Grand Tower Energy Center, LLC

Application to Establish a Groundwater Management Zone (GMZ)

Grand Tower, Jackson County, Illinois

July 2019
Revision 2

The business of sustainability

ERM

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July 25, 2019

Illinois Environmental Protection Agency
1021 North Grand Avenue East
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Springfield, Illinois 62794-9276

Attention: Mr. William "Bill" Buscher

Reference: Application to Establish a Groundwater Management Zone (GMZ)
Grand Tower Energy Center, LLC (GTEC)
Grand Tower, Jackson County, Illinois
Revision 2

Mr. Buscher:

On behalf of Grand Tower Energy Center, LLC (GTEC), ERM NC, Inc. (ERM) is submitting the attached revision to the Application to Establish a Groundwater Mangement Zone (GMZ) for the inactive coal combustion waste (CCW) ash basin located on the GTEC facility property. The GMZ Application was originally submitted to the Illinois Environmental Protection Agency (IEPA) in January 2017. ERM subsequently received comments from IEPA in a letter dated June 6, 2017. ERM has incorporated responses to IEPA's comments in this document. ERM received additional comments from the IEPA on the GMZ Application on June 6, 2019. Responses to this letter are presented in Appendix 9 of this document

This application is made in accordance with the State of Illinois Administrative Code TITLE 35: Environmental Protection, SUBTITLE F: Public Water Supplies, CHAPTER I: Pollution Control Board, PART 620: Groundwater Quality regulations. This application is also made pursuant to an IEPA Violation Notice issued to Ameren; Grand Tower Generating Station, Identification No. 6285, Violation Notice W-2012-00062 dated June 27, 2012. The Violation Notice was issued subsequent to a Phase 1 Hydrogeologic Assessment Study performed at the facility by Natural Resource Technology, Inc. on behalf of Ameren Energy Generating Company (Ameren) conducted from October 2010 through March 2013. This study was performed in order to evaluate the potential for groundwater quality violations in the vicinity of the inactive CCW basin. The Violation Notice was issued due to exceedance of Class I Groundwater Quality Standards for pH, iron, manganese, boron, sulfate and Total Dissoved Solids (TDS) based on laboratory analytical results collected from four (4) monitoring wells in the immediate vicinity of the inactive CCW basin.

The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of Rockland Capital, and was purchased from Ameren in February 2014. Current ownership retained ERM to provide additional field studies, analyses and modeling necessary to submit this GMZ application. ERM previously met with IEPA personnel to discuss this project on June 29, 2016 at the IEPA Springfield office and have incorportated additional information requested during this meeting accordingly.

This application is based on historic monitoring, sampling and reporting of groundwater quality at the facility CCW basin performed by ERM and others. In accordance with comments in IEPA's June 6, 2017 letter to ERM, additional groundwater investigation was conducted. This investigation included the installation of additional monitoring wells, eight episodes of groundwater sampling, statistical assessment of the groundwater quality data, and revisions to modeling conducted to support the proposed closure scenario.

If you should have any questions or require additional information concerning this Application to Establish a GMZ, please contact us at your convenience.

Sincerely,

ERM NC, Inc.

David W. Wasiela, P.E.
Senior Engineer

Brett Carney, P.G.
Senior Geologist

John Dulude, P.E.
Principal

cc: Mr. Keith Feemster – Rockland Capital

Attachment: Application to Establish a Groundwater Mangement Zone (GMZ)

Application to Establish a Groundwater Management Zone (GMZ) pursuant to:

TITLE 35: ENVIRONMENTAL PROTECTION

SUBTITLE F: PUBLIC WATER SUPPLIES

CHAPTER I: POLLUTION CONTROL BOARD

PART 620: GROUNDWATER QUALITY

Owner:

Main Line Generation LLC

Grand Tower Energy Center, LLC (GTEC)

1820 Power Plant Road, Grand Tower, Illinois 62924

Prepared By:

ERM NC, Inc.

15720 Brixham Hill Avenue, Suite 120

Charlotte, North Carolina 28277

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1.0 Introduction

1.1 Regulatory Background

This Application to Establish a Groundwater Management Zone (GMZ) has been developed based on State of Illinois Administrative Code TITLE 35: Environmental Protection, SUBTITLE F: Public Water Supplies, CHAPTER I: Pollution Control Board, PART 620: Groundwater Quality. This submittal also contains information included in the guidance issued by IEPA, "Establishing a Groundwater Management Zone at RCRA Facilities" dated October 12, 2001. This application has been developed to meet or exceed the requirements set forth in Code of Federal Regulations (CFR) Part 257—Criteria for Classification of Solid Waste Disposal Facilities and Practices, Subpart D - Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments, 257.100 Inactive coal combustion waste (CCW) surface impoundments/ash basins.

1.2 Facility History

The Grand Tower Energy Center, LLC (GTEC) has reportedly produced electricity since 1951 utilizing both coal and oil fired boilers prior to converting to natural gas in 2001. While operating coal fired boilers, GTEC developed a CCW basin for both fly ash and bottom ash residuals. Reportedly, original construction of the basin contained an internal divider soil berm to segregate bottom ash and fly ash residuals. The earliest plans reviewed for the basin were prepared by Sargent & Lundy dated 1969. Based on plans dated 1985, the basin was expanded from an original 10 acre footprint to the approximate 21- acre footprint.

The CCW basin has not received CCW materials since converting to natural gas in 2001. The basin continues to receive low volume facility waste water, which discharges to an unnamed tributary of the Mississippi River under an active NPDES permit (NPDES Permit No. IL0000124). Subsequent to closure, the low volume waste will be diverted from the CCW basin to a treatment system within the power plant to eliminate influent sources from the basin.

In 2009, the GTEC owner at the time, Ameren Energy Generating Company (Ameren), was requested to provide a hydrogeologic assessment report for the CCW basin to evaluate groundwater quality data and determine if operation of the CCW basin had adversely affected groundwater. Ameren commissioned Natural Resource Technology, Inc. to perform the assessment and report findings. The assessment was executed beginning in 2010 and was completed in March 2013. A complete copy of this Phase 1 Hydrogelogic Assessment for the GTEC CCW basin is included in Appendix 1 for reference.

While the assessment was ongoing, GTEC received a Violation Notice from the Illinois Environmental Protection Agency (IEPA) (Violation Notice W-2012-00062 dated June 27, 2012). This violation notice was issued due to reported exceedances of Class I groundwater standards based on results from four (4) groundwater monitoring wells installed during the assessment. A copy of the Violation Notice is included in Appendix 2 for reference.

Current day, GTEC is a 478 Megawatt (MW) natural gas combined cycle facility that is located in Grand Tower, Illinois adjacent to the east bank of the Mississippi River. GTEC is located on about 300-acres of land and is a merchant facility, which sells energy and capacity into the Midcontinent Independent System Operator (MISO) system. The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of Rockland Capital, and was purchased from Ameren in February 2014.

In accordance with Federal CFR requirements for closure of inactive CCW ash basins, GTEC intends to close the basin in 2019 to meet the deadlines included in the Federal rules.

2.0 Facility Information

Facility name: Grand Tower Energy Center, LLC (GTEC)

Facility address: 1820 Power Plant Road, Grand Tower, Illinois 62924

County in which facility is located: Jackson

IEPA, Bureau of Land, and United States Environmental Protection Agency (USEPA) Identification Numbers: IEPA ID# 6285

A general description of the type of industry, products manufactured, raw materials used, location and size of the facility, including SIC codes: GTEC is a 478 MW natural gas combined cycle facility that is located in Grand Tower, Illinois adjacent to the east bank of the Mississippi River. GTEC is located on 300 acres of land and is a merchant facility, which sells energy and capacity into the MISO system. The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of Rockland Capital, and was purchased from Ameren in February 2014. The facility operates under the SIC codes (and corresponding NAICS Codes) listed below.

SIC Codes:
4911 - Electric Services (other electric power generation)
4931 - Electric and Other Services Combined (other electric power generation)
4939 - Combination Utilities, NEC (other electric power generation)

NAICS Codes:
2211 - Electric Power Generation, Transmission and Distribution
221119 - Other Electric Power Generation
22112 - Electric Power Transmission, Control, and Distribution
221121 - Electric Bulk Power Transmission and Control

GTEC has reportedly produced electricity since 1951 utilizing both coal and oil fired boilers prior to converting to natural gas in 2001. Under current operating conditions, the facility stores and utilizes various materials for on-going operations including:

Lubrication oil	Unleaded gasoline	Degreasing solvents
Hydraulic fluid	Sulfuric acid	Coagulant polymers
Transformer oil	Sodium hydroxide	Liquid nitrogen
Kerosene	Ammonia (solution)	Pressurized hydrogen gas
Diesel fuel	Isopropyl alcohol	

3.0 Identification of Specific Units

The unit identified for this application to establish a GMZ is an inactive CCW basin about 21-acres in size. This basin is located south of the GTEC power plant and east of the Mississippi River as shown in Figure 1 – Site Location Plan and Figure 2 – USGS Site Location Plan. As stated previously, this basin was reportedly constructed in 1969 based on original design plans prepared by Sargent & Lundy. The locations of monitoring wells on the site and the GMZ are shown on Figure 3 of this document.

4.0 Facility Maps & Drawings

In addition to the site location figures previously mentioned, ERM developed site specific plans for closure of the CCW basin located at the GTEC facility using an updated topographic survey prepared by Klingner & Associates, P.C., dated January 21, 2016. This survey was performed as part of ERM's efforts to evaluate CCW basin closure alternatives available based on existing site conditions, subsurface soil conditions and surrounding hydrogeologic setting.

This plan set is included in Appendix 3 for reference and includes the following:

Sheet 1: Topographic Survey – Existing Site Conditions
Sheet 2: General Notes
Sheet 3: Subsurface Exploration 2015 – 2016
Sheet 4: Bottom of Ash Grading Plan
Sheet 5: Cross Sections – Existing Site Conditions
Sheet 6: Erosion and Sediment Control Grading Plan
Sheet 7: Ash Re-Grading Plan
Sheet 8: Final Closure Grading Plan
Sheet 9: Final Closure Cross Section Plan
Sheet 10: Erosion and Sedimentation Plan Details (1 of 2)
Sheet 11: Erosion and Sedimentation Plan Details (2 of 2)
Sheet 12: Closure Details

This plan set was developed as ERM worked with the owner to evaluate potential closure alternatives for the CCW basin in accordance with the regulatory framework referenced in Section 1.1.

5.0 Groundwater Classification

Based on soil borings and monitoring wells previously completed on the site, groundwater at the GTEC facility is classified as Class I Groundwater. This designation is in accordance with TITLE 35: ENVIRONMENTAL PROTECTION, SUBTITLE F: PUBLIC WATER

SUPPLIES, CHAPTER I: POLLUTION CONTROL BOARD, PART 620 - GROUNDWATER QUALITY. As stated in Section 620.210, Class I: Potable Resource Groundwater is designated as:

a) Groundwater located 10 feet or more below the land surface and within:

1) The minimum setback zone of a well which serves as a potable water supply and to the bottom of such well;

2) Unconsolidated sand, gravel or sand and gravel which is 5 feet or more in thickness and that contains 12 percent or less of fines (i.e., fines which pass through a No. 200 sieve tested according to ASTM Standard Practice D2487-06, incorporated by reference at Section 620.125);

3) Sandstone which is 10 feet or more in thickness, or fractured carbonate which is 15 feet or more in thickness; or

4) Any geologic material which is capable of a:

A) Sustained groundwater yield, from up to a 12 inch borehole, of 150 gallons per day or more from a thickness of 15 feet or less; or

B) Hydraulic conductivity of 1×10^{-4} cm/sec or greater using one of the following test methods or its equivalent:
i) Permeameter;
ii) Slug test; or
iii) Pump test.

6.0 Constituents of Concern

During the Phase 1 Hydrogeologic Assessment performed by Natural Resource Technology, Inc. from 2010 through 2013 (Appendix 1), groundwater samples were collected on a quarterly basis for a period of two years from four monitoring wells (APW-1, APW -2, APW-3 & APW-4) surrounding the CCW basin. Well APW-1 is located upgradient of the CCW basin and serves as the background groundwater quality well for the site. The remaining three wells are located east, south and west of the CCW basin to act as sentinel wells for detection monitoring. Locations of these wells are shown on Figure 3.

These wells were sampled during eight consecutive calendar quarters from November 2010 through August 2012 with laboratory analyses for inorganic constituents listed under Title 35, 620.410 with the exception of radium 226 and 228.

