both horizontally within the domain and vertically through the matrix. The plume has a vertical extent of 250 ft, which means over the 6 years simulated it has traveled 0.1 feet per day. This is reasonable based on the geology of the area. If hypothetically, some of the constituents had escaped the liner since the CCP was added, it could not travel far enough to reach the wells or surface water.



## 8 Model Assumptions and Limitations

The model assumptions include the following:

- The steady-state flow model was calibrated to hydraulic heads measured at monitoring wells between 2015 and 2019. The model does not account for changing recharge or stage of the Cape Fear River, and is not calibrated to match transient (time-varying) measurements of groundwater levels. The steady-state calibration does not consider groundwater storage, and was not calibrated to groundwater fluxes into (or out of) adjacent surface water bodies, the latter of which there is insufficient data to use as a calibration target.
- Heterogeneity in the subsurface conditions may not be fully captured by the geologic data used to create the model and is necessarily generalized in the model. Such varying conditions result in uncertainty in the model outcome.
- It is assumed that constant-density Darcian-flow conditions occur throughout the model domain at all times, such that MODFLOW is an acceptable code to simulate the movement of groundwater in the shallow subsurface. Conditions may occur occasionally in which these assumptions do not hold. Examples would include: 1) seasonal temperature changes of the Cape Fear River affecting groundwater temperatures, thereby changing the viscosity and density of water, and thus the assumed constant hydraulic conductivity of the aquifer materials; and 2) when the same effects occur due to increase of concentrations of dissolved mass in the groundwater system. These conditions likely contribute to uncertainty in the model, however, other factors such as unknown heterogeneous subsurface conditions and time variability in aquifer stresses and recharge are likely larger sources of uncertainty.
- The uncertainty in model parameters and predictions has not been quantified.
   Therefore, the error in the model predictions is not known. It is assumed the model results are suitable for a relative comparison of transport scenarios.

This is an initial description of the assumptions and limitations of the modeling effort. Part of the process of performing applied modeling may include additional assessment of uncertainty, both in the model simulation results, and in the data that are used to develop and calibrate the model.



## 9 Findings

The model findings include the following:

- Water levels simulated by the model were consistent with water levels measured in onsite monitoring wells between August 2015 and October 2019, as indicated by water levels at individual points approaching the mean water level for that period and the overall predicted-to-observed water level residuals having a Root Mean Squared Error (RMSE) of 5.18 feet, which is less than the root mean square of two standard deviations for the observed data. This shows that the model predicted water levels are within the observed conditions and the model adequately represents groundwater flow given the measured conditions at the site.
- Groundwater flow direction simulated by the model is consistent with observations and measurements from recent semi-annual sampling activities. Groundwater flows east and west from a north-south trending historic ridge through the site.
- Particle tracking was used to simulate the farthest extent a CCP constituent would travel, given the hydrogeologic regime modeled. The model estimated that in most directions, groundwater only moved a few tens of feet from the base of the Structural Fill. At one location in the southeast corner of the Structural Fill, a small, low-concentration plume was predicted to move to the southeast. This plume remained within the footprint of the former mine and within the permitted boundary of the Structural Fill. Except for this location, water from beneath the Structural Fill would not have traveled far enough to reach the monitoring wells during the simulated timeframe and no water from the beneath the Structural Fill would arrive at surface water.
- The model indicates that if constituents escaped the liner, they would remain on-site, mostly directly beneath the Structural Fill and be found mostly in the Residuum, Transition Zone and PWR layers modeled.