As a result of these efforts, the following was concluded from the Natural Resource Technology, Inc., Phase 1 Hydrogeologic Assessment at the GTEC CCW basin (taken directly form Phase 1 Report below):

"

The primary conclusion from voluntary monitoring of groundwater at the Grand Tower CCP impoundment is that operation of the impoundment has caused exceedances of Class I groundwater quality standards for boron and sulfate. The Class I standards for manganese and iron are also exceeded in places, although these concentrations are attributed to naturally occurring causes. Exceedances of Class I standards for pH and TDS are also not related to CCP impoundment operation. Furthermore:
■ The surficial lithologic unit at the site consists of fine-grained alluvium; CCP indicator constituent concentrations in underlying groundwater indicate that there is a vertical migration pathway through the surficial deposits. ■ Groundwater flow at the site is dependent on Mississippi River stage. Flow is inland during periods of high stage, and toward the river during periods of low stage. ■ Due to occasional groundwater flow reversals, there is potential for off-site migration toward the closest property boundary southeast of the CCP impoundment. This potential for off-site migration during groundwater flow reversals also suggests that the town of Grand Tower community water supply wells cannot be ruled out as potential receptors; although this would be a large distance (1.3 miles) for groundwater to migrate from the CCP impoundment. ■ Arsenic and barium had elevated concentrations relative to background in APW-2, a monitoring well between the impoundment and the river; and selenium had elevated concentrations in APW-4, which is located west of (inland from) the impoundment. The barium and selenium concentrations were lower than Class I groundwater quality standards, and the arsenic concentrations were lower than the Class I standard in effect at the time of sampling, although the first two arsenic samples had concentrations that would be higher than the standard that went into effect in October 2012. Chloride and TDS also have downgradient concentrations that, while lower than Class I standards, appear to reflect impacts from the CCP impoundment. ■ A conservative estimate of boron loading to the Mississippi River suggests that the incremental boron concentration increase in the river caused by leachate released from the CCP impoundment is not measurable.

"

The IEPA's June 27, 2012 Violation Notice W-2012-00062 (Appendix 2) listed constituents of concern in groundwater to include iron, manganese, boron and sulfate, along with pH and total dissolved solids (TDS).

ERM performed groundwater sampling of Monitoring Wells APW-1, APW-3 and APW-4 in August 2016. Unfortunately, Well APW-2 was not accessible for personnel and sampling equipment due to excessive vegetation growth in the immediate vicinity. ERM returned to the site in December 2016 to further evaluate groundwater quality. Upon arrival, well APW-1 was determined to be damaged from an apparent equipment or vehicle strike and could not be sampled. The remainder of the wells were sampled and analyzed with results included in Table 1 below.

Samples were obtained using low-flow sampling techniques and analyzed for total metals and anions, which differs from the bailer sampling and field filtering conducted previously. Results are presented in Table 1 and included in Appendix 4. Results of this sampling are presented in Appendix 4 and summarized in Table 1 below. Based on the August 2016 sampling event, boron and pH were detected at concentrations exceeding the Class I groundwater quality standards defined in Part 620 in some of the wells (APW-2 not sampled during this event). The pH exceedance indicated in the 2016 sampling work

occurred for the upgradient "background" Well APW-1. The December 2016 sampling event showed that boron, manganese, and iron exceeded the Class I groundwater quality standards at some of the wells.

COMPARISON OF HISTORIC SAMPLING RESULTS WITH ERM 2016 SAMPLING

Historic Average Results for Constituents (Performed by Others) - Dissolved Analytical

Well #	Sulfate (mg/l)	Iron (mg/l)	Manganese (mg/l)	Boron (mg/l)	TDS (mg/l)	pH
APW-1	46	ND	0.034	0.28	399	6.44
APW-2	391	6.1	0.66	7.0	829	7.04
APW-3	232	0.45	0.28	4.7	435	6.43
APW-4	184	0.051	0.12	4.8	553	7.24
Class I Standard	400	5	0.15	2	1,200	6.5 - 9.0

Based on reported "Mean" values over 8 calendar quarters (11/2010 - 8/2012)

ERM August 2016 Sampling Results - Results based on Totals (Not Dissolved)

Well #	Sulfate (mg/l)	Iron (mg/l)	Manganese (mg/l)	Boron (mg/l)	TDS (mg/l)	pH
APW-1	27	1.43	0.124	0.192	192	6.47
APW-2	See Note Below		---	---	---	---
APW-3	26	1.19	0.048	0.34	214	7.76
APW-4	130	1.19	0.062	2.56	470	7.27
Class I Standard	400	5	0.15	2	1,200	6.5 - 9.0

Based on sampling event on August 25, 2016 - APW-2 was not accessible

ERM December 2016 Sampling Results - Results based on Totals (Not Dissolved)

Well #	Sulfate (mg/l)	Iron (mg/l)	Manganese (mg/l)	Boron (mg/l)	TDS (mg/l)	pH
APW-1	See Note Below		---	---	---	---
APW-2	330	17.8	0.71	6.27	670	7.2
APW-3	210	4.85	0.64	2.8	552	7.55
APW-4	130	0.45	0.066	2.35	502	7.33
Class I Standard	400	5	0.15	2	1,200	6.5 - 9.0

Based on sampling event on December 1, 2016 - APW-1 damaged prior to arriving on site

TABLE 1

In a letter dated June 6, 2017, IEPA provided comments to ERM that included a request for additional monitoring wells and sampling for analyses of Appendix III and IV parameters, as defined by CFR 257, for all existing and new wells. ERM installed eight additional monitoring wells in August 2017. Boring and well construction logs are provided in the attached August 2018 Annual Groundwater Monitoring Report, which is included in Appendix 5. The locations of these monitoring wells are shown on Figure 3.

Eight episodes of groundwater sampling were conducted from September 2017 through February 2018 to establish background concentrations on the Site and to conduct a preliminary evaluation to determine if the CCW basin is impacting groundwater quality. Wells were sampled using low flow conditions and a submersible pump with dedicated tubing. Based on the sampling data and statistical analyses of the results, the following analytes and wells were above the Class I groundwater quality standards defined in Part 620 during the 2017-2018 sampling event:

- Arsenic in well APW-10S;
- Boron in well APW-2, APW-3, APW-5, APW-6D, and APW-6S;
- Calcium in well APW-10D, APW-10S, APW-2, APW-5, and APW-7;
- Lithium in well APW-2 and APW-4;
- Molybdenum in well APW-2, APW-5, and APW-6S; and
- Sulfate in well APW-2.

In accordance with 40 CFR §257.93(f), statistical methods for evaluating groundwater monitoring data for each specified constituent were utilized at the Site to establish background concentrations for parameters with no state or federal standard, to assess the statistical validity of the data, and to help establish whether exceedances to standards are related to the basin. Based on the statistical analyses, up to six Appendix III or IV parameters exceed background or regulatory standards. These exceedances do not impact the existing closure plans for the GTEC ash basin. The statistical analyses is presented in Appendix 5.

Based on the previous work performed, the Violation Notice issued, and ERM's continuing work at the site, the constituents of concern for this facility are boron, sulfate, calcium, molybdenum, lithium, pH and TDS. The presence of arsenic at APW-10S is not believed to be related to the basin on the Site due to its location and the lack of exceedances at wells located between the basin and the APW-10S well.

7.0 Groundwater Monitoring

Regional Geology

From previous work performed at the site, subsequent ERM field work, and available literature, the GTEC facility is located in the Mississippi Valley where Quaternary coarse-grained outwash deposits of the Henry Formation are overlain by channel and floodplain deposits of the Cahokia Formation (Berg and Kempton; 1987; Linebeck, 1979). The outwash of the Henry Formation generally consists of sands and gravels, and is a significant aquifer under the site. Historic well logs suggest the Henry Formation ranges in thickness from 150 to 200 feet in the GTEC area. The Cahokia Formation consists primarily of overbank and modern river and stream deposits, and is comprised more commonly of finer-grained silt and clay with occasional sand seams. This unit is the uppermost saturated unit under the site. Wells on the site are screened within the Henry Formation, which appears to be hydraulically connected to the Cahokia Formation.

Site Hydrology

As stated previously, groundwater monitoring was performed at the GTEC facility for eight (8) consecutive calendar quarters from November 2010 through August 2012 (Natural Resource Technology, Inc., Phase 1 Hydrogeologic Assessment – Appendix 1), by ERM in August and December 2016, and during eight episodes between September 2017 and February 2018. The groundwater monitoring well network consists of 10 monitoring wells in the upper Henry Formation (APW-1, APW-2, APW-3, APW-4, APW-5, APW-6S, APW-7, APW-8, APW-9, and APW-10S) and two monitoring wells at the base of the Henry Formation (APW-6D and APW-10D) surrounding the CCW basin. The locations of these wells are shown on Figure 3. These wells are screened within the sands of the Henry Formation, which appear to be hydraulically connected to the saturated soils in the Cahokia Formation. Historical groundwater elevations indicate that groundwater flow is primarily to the west and southwest, along and toward the Mississippi River, except during periods of elevated river stage, when groundwater flow is reversed and toward the east. Based on groundwater monitoring conducted previously, monitoring wells APW-1 and APW-9 are located upgradient of the CCW basin and serve as the background groundwater quality wells for the site. The remaining wells are located east, south and west of the CCW basin, and act as sentinel wells for detection monitoring. It should be noted that shallow and deep wells (APW-10S and APW-10D) were installed on the southern GTEC property boundary, to evaluate groundwater quality upgradient of a public water supply well in the city of Grand Tower, which is about 1.1 miles south of these monitoring wells.

Piezometers installed by ERM into the uppermost saturated unit beneath the CCR basin (Cahokia Formation) were subjected to aquifer testing to determine the hydraulic conductivity of the aquifer under the site. Results of this testing indicate that the mean hydraulic conductivity of the piezometers is 5.73 ft/day or 2.0×10^{-3} cm/sec (Individual results presented in Table 2). The mean hydraulic conductivity of the Henry Formation aquifer varied between3.77×10^{-3} cm/sec in the upper Henry Formation to 2.44×10^{-2} cm/sec in the lower Henry Formation. Aquifer hydraulic conductivities used in groundwater modeling are presented in the August 2018 Annual Groundwater Monitoring Report in Appendix 5.

Due to the historic information and results received from these wells, GTEC intends to continue utilizing the APW wells in the monitoring well network moving forward.

Bouwer and Rice Slug Test Analysis for Fully Penetrating Wells
GTEC - Grand Tower, IL

		K (Ft/Day)	K (Cm/Sec)	Avg. K (Cm/Sec)
P-1	Rising Head Test 1	0.25	8.82E-05	1.48E-04
	Rising Head Test 2	0.25	8.82E-05	
	Falling Head Test 1	0.54	1.91E-04	
	Falling Head Test 2	0.64	2.26E-04	
P-2	Rising Head Test 1	23	8.11E-03	8.11E-03
	Rising Head Test 2	22	7.76E-03	
	Rising Head Test 3	22	7.76E-03	
	Falling Head Test 1	26	9.17E-03	
	Falling Head Test 2	23	8.11E-03	
	Falling Head Test 3	22	7.76E-03	
P-3	Rising Head Test 1	0.21	7.41E-05	8.38E-05
	Rising Head Test 2	0.23	8.11E-05	
	Falling Head Test 1	0.25	8.82E-05	
	Falling Head Test 2	0.26	9.17E-05	
P-4	Rising Head Test 1	0.17	6.00E-05	8.29E-05
	Rising Head Test 2	0.2	7.06E-05	
	Falling Head Test 1	0.31	1.09E-04	
	Falling Head Test 2	0.26	9.17E-05	
P-5	Rising Head Test 1	1.3	4.59E-04	4.50E-04
	Rising Head Test 2	1.4	4.94E-04	
	Falling Head Test 1	1.2	4.23E-04	
	Falling Head Test 2	1.2	4.23E-04	
P-6	Rising Head Test 1	0.65	2.29E-04	2.21E-04
	Rising Head Test 2	0.62	2.19E-04	
	Falling Head Test 1	0.58	2.05E-04	
	Falling Head Test 2	0.66	2.33E-04	

Table 2

Hydraulic conductivities of monitoring wells screened in the Cahokia Formation

8.0 Schedule for Investigation

The Phase 1 Hydrogeologic Assessment was completed March 19, 2013 by Natural Resource Technology, Inc. on behalf of Ameren (Appendix 1). The assessment included the installation of four monitoring wells, investigation of local and regional hydrogeology, groundwater monitoring, analytical testing over eight (8) consecutive calendar quarters, and a presentation of potential groundwater impacts associated with the on site CCW basin.

As a compliment and expansion to the previous work, ERM conducted additional field exploration, testing and evaluations from November 2015 through August 2016. Field work conducted by ERM included the following:

- Performed twenty (20) auger probes within the CCW basin limits to record depth of disposed CCW materials and sample underlying soils;
- Retrieved six (6) undisturbed soil samples at the bottom of the CCW basin for geotechnical laboratory testing and assessment of liner conditions;
- Performed three (3) soil test borings along the CCW basin west embankment to evaluate existing conditions of the embankment/soils in place;
- Retained two (2) bulk samples of containment berm soils for geotechnical laboratory testing;
- Installed six (6) temporary piezometers within soil test borings for groundwater studies to verify groundwater flow conditions at the site;
- Developed an updated site topographic survey including the horizontal and vertical locations of the auger probes, soil test borings, and piezometers;
- Conduct field testing for in-situ permeability of well screened intervals; and
- Collect groundwater elevations.

Results of ERM's additional field and laboratory work is included in Appendices 4 and 6 for reference.

Based on the 20 auger probes advanced within the basin limits, a consistent layer of clay, silty clay, or clayey silt was encountered at the base of all locations ranging in elevation from a low of 348 (A-20) to a high of 357.4 (A-17). CCW materials were encountered at all of the auger probes above the clayey layer. Undisturbed samples of the clay soils under the ash layer were retained at six (6) representative auger probe locations and tested for undisturbed coefficient of permeability testing. Results are presented below and included in Appendix 6.