## 10 References

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# Tables

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Table 6.1. Hydraulic Conductivity Estimates used in the Groundwater Flow Model

Material	Horizontal K (ft/d)	Vertical Anisotropy		
Over the condens				
Overburden	2	3		
Saprolite	1	2		
Transition Zone	2	2		
Rock	0.25	1		
Coastal	10	3		
L1P1	0.99	3		
L1P2	5.72	3		
L1P3	0.013	3		
L1P4	0.011	3		
L1P5	0.0012	3		
L1P6	0.0084	3		
L1P7	0.16	3		
L2P1	0.023	3		
L2P2	1.39	3		
L2P3	10	2		
L2P4	0.059	3		
L2P5	0.064	3		
L2P6	0.028	3		
L2P7	0.59	3		
L3P1	0.027	3		
L3P2	0.0056	3		
L3P3	10	2		
L3P4	12	2		
L3P5	0.041	3		
L4P1	0.053	1		
L5P1	0.065	1		



Table 6.2. Calibration Head Targets, Statistics, Computed Values, and Residuals

Monitoring Well Name	Screen Top Elevation	Screen Bottom Elevation	Mean Observed Head	95% Confidence Interval	Standard Deviation	Computed Head	Head Residual
BG-2	178.41	168.41	180.61	95	2.52	182.07	-1.46
MW-1	220.20	205.2	220.66	95	1.44	220.30	0.36
MW-2	197.45	182.45	197.18	95	5.41	212.43	-15.26
MW-3	194.20	179.2	204.70	95	6.06	205.86	-1.16
MW-4	201.79	191.79	205.66	95	2.31	206.53	-0.88
MW-5	208.72	198.72	223.15	95	6.19	218.24	4.91
MW-6	216.63	201.63	223.83	95	0.76	224.33	-0.50
MW-7	224.53	214.53	216.61	95	3.01	218.38	-1.77
MW-7R	213.99	203.99	202.79	95	2.50	222.36	-1.56
MW-8	202.41	187.41	199.79	95	1.09	201.07	-1.27

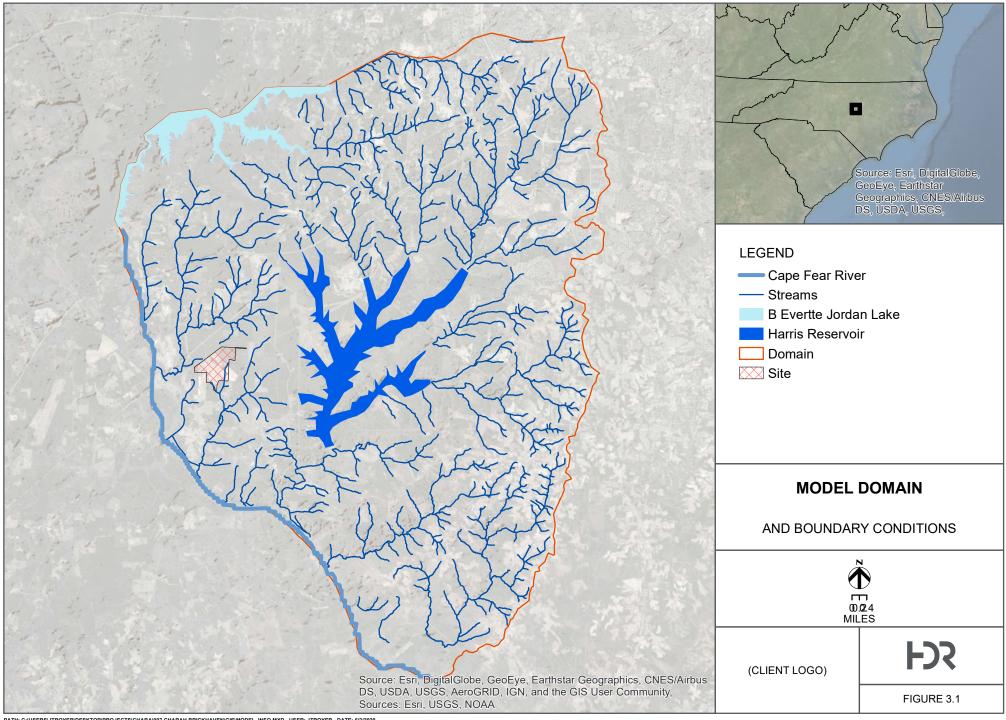
Note: Elevation and hydraulic head (head) are measured in feet and referenced to the North American Vertical Datum of 1983

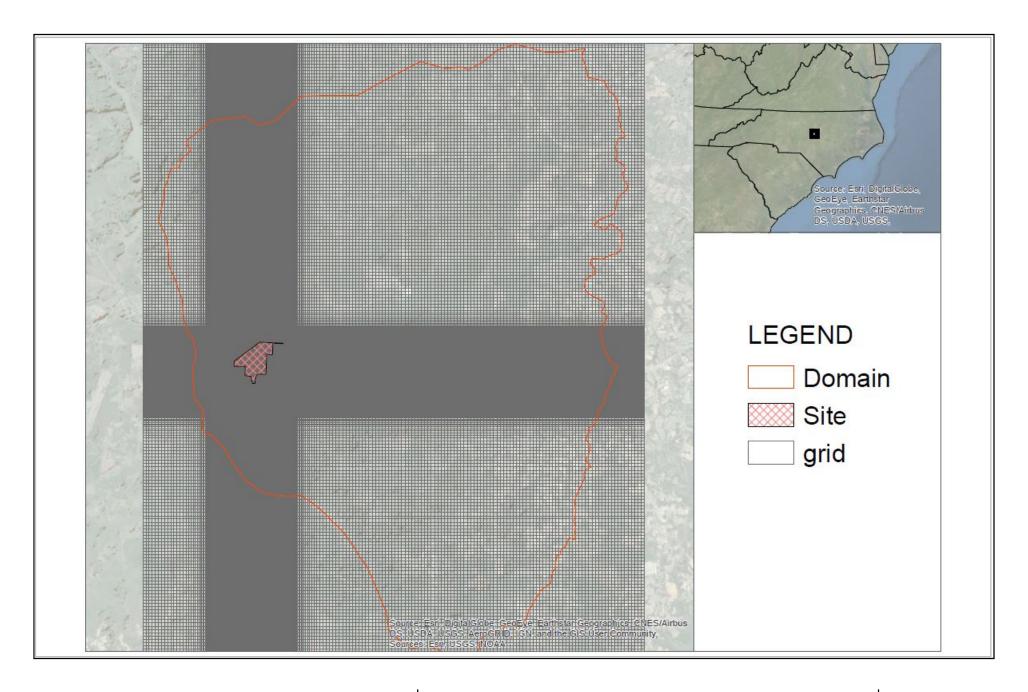


# Figures

FDR

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GRID FRAME CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

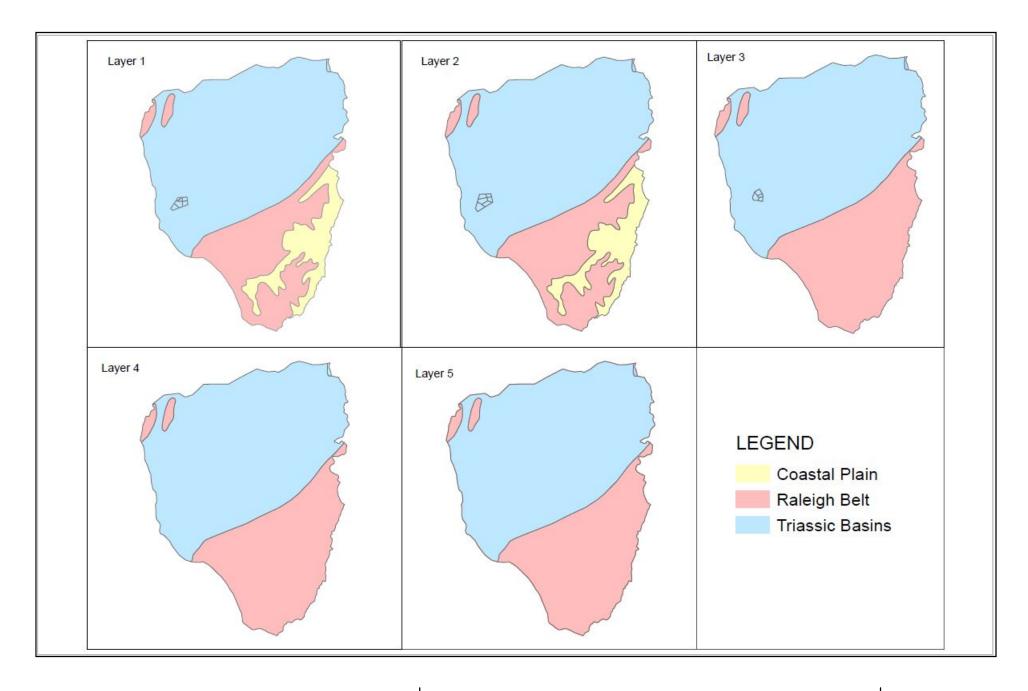
BRICKHAVEN NO. 2 MINE "A"