BORING #	DEPTH BELOW GROUND SURFACE	COEFFICIENT OF PERMEABILITY (k), (CM/SEC)
A-1	28 - 30.5 FT	1.6×10^{-5} cm/sec
A-4	26 - 28.5 FT	8.5×10^{-8} cm/sec
A-6	23 - 25.5 FT	9.3×10^{-6} cm/sec
A-10	32 - 34.5 FT	1.0×10^{-6} cm/sec
A-15	26 - 28.5 FT	8.4×10^{-8} cm/sec
A-19	25 - 27.5 FT	5.9×10^{-8} cm/sec

Laboratory Testing performed by Klingler, Hannibal, MO

Based on the three (3) soil test borings advanced in the CCW basin western containment berm, the berm is constructed of primarily silty clay soils that would be suitable to use for closure construction efforts. A standard Proctor moisture-density relationship test was performed on bulk samples retrieved from cuttings at Borings B-1 and B-3 (included in Appendix 4) for verification of soil properties.

ERM installed six (6) piezometers/observation wells around the perimeter of the CCW basin to evaluate and confirm hydrogeologic conditions in the immediate vicinity of the site. Predominantly, the data obtained from installing these piezometers confirm the presence of silty and clayey sediments overlaying sands of the Henry Formation. These piezometers are screened primarily in the Cahokia Formation. Monitoring from these piezometers, in conjunction with data from the wells screened in the Henry Formation, indicate that the units appear to be hydraulically connected, with the saturated Cahokia soils serving as a vertical percolation or recharge zone for the Henry Formation. Groundwater elevations in the piezometers are typically higher than those in the nearby Henry Formation wells. Table 3 illustrates the groundwater elevation relationship between two adjacent wells; P-4 in shallow Cahokia soils and APW-2 in Henry Formation soils. Based on this data, it appears there is a strong downward vertical gradient between the two formations. The downward gradient dissipates during periods of elevated river stage, based on monitoring during the(late December 2015 to January 2016 Mississippi River flooding).

Well Identification	P-4		APW-2		Vertical Downward Gradient (ft)
Top of Casing Elevation(1)	361.7		362.3		
Depth to Water/Elevation	Depth (ft)	Elevation	Depth (ft)	Elevation	
Date					
12/11/2015-12/12/2015	11.31	350.39	19.1	343.2	7.19
12/16/2015	12.1	349.6	16.81	345.49	4.11
12/23/2015	8.11	353.59	10.31	351.99	1.6
1/19/2016	9.14	352.56	14.45	347.85	4.71
3/9/2016	13.69	348.01	22.12	340.18	7.83

Table 3 - Comparison of Shallow Well P-4 & Deep Well APW-2

With this vertically downward movement, the Henry Formation wells are the targets for continued monitoring.

Investigation information related to the August 2017 monitoring well installations was discussed above and is presented in the August 2018 Annual Groundwater Monitoring Report (see Appendix 5).

9.0 Groundwater Monitoring Results

As stated previously, groundwater monitoring was performed for eight (8) consecutive calendar quarters from November 2010 through August 2012 with laboratory analyses for inorganic constituents listed under Title 35, 620.410 with the exception of radium 226 and 228. The results of this sampling are discussed above and in Appendix 1, and indicate that impacts from the basin occur in the vicinity of the basin. These wells (APW-1 through APW-4) are screened in the Henry Formation sands, which is the primary aquifer under the site. ERM also sampled these wells in August and December 2016 and, after installation of eight additional wells in August 2017, during eight events from September 2017 through February 2018 to obtain more recent data. The analytes during the 2017 and 2018 sampling events included the Appendix III and IV parameters.

Based on the data collected during the initial Hydrogeologic Assessment, a Violation Notice W-2012-00062, which was issued by IEPA on June 27, 2012 (Appendix 2), listed constituents of concern in groundwater to include iron, manganese, boron and sulfate along with pH and total dissolved solids (TDS) in unacceptable ranges for Class I groundwater standards.

This application to establish a GMZ for the CCW basin is based on these historical findings and the violation notice. Based on these previous investigations, groundwater in the vicinity of the GTEC CCW basin appears to be impacted with constituents including:

- Calcium
- Molybdenum
- Lithium
- Sulfate
- Boron
- pH
- Total dissolved solids (TDS)

10.0 Proposed Remedy Description

ERM evaluated a number of potential corrective actions using our experience for similar projects and site-specific data available for consideration. The following alternatives were evaluated for the GTEC CCW basin:

1. CCW Basin Reconstruction Closure (Source Area Control)
2. Site Monitoring with No Groundwater Collection
2. Groundwater Collection Trench
3. Containment Using a Low Permeable Vertical Barrier
4. Ash Stabilization
5. Ash Removal and Disposal

Each alternative is discussed briefly below.

CCW Surface Basin Reconstruction Closure (Source Area Control)

Based on the hydrogeologic information available, CCW basin reconstruction and closure appears to be a viable long term corrective action. The CCW basin may be reconstructed to condense the overall footprint to approximately 14 acres as shown on the proposed closure plans (Appendix 3). Reconstruction of the basin would include the following:

- Removal and stockpiling of all available clean soils in and around the basin footprint to use as cover soils.
- Re-grading of CCW materials to promote long term drainage utilizing 4H:1V side slopes and minimum 5% drainage slope across the surface.
- Installation of a 40-mil linear low density polyethylene liner (LLDPE) with geocomposite drainage media across the entire reconstructed footprint.

- Removal of the western containment berm to provide construction soils and cover soils to avoid importing from off-site. Approximately 55,000 cubic yards would cost $800,000 to import from off-site compared to $220,000 to utilize on-site materials ($600,000 savings).
- Permanently seed and establish vegetation for long term stability.

This alternative will greatly reduce or eliminate the continued migration of rainfall into and through CCW materials and into underlying water bearing zones by deflecting water via overland flow off of the basin and not through it. This alternative is considered an effective corrective action for implementation of a groundwater management zone for IEPA approval.

Site Monitoring with No Groundwater Collection

Based on analytical monitoring performed on the site, groundwater constituents of concern (boron, sulfate, TDS, pH, molybdenum, lithium, and calcium) generally do not show a declining trend over time but rather a constant level of concentration. With the last receipt of CCW materials into the basin occurring in 2001, natural attenuation, which would be indicated by a declining trend in constituents, does not appear to be occurring. With the lack of declining groundwater constituent of concern trends, it is our opinion that this alternative should not be considered for this site.

Groundwater Collection Trench

Based on the preliminary hydrogeologic data for the CCW basin, groundwater impacts are present in the upper Henry Formation, which consists of primarily fine to coarse sands with some gravels. A confining layer or aquitard layer of clayey soils was not encountered at any of the monitoring well locations extending to depths greater than 58 ft below ground surface with exception to APW-6D, which encountered a clayey silt seam from about 58 to 75 feet below grade. Installation of a groundwater collection trench is viable if the vertical limits of impacted groundwater flow can be identified and collected, there is a basal confining layer to key the trench into, and depth of containment is not excessive. Based on the information at this time, a groundwater collection trench does not appear to be an effective corrective measure for the GTEC site.

Containment Using a Low Permeable Vertical Barrier

For the same reasons discussed above in the Groundwater Collection Trench alternative, the lack of a basal confining layer in the upper 58 feet of the formation does not appear to allow for a low permeable vertical barrier to be an effective corrective measure for the GTEC site.

Ash Stabilization

Using this alternative, the coal ash would be solidified into a solid block of coal ash. Creating a solid block of material traps the material and its constituents in place and also decreases the permeability of the material. Under this alternative, cement or a similar

pozzolanic agent would be used as the binding agent, which would be mixed in with the existing coal ash material to create a monolithic mass. This work would be conducted using a specially designed auger mechanism that is attached to a crane. The auger mechanism injects and mixes the binding agent into the coal ash. This process is repeated over the entire coal ash deposit until the entire fill has been mixed. This alternative would not address the long term infiltration of rainfall through the ash fill, although flow through the solidified mass would be greatly reduced due to a decrease in permeability. Estimated solidification cost averages $550,000 to $670,000 per acre for the approximate CCW depth of 20 feet. For the approximate 20-acre basin footprint, the estimated stabilization costs would be $10.5 to $12.7 million. For these reasons, this alternative does not appear feasible as an effective long term corrective action.

Ash Removal and Disposal

The Ash Removal and Disposal alternative will require the procurement of an appropriately permitted solid waste disposal facility and loading and hauling of approximately 750,000 tons (640,000 cubic yards) of CCW materials. A typical gate rate for a Subtitle D landfill in this area of Illinois is $36 to $42 per ton of waste. Not including the transportation hauling costs, the tipping fees would exceed $27 million. Therefore, this alternative does not appear to be economically feasible.

Proposed Alternative

The proposed remedy for the GTEC CCW basin is source area control with intrinsic (natural attenuation) remediation and performance monitoring. Source area control will be executed by re-grading CCW materials and condensing the disposal footprint, followed by installation of a 40-mil LLDPE synthetic cap. This cap, along with drainage improvements, will provide source control measures that will significantly reduce or eliminate rainfall infiltration and leachate generation from the CCW basin. This decrease in leachate generation will mitigate the migration of constituents to groundwater at the site and will allow the gradual reduction of constituent concentrations in groundwater to levels protective of human health, as discussed below and in the Technical Memorandum provided in Appendix 7. Improvements to water quality as a result of the synthetic cap installation and drainage modifications will be monitored via the existing network of groundwater monitoring wells.

Following selection of this remedy, ERM developed proposed closure plans (Appendix 3) incorporating subsurface data collected from the site. Using these plans, ERM utilized the Hydraulic Evaluation of Landfill Performance (HELP) Model to developed a 30–year simulation of rainfall infiltration into and through CCW materials 1) based on current conditions and 2) following closure using the selected remedy. Based on results of the simulations, rainfall infiltration through CCW materials and into the upper Henry Formation will reduce from an annual average total infiltration of 490,000 gallons per year (existing conditions) to 33 gallons per year (post closure). Therefore, the installation of the proposed cap system will provide effective source area control. HELP modeling results are presented in Appendix 8.

11.0 Proposed Remedy – Groundwater Modeling

Model set-up, calibration, assumptions, and results are presented in Appendix 8. The Graphical User Interface (GUI) Visual MODFLOW Classic was used for model construction, calibration and output interpretation. MODFLOW-NWT, a Newton formulation of MODFLOW-2005, was selected to simulate groundwater flow in the study area. MODFLOW-NWT linearization approach uses a continuous function of groundwater head to solve the system of nonlinear equations representing an unconfined aquifer with the Upstream-Weighting (UPW) Package rather than the drying and rewetting discrete method used in other packages provided in MODFLOW-2005 or earlier versions.

MODFLOW-NWT does not set dewatered cells as no-flow, or inactive, so rewetting variables are not necessary. The UPW Package maintains a smooth and continuous function by using the upstream head to calculate the flow between cells so that flow from a dewatered cell is not possible and creating inactive cells is not necessary.

The numerical code selected for this project is MT3DMS (Zheng and Wang, 1999) version 5.3 (Zheng, 2010). This model solves the three-dimensional flow and transport of dissolved species using the heads and flow solution of MODFLOW models and is one of the most tested and used finite differences codes in the world. MT3DMS includes processes such as advection, dispersion, first order decay due to biodegradation or physical processes, and includes a dual domain formulation to account for forward and back diffusion processes from small low permeability materials within aquifers. This code uses MODFLOW output velocities to calculate migration and attenuation of impacts.

ERM utilized these models to approximate the creation and dispersion of the dissolved constituent plumes following deposition of CCW materials in the now inactive CCW basin and to predict how the installation of a cap over the basin will change the impact to groundwater.

Model calibration utilized piezometric data obtained during the 2017-2018 sampling events. The first time step of the transient flow model was run in steady state to allow calculation of calibration statistics. Based on groundwater flow modeling, the modeled flow direction is generally very similar to the measured equipotentials for a similar river stage elevation shown in the Annual Groundwater Monitoring Report presented in Appendix 5.
Results of the model calibration indicate a good match between calculated and observed groundwater elevations at the existing site monitoring wells. Model basic statistical measures are within the typically industry accepted parameters, including a low mean residual error, and a normalized root mean squared (NRMS) error of 9.103% (the target NRMS is 10% or less for most sites). Model calibration is discussed in further detail in the Technical Memorandum, Contaminant Fate and Transport, which is included in Appendix 8.

Once the groundwater flow model was considered to be calibrated to represent measured site conditions, ERM conducted fate and transport modeling. Boron, sulfate, lithium, and molybdenum were modeled due to their geochemical reactions and conservative transport

characteristics and presence in wells arounf the inactive CCW basin. Using infiltration data defined through HELP modeling (which is presented in Appendix 8), the fate and transport of these constituents was modeled 30 years after completion of CCW basin closure activities, using the selected alternative. Results from this modeling are presented below.

Boron

- Currently, concentrations of boron in groundwater exceed the Class I groundwater standard of 2 mg/L in Layers 4 and 5.
- The Model predicts that the horizontal and vertical extents of the boron plume will begin to contract within the first 5 years.
- The Model predicts that boron concentrations in Layer 5 will reduce to below 4 mg/L by Year 10 and to below 2 mg/L between Year 25 and 30.
- The Model predicts boron concentrations greater than 2 mg/L with be contained within the proposed GMZ by Year 30.
- The Model predicts boron concentrations at the point of compliance wells will be less than 2 mg/L by Year 45.

Sulfate

- Currently, concentrations of sulfate in groundwater exceed the Class I groundwater standard of 400 mg/L in Layer 4.
- The Model predicts that the horizontal and vertical extents of the sulfate plume will begin to contract within the first 5 years.
- The Model predicts concentrations of sulfate greater than 400 mg/L in Layer 4 only.
- The Model predicts that the sulfate concentrations at the point of compliance wells will be less than 400 mg/L in Layer 4 by Year 15.

Lithium

- Currently, concentrations of lithium in groundwater exceed the EPA Tapwater screening level of 0.04 mg/L in Layers 4 and 5.
- The Model predicts that lithium concentrations in Layer 5 will be less than 0.04 mg/L by Year 20.
- The Model predicts that lithium concentrations greater than 0.04 mg/L with be contained within the proposed GMZ by Year 25.
- The Model predicts that lithium concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 35.

Molybdenum

- Currently, concentrations of molybdenum in groundwater exceed the EPA Tapwater screening level of 0.1 mg/L in Layers 4 and 5.
- The Model predicts that the horizontal and vertical extents of the molybdenum plume with begin to contract within the first 10 years.
- The Model predicts that molybdenum concentrations greater than 0.1 mg/L with be contained within the proposed GMZ by Year 45.
- The Model predicts that molybdenum concentrations in Layer 5 will be less than 0.1 mg/L by Year 45.
- The Model predicts that molybdenum concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 50.

The model supports the premise that the installation of the closure cap will significantly reduce the impact of CCW materials to the groundwater. These results may change or be refined with additional groundwater/elevation/river stage data obtained during continued monitoring of groundwater quality and flow. The models indicate that the groundwater impacts will remain within the area defined for the GMZ, and that the impacts will no longer discharge into the Mississippi River.

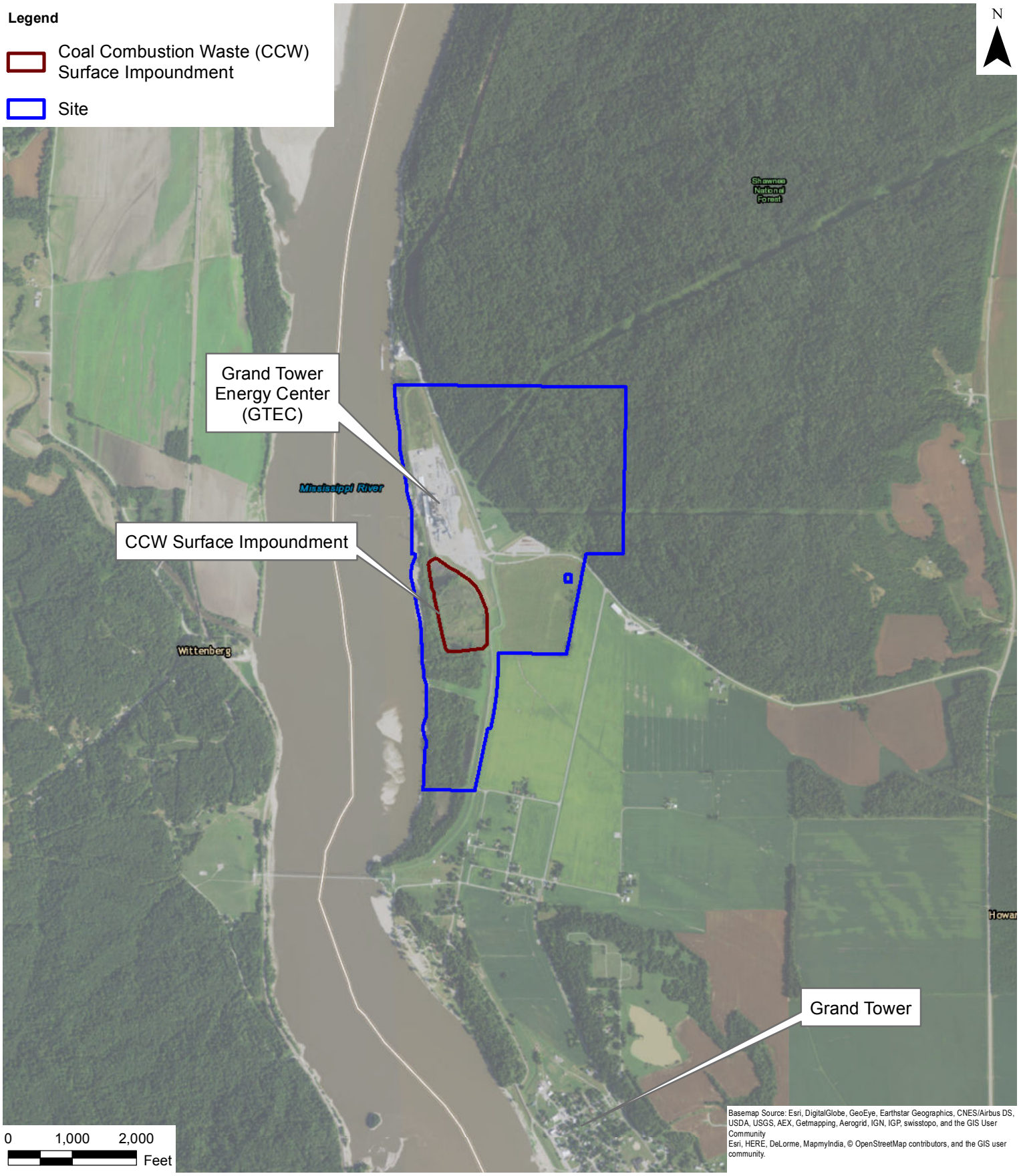
12.0 Proposed Remedy – Continued Monitoring

GTEC proposes to continue monitoring for groundwater quality following closure of the current CCW basin. Based on previous historic sampling and analysis, a GMZ would be needed for molybdenum, lithium, sulfate, and boron.

ERM began field sampling and laboratory analyses in 2016 including the use of low flow peristaltic pumps, no field filtering, and analyses for total metals in lieu of dissolved. Based on the data (not including APW-2), these adjustments appear to have an impact on reporting of groundwater quality constituent levels. Additionally, natural attenuation may be occurring since the CCW surface basin has not received CCW materials since 2001. Based on the recent results of groundwater monitoring and per IEPA's June 6, 2019 comments letter, GTEC proposes to monitor the well network quarterly for a minimum period of five years following completion of the CCW basin closure. Sampling and analyses will occur quarterly following completion of CCW basin closure activities. Wells will be developed and sampled using low flow peristaltic pumps with samples placed in laboratory supplied containers, and shipped using chain-of-custody. The samples will be placed in laboratory supplied coolers and shipped to the laboratory for analytical testing. Groundwater samples will be analyzed by an IEPA-approved laboratory quarterly and analyses will include the Appendix III and IV parameters. Field parameters will include pH, specific conductivity, and temperature, at a minimum.

The quarterly results will be submitted to IEPA including a summary of field activities, laboratory analyses, constituent trends and evaluation of statistically significant increases for constituent concentrations. At the end of the first five-year monitoring and reporting post-closure time frame, a groundwater performance monitoring report will be submitted to IEPA to either demonstrate restoration of groundwater quality to Class I standards or present a continued groundwater monitoring plan for an additional five years. In addition, the results will be compared to the modeled concentrations to evaluate that a decreasing trend, as defined through modeling, is occurring at the predicted rate. Significant changes from the model results will lead to additional calibration and assessment of future expected rates of decrease for the constituents of concern.

Figures



ERM NC, Inc.

DATE: 11/8/2016	SCALE: AS SHOWN	DRAWN: A Freeman

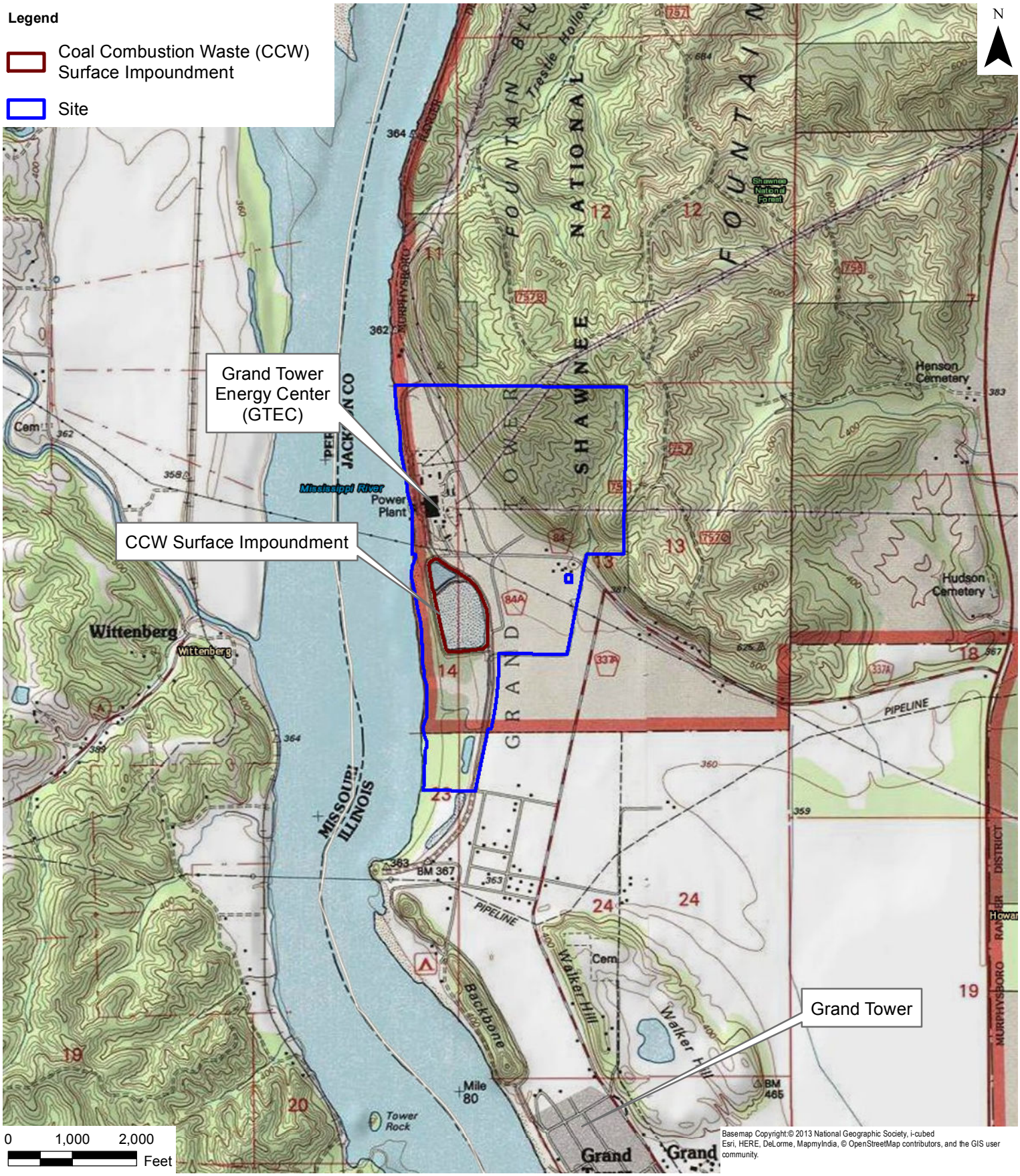
FILE: P:\Projects\0297751 Rockland Capital Fly Ash Impoundment Closure.DW\2016 Model\GIS\MXD\Fig1.mxd

FIGURE 1
SITE LOCATION

Grand Tower Energy Center

Grand Tower

Jackson County, Illinois



ERM NC, Inc.

DATE: 11/8/2016	SCALE: AS SHOWN	DRAWN: A Freeman

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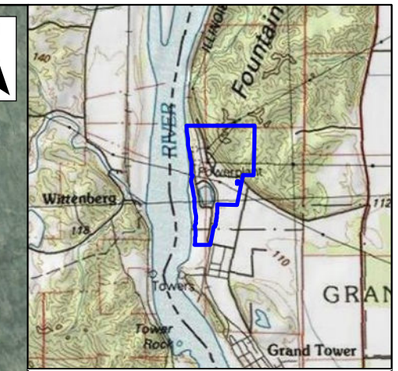
FIGURE 2
USGS TOPOGRAPHIC SITE MAP

Grand Tower Energy Center

Grand Tower

Jackson County, Illinois



Legend

- Site
- Right of Way
- Inactive Ash
- Proposed GMZ
- Shallow Well
- Deep Well
- Piezometer

Figure 3
Proposed Location of GMZ
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

DRAWN BY: GIS

FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F1_Ltr_PropGMZ.mxd, REVISED: 07/11/2019 , SCALE: 1:9,295 when printed at 11x17

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Appendix 1

Phase 1 Hydrogeologic Assessment Report, March 19, 2013

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ENVIRONMENTAL CONSULTANTS

PHASE 1 HYDROGEOLOGIC ASSESSMENT REPORT

COAL COMBUSTION PRODUCT IMPOUNDMENT
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

Project No. 2123

Prepared For:

AMEREN ENERGY GENERATING COMPANY

Prepared By:

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March 19, 2013

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Figure 2 Site Location Map
Figure 3 Potable Well Search Results
Figure 4 Monitoring Well Screen Elevations
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NATURAL RESOURCE TECHNOLOGY

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Figure 7 Groundwater Elevation Contours: August 8, 2012

TABLES

Table 1 Monitoring Well Construction Details
Table 2 Groundwater Levels and Elevations

Table 3 Field and Laboratory Groundwater Monitoring Parameters
Table 4 Statistical Summary of Groundwater Quality Data for Period of November 2010 – August 2012

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Appendix A Regional Geology
Appendix B Well Survey Results
Appendix C Boring Logs with Well Diagrams
Appendix D Groundwater Quality Data Summary: November 2010 – August 2012
Appendix E Exceedances of Class I Groundwater Standards: November 2010 – August 2012
Appendix F Hydraulic Gradient and Boron Loading Calculations

1 INTRODUCTION

1.1 Purpose

Ameren Energy Generating Company owns and operates the Grand Tower Energy Center in Jackson County, Illinois. The power station began operation in 1951 and formerly operated both coal- and oil-fired boilers, but converted to natural gas in 2001. The plant has one impoundment formerly used for coal combustion product (CCP) management and currently used for low volume wastewater (LVW) (Figure 1). To assess the potential for constituent migration from this impoundment as requested by the Agency in their correspondence dated May 15, 2009, Ameren commissioned a hydrogeologic study, water well survey, development of a groundwater monitoring plan, and an initial groundwater quality assessment.