DATE

**JULY 2020** 

**FIGURE** 

5.1





MATERIAL DISTRIBUTION CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

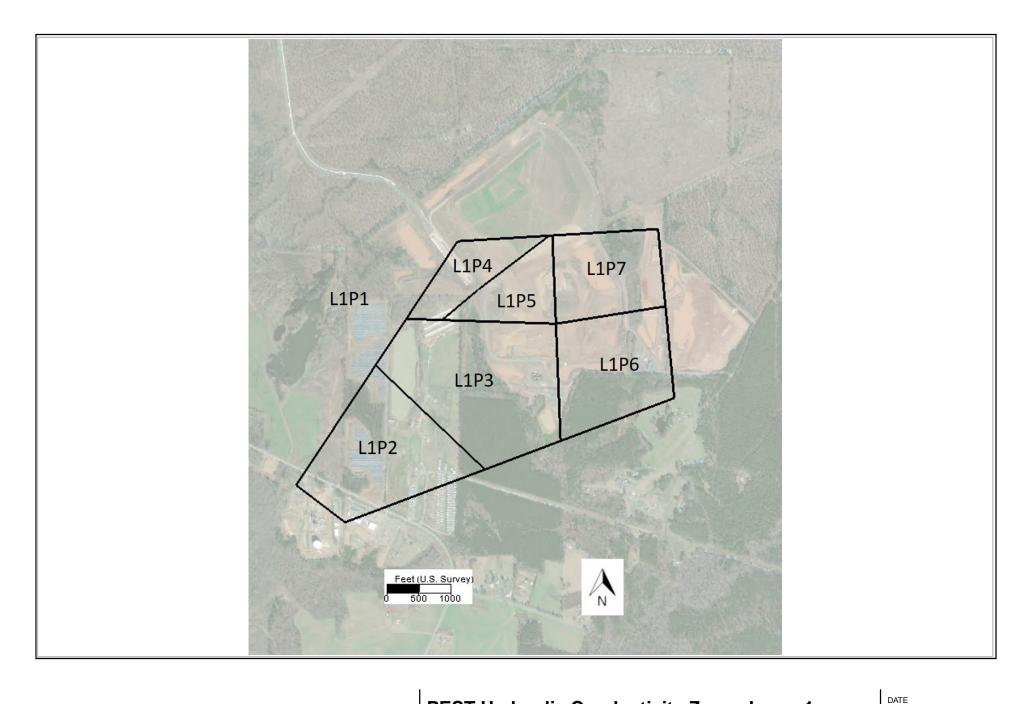
BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