The objectives of this report are to:

- Summarize hydrogeologic information pertinent to the site.
- Evaluate groundwater quality data to determine whether or not operation of the impoundment has adversely affected groundwater.
- Determine the potential for off-site migration and whether or not there are potential groundwater receptors in the event of a release.

2 SETTING

The information in this section incorporates material previously presented in the 2009 site characterization and groundwater monitoring plan developed by Rapps Engineering & Applied Services, and is included here for completeness.

2.1 Power Plant and CCP Impoundment

The Grand Tower Energy Center (GTEC) is located in Jackson County in southwestern Illinois, approximately 1 mile north of the town of Grand Tower (Figure 2). The plant is located on the floodplain on the east side of the Mississippi River adjacent to the levee. The GTEC has one impoundment, which straddles the boundary between Sections 13 and 14, Township 10 South, Range 4 West.

GTEC has produced electricity since 1951. The GTEC's sole CCP impoundment (also referred to as ash pond) covers 21.7 acres with a volume of approximately 157 acre-feet, and has a height of 22 feet. The impoundment formerly received bottom ash and fly ash from two coal-fired boilers (there were also two oil-fired boilers), but since the plant's conversion to natural gas in 2001 has received only low volume wastes and storm water from the plant. Historically, the CCP impoundment was constructed as separate bottom ash and fly ash impoundments with a shared intermediate berm, all constructed using native materials. However, sometime prior to 1976 it appears that the separate ponds may have been reconfigured into one pond by opening the shared berm.

The GTEC has an active NPDES permit for discharge to a tributary of the Mississippi River located to the south of the CCP impoundment.

2.2 Regional Geology

The GTEC is located in the Mississippi Valley, where Quaternary deposits consist of glacial outwash of the Henry Formation overlain by channel and floodplain deposits of the Cahokia Formation (Berg and Kempton, 1987; Lineback, 1979). The outwash constituting the Henry Formation is predominantly sand and gravel. Well logs suggest that the Henry Formation attains a maximum thickness of approximately 150 to 200 feet in vicinity of the GTEC. The Cahokia Formation consists of deposits in the floodplains and channels of modern rivers and streams, and is comprised of mostly poorly sorted sand, silt, and clay with wood and shell fragments, and local deposits of sandy gravel (Lineback, 1979). The upper part consists of overbank silts and clays, while the coarser-textured lower portion is mainly sandy channel and lateral accretion deposits.

The unlithified deposits are underlain by Mississippian age limestone, sandstone, and shale of the Upper Valmeyeran Series and the Upper and Lower Chesterian Series (Swann, 1963; Willman et al., 1967). Additional detail is provided in Appendix A.

2.3 Water Resources

2.3.1 Surface Water

The major surface water body in the vicinity of the GTEC is the Mississippi River, which flows from north to south and is located 150 to 350 feet west of the CCP impoundment. Other surface water bodies in the area include the Big Muddy River, which flows from northwest to southeast and is located approximately 4.5 miles east of the plant, and Tower Island Chute, a large oxbow lake approximately 3 miles south of the GTEC. In addition, minor streams and drainage channels cut across the valley floor in the area. These are either engineered structures or intermittent streams that drain into the Mississippi River and its tributaries.

2.3.2 Groundwater

Berg, Kempton, and Cartwright (1984) classified the area as AX (alluvium, a mixture of gravel, sand, silt, and clay along streams, variable in composition and thickness). Aquifers in southern Illinois have been classified as one of two main types: (1) unconsolidated sediments that are glacial or alluvial in origin and contain mostly sand and gravel deposits interbedded with clay and silt; and, (2) bedrock aquifers, primarily sandstone and fractured limestone, which vary widely in permeability (Roberts et al., 1957). The principal aquifer in the study area is the thick sand and gravel outwash deposits of the Henry Formation in the Mississippi Valley. Well logs indicate that high capacity wells with yields up to 1,100 gallons per minute (gpm) and specific capacities ranging from 40 to 90 gpm per foot of drawdown have been developed in this aquifer. Groundwater wells in adjacent upland areas are either shallow dug wells or drilled into bedrock to depths ranging from 100 to 500 feet. Most of these wells have low yields ranging from 5 to 10 gpm and specific capacities of up to 2 gpm per foot of drawdown (Ibid.).

2.3.3 Well Search

Public records were searched to identify water wells located within 2,500 feet of the CCP impoundment. The GTEC property boundary is located in Township 10 South, Range 4 West, and the unlined ash pond is located within Sections 13 and 14. The 2,500 foot boundary spans across Sections13, 14, 23, and 24. All wells within Sections 13, 14, 23, and 24 were searched. In addition, the search was expanded south to Sections 25 and 26 due to the hydrogeology of this site and occasional groundwater flow reversals as described in Section 4. Identified wells are shown on Figure 3 and tabulated in Appendix B.

The following sources of information were queried to identify water well locations.

- Illinois State Geological Survey's Illinois Water Well (ILWATER) Internet Map Service
- Illinois State Water Survey Domestic Well Database
- Illinois EPA's web-based Geographic Information System (GIS) files
- Illinois Department of Public Health
- Jackson County Health Department

Eleven water well records were identified within the six sections near the CCP impoundment, and are numbered 1 through 11 on Figure 3 and Appendix Table B-1. Wells 4 through 7 were not mapped due to insufficient location information provided from the ISWS database. These unmapped wells are owned by Ameren Energy and are likely industrial and commercial wells located on the GTEC property.

Three wells were identified as farm/domestic wells. The only one of these wells within 2,500 feet of the CCP impoundment (well number 1 on Figure 3) is on property currently owned by Ameren and there are no buildings in the vicinity of this location.

There are also two non-community water supply (NCWS) wells, well numbers 10 and 11, on the GTEC property (Figure 3). These wells are used for plant production water, rather than potable use. The GTEC obtains its potable water from the town of Grand Tower public water supply.

There are two community water supply (CWS) wells, well numbers 2 and 9, located in Section 25 in the town of Grand Tower. The IEPA database indicated that both CWS wells include a minimum setback zone (MSZ) of 200 radial feet and a Wellhead Protection Area (WHPA) of 1,000 radial feet (Figure 3).[1] These setback zones do not reach onto GTEC property. These wells are 1.3 miles from the CCP impoundment. The CWS wells were drilled to depths of 150 to 160 feet, where the available record indicates water is withdrawn from sand and gravel.

[1] The Illinois Environmental Protection Act specifies a minimum setback zone of 200 feet around all CWS wells, and provides the option for well owners to establish a maximum zone and/or a wellhead protection area. Certain activities are regulated in these areas to reduce potential for contamination of groundwater withdrawn by the well.

3 MONITORING WELL INSTALLATION, DEVELOPMENT AND SAMPLING

3.1 Monitoring Well Installation and Development

Four monitoring wells (APW-1, APW-2, APW-3, and APW-4) were installed from October 9 to 15, 2010 (Figure 1) by Geotechnology, Inc. At each well location, subsurface borings were advanced with a rotary drill rig equipped with hollow-stem augers to facilitate soil classification. Soil was continuously sampled through the center of the hollow stem auger. Monitoring wells, constructed of 2” inside diameter schedule 40 PVC riser and screen, with steel above-ground well covers, were installed at each location to monitor groundwater within the uppermost water bearing unit adjacent to the impoundment. The wells were constructed consistent with monitoring well construction standards per IAC Title 35, Section 811.318. Drilling and sampling equipment was decontaminated before sampling and between sample locations to prevent cross contamination. The monitoring wells were surveyed by a licensed surveyor.

Monitoring well construction and survey data are summarized in Table 1. Boring logs and well diagrams are included in Appendix D. Boring depths were between 56 and 57.5 feet below ground surface (bgs). All four borings were logged to a depth of 40 feet; however, logging was discontinued below 40 feet due to the heaving sands intercepted at all of the boring locations. A cross-sectional view of the four monitoring wells showing ground surface and well screen elevations is provided in Figure 4.

Monitoring wells were developed from November 8 to 18, 2010 by surging and pumping a minimum of five well volumes and until specific conductivity stabilized or the wells were pumped dry. The depth to groundwater was measured in each monitoring well using an electronic water level indicator. Groundwater levels ranged from approximately 23.2 to 28.0 feet bgs at the time of well installation.

3.2 Groundwater Sampling and Chemical Analysis

The monitoring wells were sampled during eight consecutive quarterly monitoring events from November 2010 through August 2012 in order to establish a statistical baseline for groundwater quality. The monitoring wells were purged and sampled for the first quarterly sampling event on November 29, 2010 using disposable bailers. Each monitoring well was purged until three well volumes were removed. Water quality parameters including pH, specific conductivity, and temperature were monitored in the field. Groundwater depths ranged from 19.5 feet to 22.1 feet bgs in the four wells. Table 2 presents the groundwater depths and elevations.

Water samples were field filtered and preserved for all parameters (both general chemistry and metals) with the exception of cyanide. Sample containers were labeled, placed in an ice-filled cooler, and transported using standard chain-of-custody procedures. Groundwater sampling was performed by Geotechnology, Inc. and sample analyses were performed by Accutest Laboratories located in Marlborough, MA. All eight rounds of groundwater samples were analyzed for the inorganic constituents listed under Title 35, 620.410 with the exception of radium 226 and 228. Table 3 lists the field, general chemistry, and metal parameters monitored during the eight quarters of baseline sampling along with the analytical methods.

4 SITE HYDROGEOLOGY

4.1 Lithology

The information used to describe site hydrogeology is based on the local geology obtained from published sources as presented in Section 2.2 and Appendix A and boring data collected at the four monitoring well locations APW-1 through APW-4. The four borings ranged from 56 to 57.5 feet bgs and were advanced through the following unlithified materials in descending order:

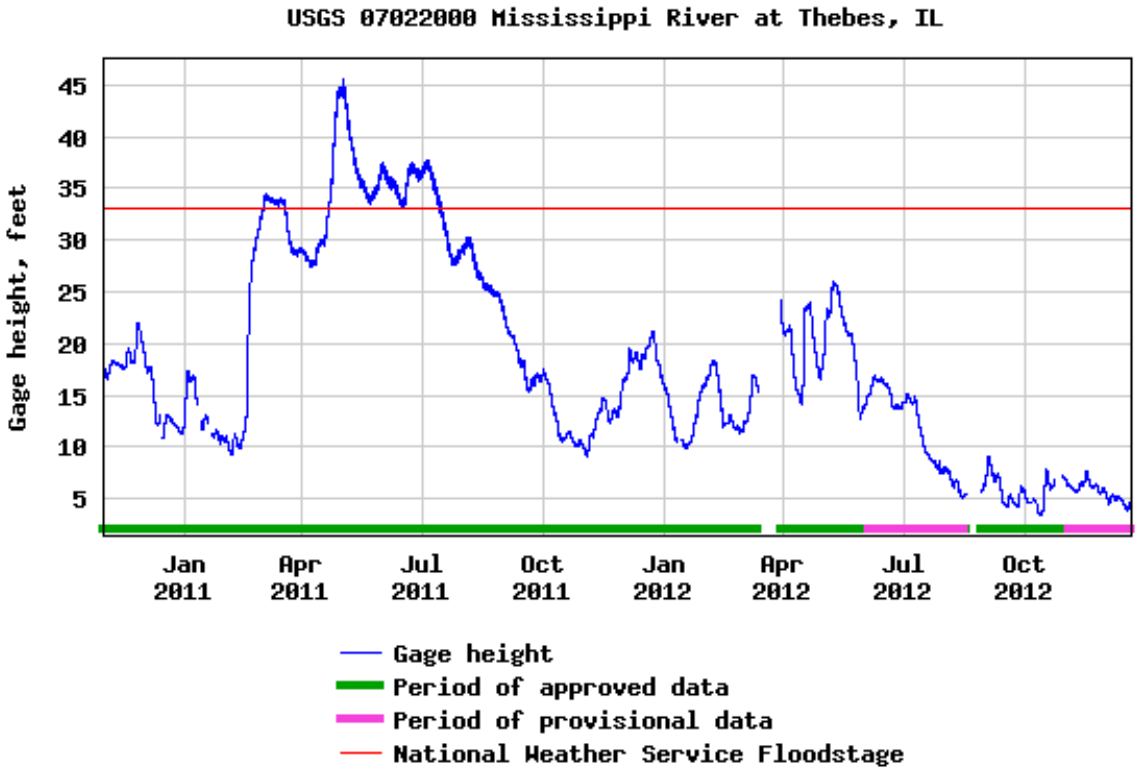
- 4.5 to 8 feet of fill, consisting of silty clay and some sand. Borings APW-2 and APW-3 also had some crushed rock within the fill material.
- 11.5 to 17.5 feet of predominantly clay, silty clay, clayey silt, and sandy silt between depths of 4.5 and 19 feet bgs. Boring APW-1 had a one foot thick layer of silty sand at 6.5 to 7.5 feet bgs within this zone, and boring APW-2 had a five foot layer of silty fine sand and fine sand at 9.5 to 14.5 feet bgs within this zone.
- 6 to 10.5 feet of sandy silt between depths of 16 and 32 feet bgs. Boring APW-4 also had occasional layers of clay and silty fine sand within this predominantly silt zone.
- Greater than 35 feet of fine to coarse sand with occasional layers of sandy silt and traces of gravel. The upper depth of this sand zone ranges from 22 to 32 feet bgs, and lower depth is below 58 feet bgs.

The uppermost water-bearing unit intercepted below the fill material in the area of the CCP impoundment is the Cahokia Formation. Based on the boring data, the Cahokia Formation consists of clay, silty clay, clayey silt, and some fine sand within its upper portion and predominantly sandy silt with some silty fine sand within its lower portion. The Cahokia Formation has a thickness ranging from 17.5 to 26.5 feet at the four boring locations around the impoundment.

Beneath the alluvial deposits of the Cahokia Formation are the outwash sands of the Henry Formation, which is the predominant water-bearing unit and aquifer in the vicinity of the GTEC. The Henry Formation was only logged to a depth of 40 feet bgs due to heaving sands, but the fine to coarse sands were drilled to a depth of approximately 58 feet bgs. The top of the Henry Formation sands were intercepted as shallow as 22 feet bgs at boring APW-3 to the south of the impoundment and as deep as 32 feet bgs at boring APW-1 to the north of the impoundment. All four monitoring wells were screened within the Henry Formation at depths between 45 and 58 feet bgs.

4.2 Groundwater Flow

Groundwater elevation data (potentiometric levels) were collected for the four monitoring wells installed within the sands of the Henry Formation. Groundwater depths and elevations for the eight quarterly monitoring events are provided in Table 2 and graphically illustrated on time-series plots in Figure 5. Groundwater depths ranged from 2.8 to 32.7 feet bgs from November 2010 through August 2012. The shallowest groundwater depths in the four wells, ranging from 2.8 to 4.9 feet bgs, were observed in June 2011. During this period the USGS Gaging Station on the Mississippi River at Thebes, Illinois (Station #07022000), the nearest station located downstream from the GTEC, recorded gage heights above the floodstage (see graph below). The deepest groundwater depths, ranging from 30.8 to 32.7 feet bgs, were observed in August 2012. During this period the gage height at the Thebes Station was below 10 feet and reached below 5 feet during September 2012. The time-series of groundwater elevations from November 2010 through August 2012 (Figure 5) illustrates that the highest groundwater elevations (i.e., shallowest) occurred in March 2011 and June 2011 and the lowest groundwater elevations (i.e., deepest) occurred in November 2011, February 2012, and August 2012.



During individual sample events, the highest groundwater elevations were recorded in APW-2, the closest monitoring well to the Mississippi River, during November 2010, March and June 2011, and February and May 2012 (Table 2), indicating groundwater flow away from the river at the time of these five measurements. The highest groundwater elevations were recorded in APW-4, the farthest well from the river, at the time of the other three measurements, indicating groundwater flow toward the river at these times. Potentiometric maps prepared using the June 2011 (Figure 6) and August 2012 (Figure 7) groundwater elevation data demonstrate groundwater flow near the CCP impoundment during the periods of maximum and minimum groundwater levels observed over the eight quarters of monitoring. Groundwater flow direction during June 2011 (Figure 6) was west to east away from the river at a very low gradient of 0.0006 (Appendix G), reflecting a period of above normal precipitation within the river basin, high river stage, and high groundwater elevations. Conversely, groundwater flow direction during August 2012 was east to west towards the river at a very low gradient of 0.0006 (Appendix G), reflecting a period of drought within the river basin with very low river stage and low groundwater elevations. The difference in groundwater elevations between measurement points was small (less than 2 feet) during each of the eight sample events, indicating that hydraulic gradients were low (0.0002 to 0.0018; Appendix G) throughout the monitoring period, regardless of flow direction.

Excluding a portion of the levee that is not owned by Ameren, the CCP impoundment is more than 200 feet from the closest property boundary, which is to the southeast (Figure 1); a direction that would normally be considered upgradient because groundwater typically flows toward major water bodies such as the Mississippi River). However, flow reversals frequently occurred during the monitoring period, and the impoundment is underlain by a transmissive sand and gravel aquifer. These observations suggest that there is potential for off-site migration, in the event of a release, if flow reversals occur over sufficiently long periods for groundwater to migrate from the impoundment toward the property boundary.

4.3 Potential For Groundwater Receptors

A potential groundwater receptor is a water supply well located in a position that can be interpreted as downgradient from the CCP impoundment, and screened within a geologic formation that can reasonably be expected to be a groundwater migration pathway in the event of a release.

Figure 3 shows water wells located within the vicinity of the CCP impoundment. As described in Section 2.3.3, there are no active water supply wells within 2,500 of the CCP impoundment other than plant production wells that are not used for potable water supply. The closest mapped water supply wells are 1.3 miles to the south, and provide the community water supply for the town of Grand Tower.

As noted in Section 4.2, there is potential for off-site migration to the southeast of the CCP impoundment if groundwater flow reversals occur for sufficiently long periods of time. There is currently insufficient data to establish whether or not such flow reversals occur. However, if there is potential for off-site migration to the southeast, then there is also potential for migration toward the Grand Tower CWS wells; although the potential for migration to the CWS wells will be lower than the potential for off-site migration due to the relatively large (for groundwater flow) distance from the CCP impoundment to the CWS wells.

5 GROUNDWATER CHEMISTRY

5.1 Overview

The purpose of the sampling and inorganic analysis of groundwater from monitoring wells at the GTEC CCP impoundment was to assess background and downgradient groundwater quality; to evaluate elevated concentrations and those exceeding groundwater standards; and to identify primary factors potentially influencing groundwater quality changes spatially and temporally.

All of the groundwater quality data collected and analyzed for both field and laboratory parameters, including the full list of inorganic constituents listed in IAC 35 Part 620 Section 410 except for radium 224/226, are provided in Appendix E for the eight quarters of monitoring conducted from November 2010 through August 2012 for the four monitoring wells APW-1, APW-2, APW-3, and APW-4.

A statistical summary of all of the water quality data at each of the four monitoring wells is provided in Table 4, including the mean, median, maximum, minimum, standard deviation, and percent non-detects. Based on low concentrations of coal ash indicator constituents, boron and sulfate, monitoring well APW-1, located to the northeast of the impoundment, is regarded as representing background groundwater quality, and APW-2, APW-3, and APW-4 characterize groundwater quality downgradient from the CCP impoundment.

Since the monitored unit at the CCP impoundment is the Henry Formation, which consists of thick sand deposits, the applicable groundwater standard is Class I. Constituents with exceedances of Class I groundwater standards are highlighted in Table 4.

5.2 Comparison of Groundwater Quality to Class I Standards

A listing of all exceedances of Class I groundwater quality standards, sorted by constituent, well location, and sample date, is provided in Appendix F. Constituents with exceedances are also highlighted in Table 4. Exceedances in groundwater based on the eight quarters of monitoring from November 2010 through August 2012 are sulfate, TDS, boron, iron, and manganese. These constituents exceeded their respective Class I groundwater standards as follows:

- pH: APW-1 (4 of 8 samples), APW-2 (1 of 8), APW-3 (1 of 8), APW-4 (1 of 8)
- Sulfate: APW-2 (4 of 8)
- TDS: APW-1 (1 of 8)

- Boron: APW-2 (8 of 8), APW-3 (8 of 8), APW-4 (8 of 8)
- Iron: APW-2 (4 of 8)
- Manganese: APW-2 (7 of 8), APW-3 (8 of 8), APW-4 (2 of 8)

Furthermore, the first two arsenic samples at monitoring well APW-2 exceeded the Class I arsenic standard that went into effect in October 2012; however, the results were in compliance with the arsenic standard at the time of sampling.

Values for pH at all monitoring wells were lower than the 6.5 standard in the first monitoring event. These site wide low values were most likely caused by systematic error due to instrument calibration or non-stabilized groundwater geochemistry at the time of sampling. There were no other values lower than 6.5 at APW-2, APW-3, and APW-4, while pH was lower than 6.5 in three of the subsequent seven quarterly monitoring events at APW-1. Coal ash leachate tends to be alkaline and is therefore not a source of low pH.

As noted in Section 5.3 below, the single TDS exceedance in APW-1 appears to be anomalous, and the iron and manganese concentrations are not associated with the CCP impoundment. However, the likely source of the boron and sulfate exceedances is leachate released from the CCP impoundment.

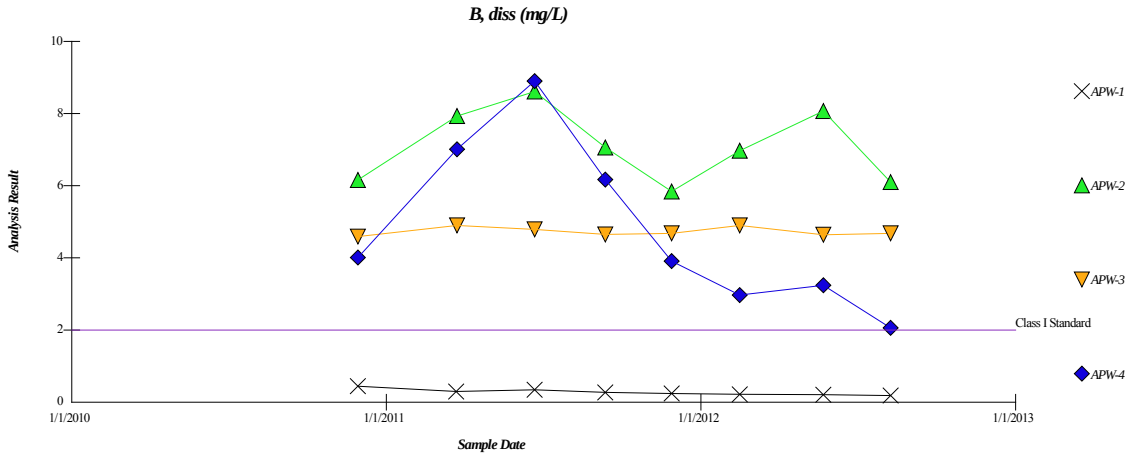
5.3 Groundwater Quality Analysis

5.3.1 Primary Coal Ash Leachate Indicators

Boron and sulfate are the primary indicator constituents for coal ash leachate. Median boron and sulfate concentrations in all downgradient monitoring wells (APW-2, APW-3, and APW-4) were higher than concentrations in background well APW-1.

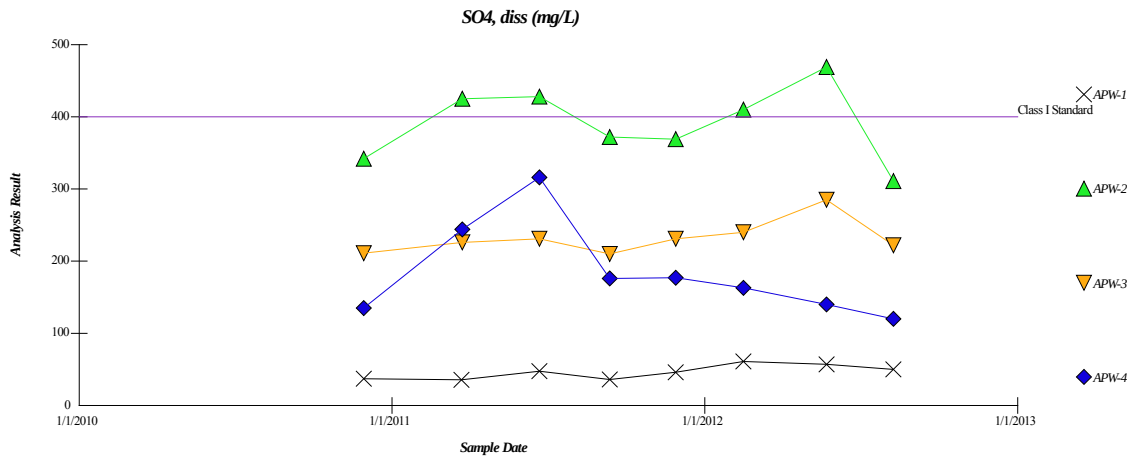
Well No.	Median Concentration	
	Boron mg/L	**Sulfate mg/L**
APW-1	0.26	47
APW-2	7.0	391
APW-3	4.7	229
APW-4	4.0	170
IL Class I Standard	*2.0*	*400*

Downgradient monitoring well APW-2 had the highest boron concentrations observed in the vicinity of the impoundment, with concentrations ranging from 5.8 to 8.6 mg/L. This well is located between the impoundment and the Mississippi River and is in the predominant direction of groundwater flow, westward from the impoundment (Figure 6), during periods of normal or low river stage. Monitoring well APW-3, located south of the impoundment, had boron concentrations ranging from 4.6 to 4.9 mg/L. Monitoring well APW-4, located east of the impoundment, had boron concentrations ranging from 2.1 to 8.9 mg/L. The maximum observed boron concentration of 8.9 mg/L (Table 4; Appendix E) occurred during the period of highest groundwater elevation and highest river stage over the eight quarters of monitoring, during which groundwater flow direction in the vicinity of the impoundment was west to east (Figure 7). The minimum observed boron concentration of 2.06 mg/L occurred during the period of lowest groundwater elevation and low river stage, during which groundwater flow direction was east to west (Figure 6). As shown in the graph below, concentration trends were flat during the sample period.