FIGURE

5.2



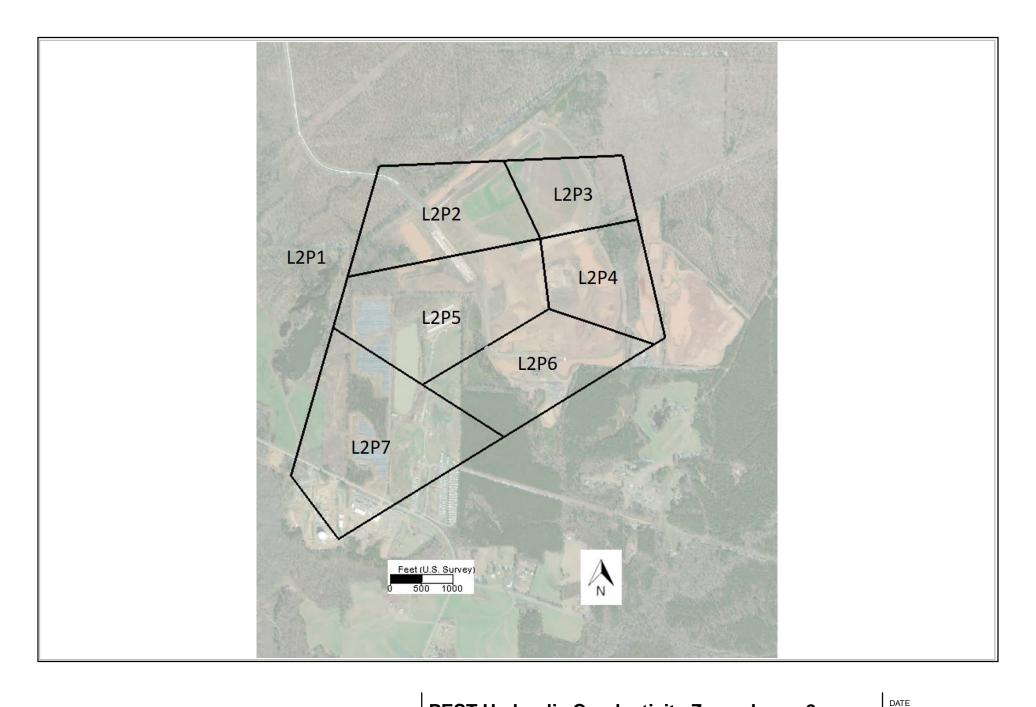


PEST Hydraulic Conductivity Zones Layer 1 CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

JULY 2020

FIGURE

6.1a



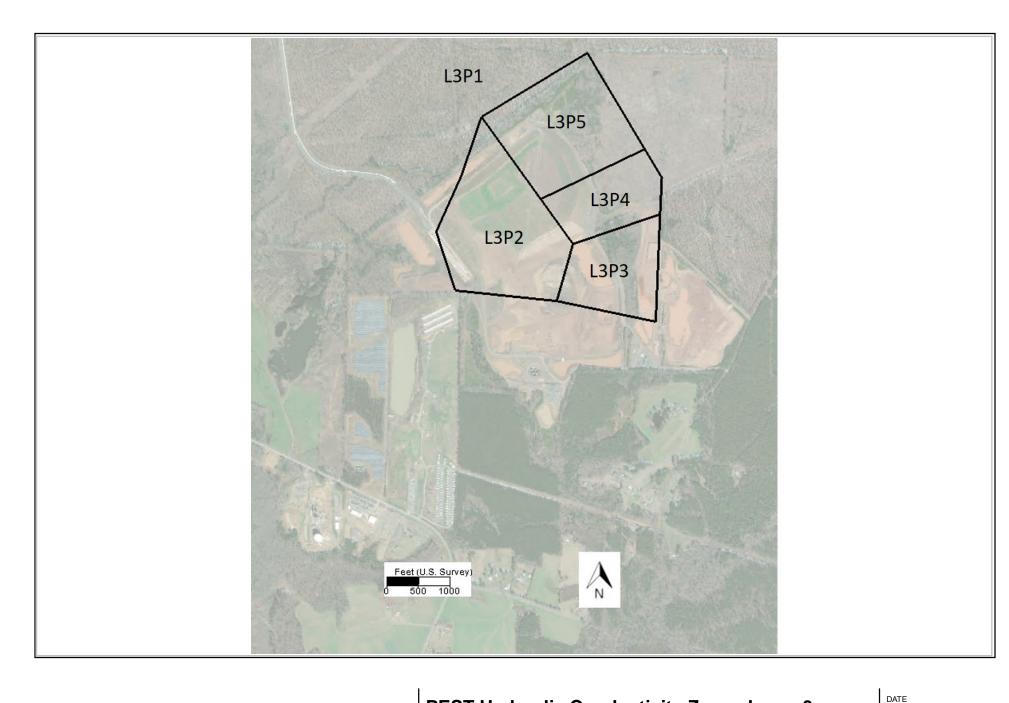


PEST Hydraulic Conductivity Zones Layer 2 CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