Graph showing boron concentrations as a function of time.

Similar to the distribution of boron in groundwater, well APW-2 had the highest sulfate concentrations, ranging from 311 to 469 mg/L. Well APW-3 had the lowest range of sulfate concentrations of the three downgradient wells, ranging from 210 to 285 mg/L. Well APW-4 had the widest range of sulfate concentrations, 120 to 316 mg/L, directly related to the reversal of groundwater flow directions from west to east during low and high river stages, respectively. As shown in the graph below, concentration trends were flat during the sample period.



Graph showing sulfate concentrations as a function of time.

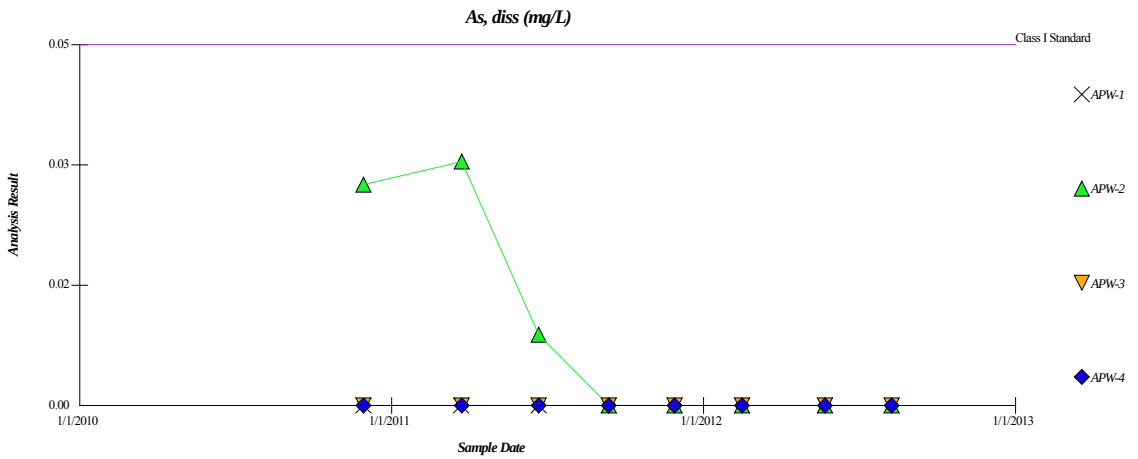
5.3.2 Other Constituents Potentially Impacted by Coal Ash Leachate

Several constituents had higher concentrations in one or more downgradient monitoring well samples than in samples from background well APW-1.

Well No.	Median Concentrations				
	Arsenic mg/L	Barium mg/L	Chloride mg/L	Selenium mg/L	TDS mg/L
APW-1	<0.025	0.14	2.0	<0.05	275
APW-2	<0.025	0.31	22	<0.05	829
APW-3	<0.025	0.076	19	<0.05	457
APW-4	<0.025	0.16	10	0.05	568
IL Class I Standard	*0.05**	*2.0*	*200*	*0.05*	*1200*

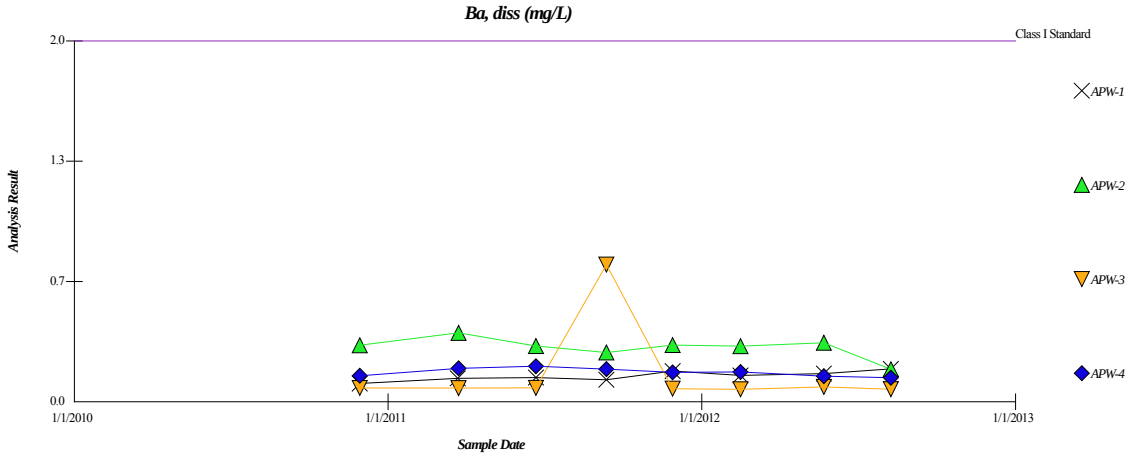
* Class I standard for arsenic at the time the samples were collected.

Arsenic concentrations were below the detection limit in all samples from background well APW-1 and downgradient monitoring wells APW-3 and APW-4. However, downgradient well APW-2 had arsenic concentrations of 0.031, 0.034 and 0.010 in the first three quarterly monitoring events (See graph below and Appendix E) followed by five consecutive quarters of arsenic concentrations below the detection limit of 0.025 mg/L. Decreasing concentration trends such as this typically indicate a geochemical disequilibrium caused by installation of the monitoring well; however, no other constituents exhibited a similar decreasing trend over time at APW-2 as might be expected with disequilibrium, so coal ash leachate cannot be ruled out as the source of the observed arsenic concentrations.



Graph showing arsenic concentrations as a function of time. Non-detects are plotted as zero.

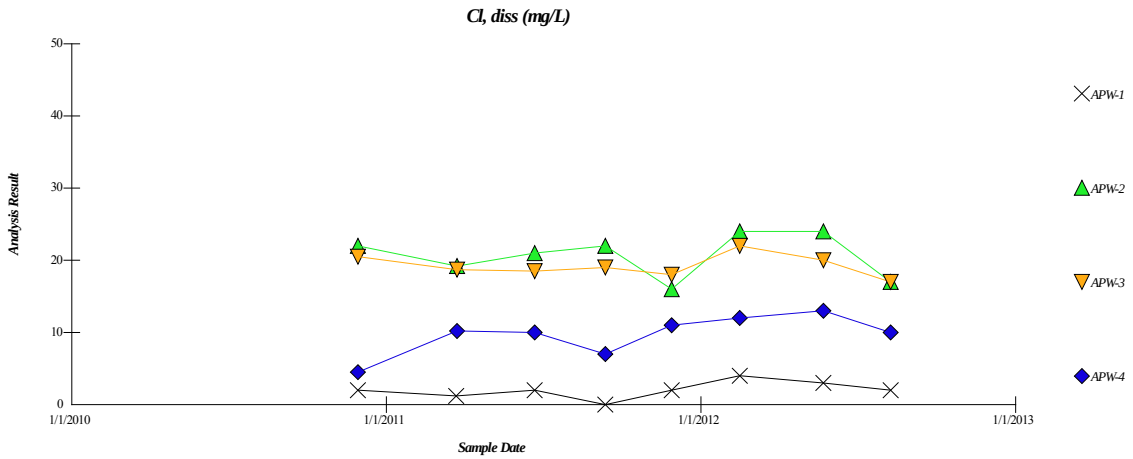
Barium concentrations at APW-2 were slightly higher than background (APW-1), while concentrations at APW-3 and APW-4 were similar to or lower than background. A maximum concentration of 0.76 mg/L at well APW-3 occurred during the September 2011 monitoring event, but appears to be an outlier given that the other seven barium concentrations at that well ranged from 0.069 to 0.083 mg/L (see graph below). APW-2 has the highest concentrations of coal ash leachate indicator constituents; therefore, it is possible that the high barium concentrations relative to background (but lower than the Class I standard) observed in this monitoring well are also associated with coal ash leachate.



Graph showing barium concentrations as a function of time. The concentration spike for APW-3 in September 2011 is interpreted as an anomalous data value.

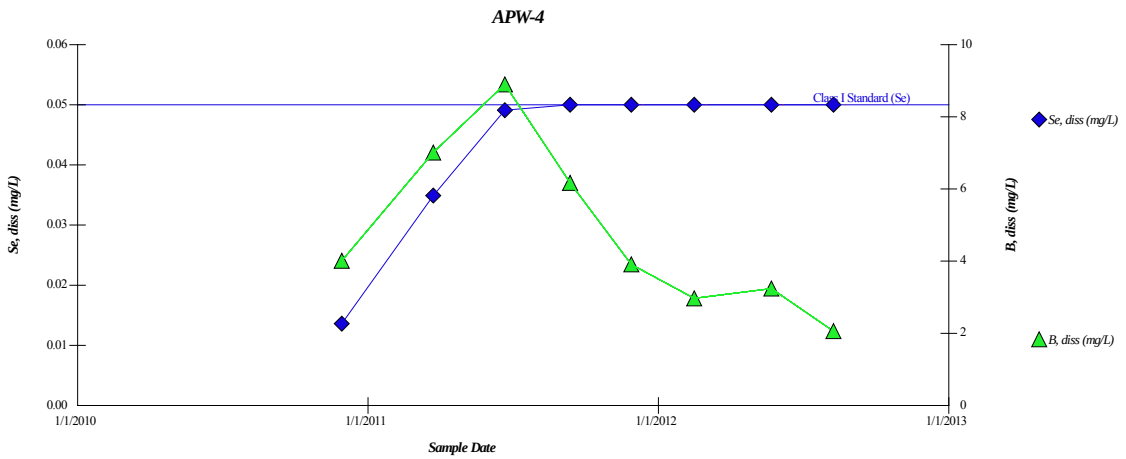
NATURAL RESOURCE TECHNOLOGY

Median chloride concentrations in the three downgradient wells ranged from 10 to 22 mg/L compared to 2 mg/L in background well APW-1. The highest chloride concentrations occurred at wells APW-2 and APW-3, with maximum concentrations of 24 and 22 mg/L, respectively. These wells are distant from roads and other potential chloride sources, leading to the conclusion that the difference in concentration between background and downgradient is associated with the CCP impoundment. Chloride concentrations monitored in downgradient groundwater are low compared to the Class I standard of 200 mg/L.



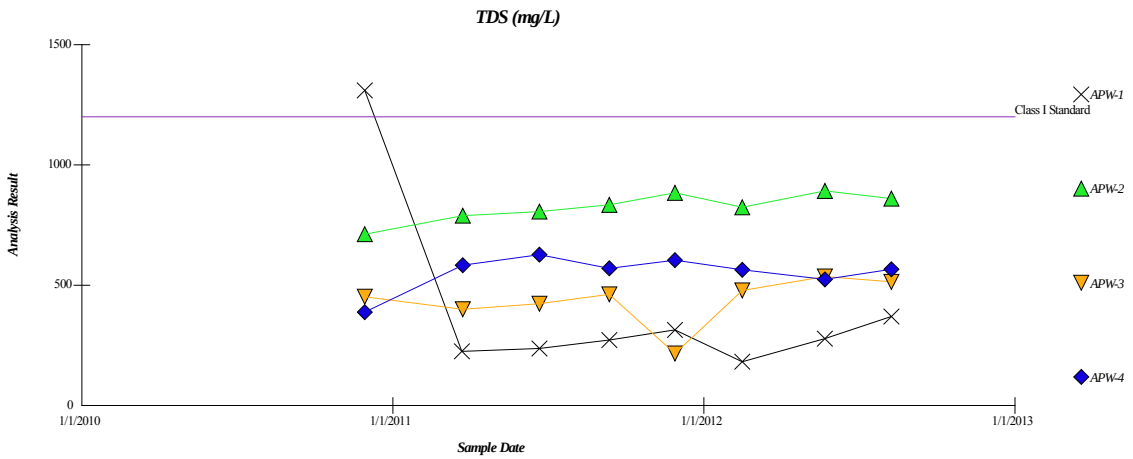
Graph showing chloride concentrations as a function of time. The Y axis is zoomed for clarity.

Selenium concentrations were below the detection limit in all eight sample events at APW-1, APW-2, and APW-3. Monitoring well APW-4 had detected selenium concentrations ranging from 0.014 to 0.050 mg/L during the first four sample events. These selenium concentrations increased with boron concentrations at APW-4, potentially suggesting a coal ash source; however, the reporting limit for selenium changed to 0.05 mg/L in November 2011, and it is not possible to determine if the similar trends continued after the first four sample events. As a result, it cannot be determined if the initial similarity was a correlation or coincidence.



Graph comparing selenium and boron concentrations as a function of time. Red-circled values are non-detects plotted at the reporting limit.

TDS is the sum of all dissolved constituents in water, and is largely based on the concentrations of major ions. Background monitoring well APW-1 had one TDS concentration of 1,310 mg/L during the first monitoring event in November 2010; however, there are no correspondingly high concentrations for other monitored constituents to explain this TDS concentration, and subsequent TDS concentrations during the next seven quarterly monitoring events ranged from 182 to 370 mg/L. These observations indicate that the November 2010 TDS concentration of 1,310 mg/L is anomalous, possibly due to the short period (less than two weeks) between well development and the first sampling event, or possibly due to a laboratory or recording error. Median TDS concentrations in downgradient monitoring wells APW-2, APW-3, and APW-4 were higher than background, and are largely a result of sulfate and a corresponding major cation that was not monitored.