JULY 2020

FIGURE

6.1b



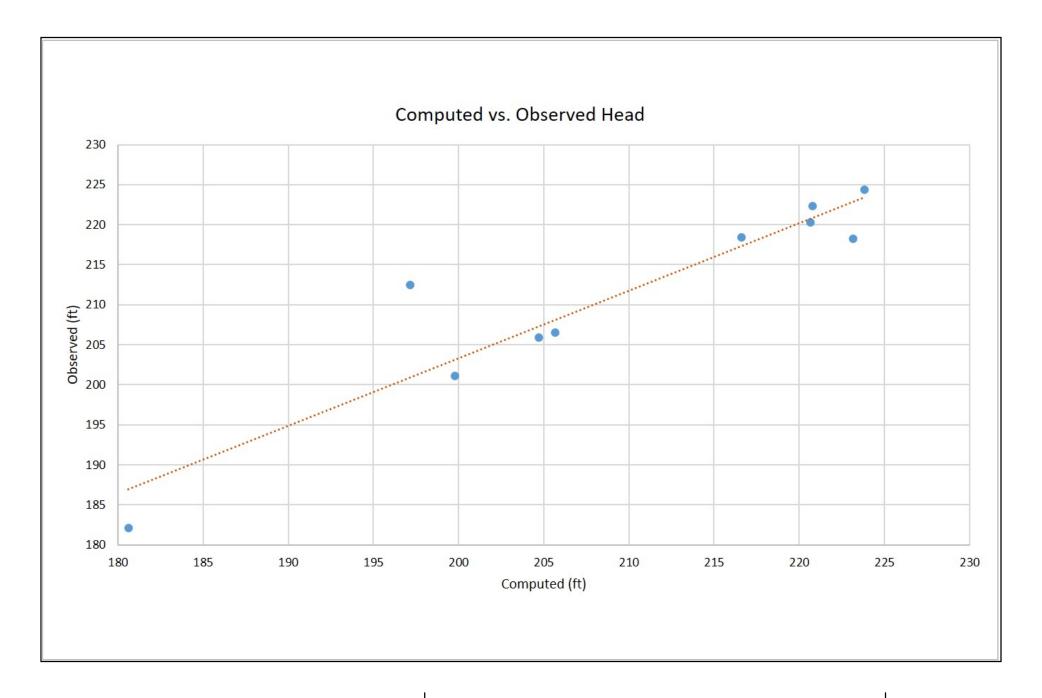


PEST Hydraulic Conductivity Zones Layer 3 CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

JULY 2020

FIGURE

6.1c





Computed vs. Observed Head CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

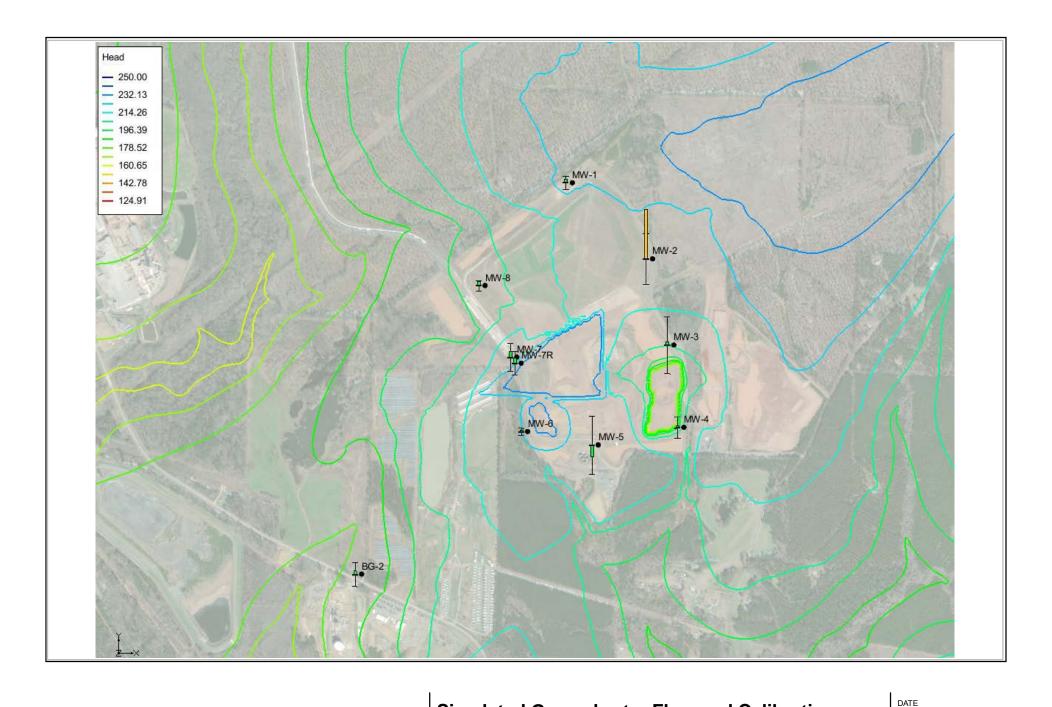
BRICKHAVEN NO. 2 MINE "A"

DATE

JULY 2020

**FIGURE** 

6.2





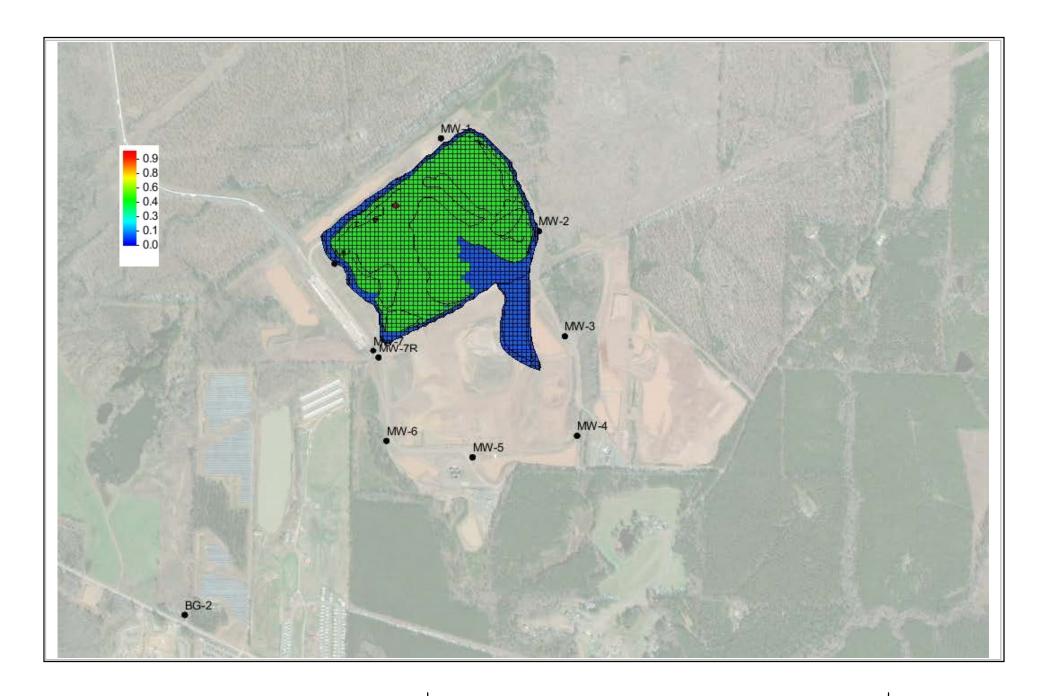
**Simulated Groundwater Flow and Calibration** CHARAH SOLUTIONS, INC.
MONCURE, NORTH CAROLINA

FIGURE

6.3

**JULY 2020** 

BRICKHAVEN NO. 2 MINE "A"





Plan View of MT3DMS Particle Tracking Plume CHARAH SOLUTIONS, INC. MONCURE, NORTH CAROLINA

DATE

JULY 2020

FIGURE

7.1



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