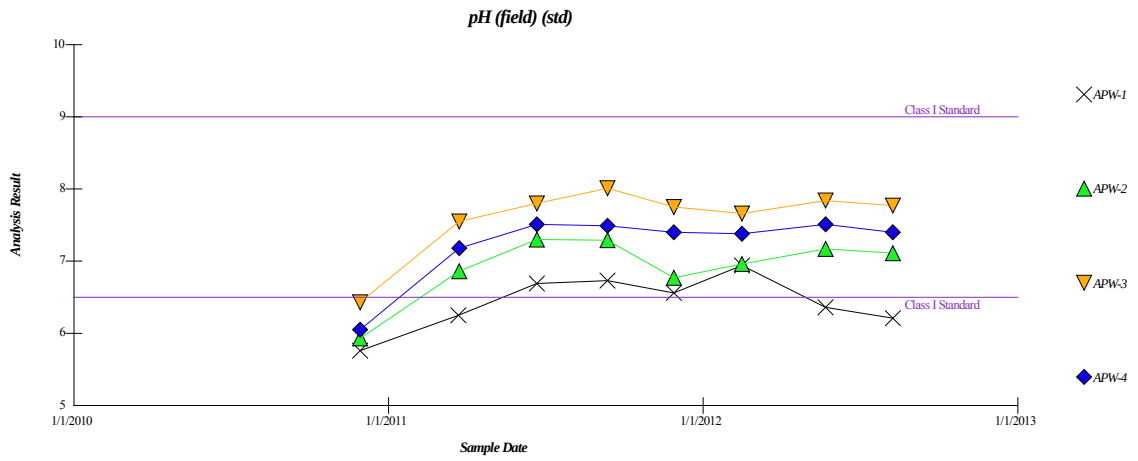
Graph showing total dissolved solids concentrations as a function of time. The concentration spike for APW-1 in November 2010 is interpreted as an anomalous data value.

5.3.3 Constituents with Elevated Concentrations Due to Causes Other than Coal Ash Leachate

As described below, observed iron and manganese concentrations are not associated with the CCP impoundment, nor are pH values.

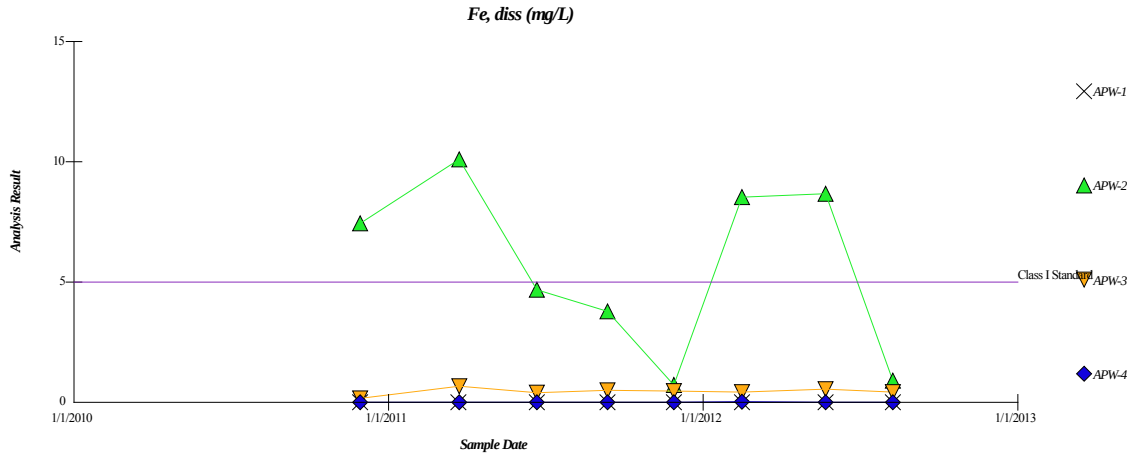
Well No.	Median Concentrations		
	Iron mg/L	Manganese mg/L	pH SU
APW-1	<0.10	<0.006	6.46
APW-2	6.1	0.66	7.04
APW-3	0.45	0.28	7.76
APW-4	<0.10	0.10	7.40
IL Class I Standard	*5.0*	*0.15*	*<6.5, >9.0*

All of the lowest pH readings at the four monitoring wells, ranging from 5.76 to 6.43, occurred in the first quarter sampling event. No similarly low pH readings were observed in the subsequent seven quarters of monitoring. Given this observation, it appears that the field instrumentation used to measure the pH was not calibrated accurately, leading to a systematic error of low pH readings in all of the groundwater samples in November 2010. An alternative explanation to account for the low pH readings is that the groundwater was not stabilized from the drilling and well installation.



Graph showing pH as a function of time.

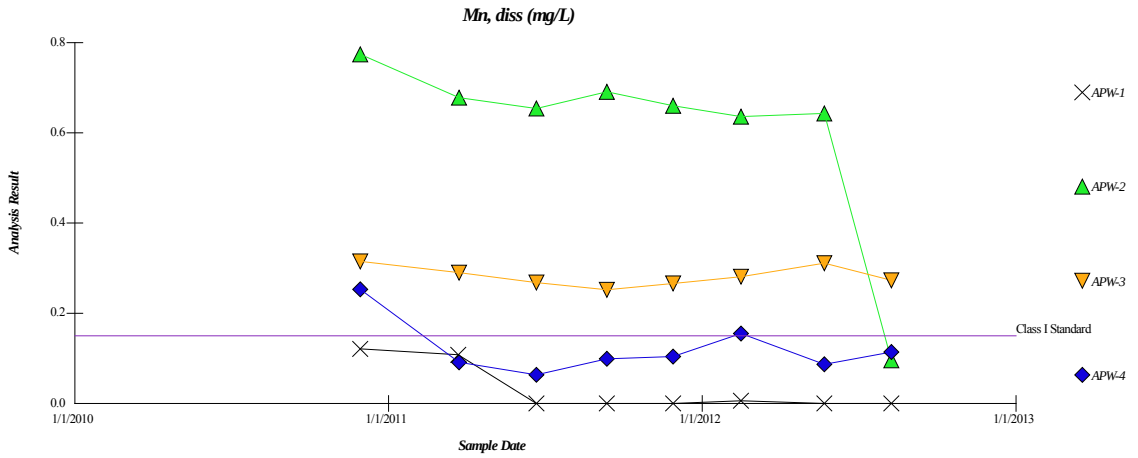
Iron concentrations were higher than background in APW-2 and APW-3, but not in APW-4.Iron concentrations were relatively low at well APW-3 to the south of the impoundment, with concentrations ranging from 0.16 to 0.67 mg/L. Conversely, downgradient monitoring well APW-2, located between the impoundment and the river, had iron concentrations ranging from 0.72 to 10.1 mg/L with a median concentration of 6.1 mg/L.



Graph showing iron concentrations as a function of time. Non-detects are plotted as zero.

Manganese concentrations were higher in all three downgradient monitoring wells than in the background well. Background well APW-1 had a median manganese concentration of 0.006 mg/L with five of eight groundwater samples below the detection limit of 0.005 mg/L. Downgradient wells APW-2 through APW-4 had median concentrations ranging from 0.10 to 0.66 mg/L with all concentrations above the detection

limit. The highest downgradient manganese concentrations were observed in groundwater at well APW-2, the closest well to the Mississippi River, with concentrations ranging from 0.10 to 0.77 mg/L. The lowest downgradient concentrations were observed at well APW-4, the farthest well from the river, ranging from 0.06 to 0.25 mg/L.



Graph showing manganese concentrations as a function of time. Non-detects are plotted as zero.

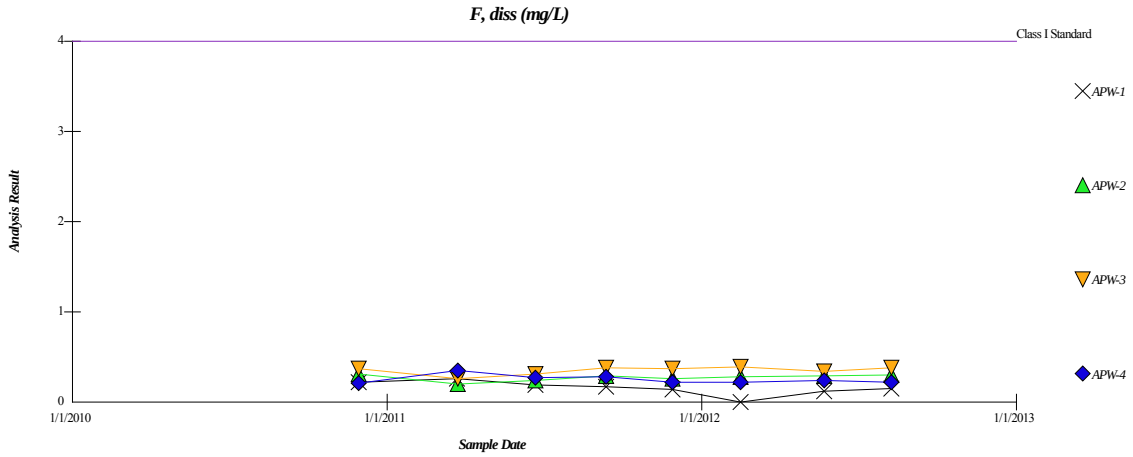
The iron and manganese concentrations observed in the four monitoring wells appear to be correlated, with highest concentrations occurring nearest to the river (APW-2) and lowest concentrations occurring distant from the river (APW-1 and APW-4). This relationship between iron and manganese concentration and proximity to the river is consistent with naturally occurring iron and manganese concentrations observed at other CCP impoundments in Illinois. Furthermore, the boring log for APW-1 lists the geologic materials encountered as brown (Appendix C), which is indicative of an oxic geochemical environment. The thickness of materials described as grey, which is indicative of a reduced geochemical environment, increases with the least grey material encountered at APW-4, next highest percentage at APW-3, and most grey material encountered at APW-2. Iron and manganese are soluble under reduced geochemical environments, and the concentrations of iron and manganese correlate with the thickness of grey geologic materials listed on the boring logs, again suggesting that the concentrations are naturally occurring.

5.3.4 Constituents with Concentrations Near or Below Background

Fluoride and nitrate concentrations in the downgradient monitoring wells were similar to or lower than concentrations in background well APW-1.

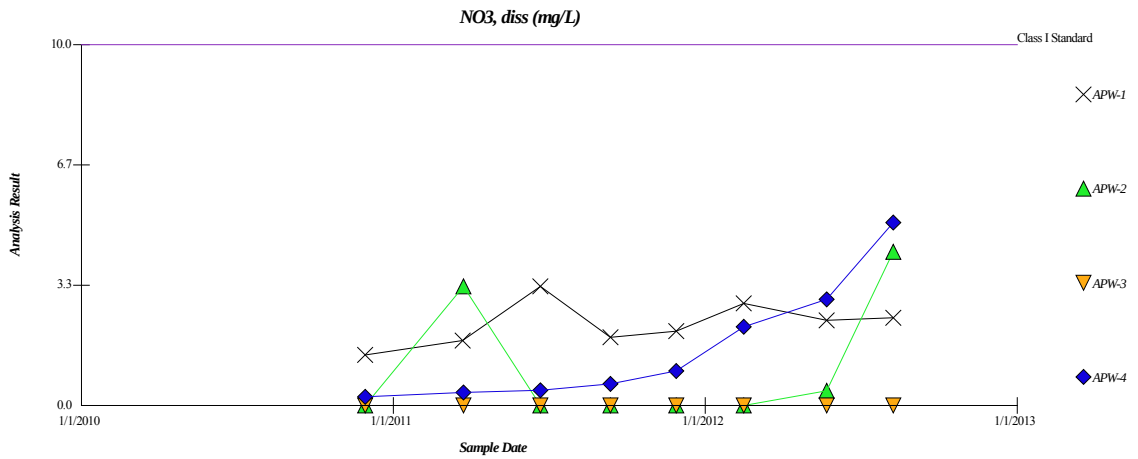
Well No.	Median Concentrations	
	Fluoride mg/L	Nitrate mg/L
APW-1	0.29	2.2
APW-2	0.29	0.080
APW-3	0.37	<0.050
APW-4	0.23	0.78
IL Class I Standard	*4*	*10*

Median fluoride concentrations in the downgradient wells ranged from 0.23 to 0.37 mg/L versus a background median (well APW-1) of 0.29 mg/L.



Graph showing fluoride concentrations as a function of time. Non-detects are plotted as zero.

Nitrate concentrations in the groundwater samples were variable both spatially and temporally. Some of the highest nitrate concentrations occurred at background well APW-1, with a range of 1.4 to 3.3 mg/L and median of 2.2 mg/L. Similarly high concentrations occurred at well APW-4, with nitrate ranging from 0.24 to 5.1 mg/L and median of 0.78 mg/L. Conversely, monitoring wells APW-2 and APW-3 had a high percentage of samples below the detection limit, 62.5 and 100 percent non-detects, respectively. However, APW-2 had a high level of variability in nitrate concentrations, ranging from below the detection limit to a maximum concentration of 4.3 mg/L during the final sample event in August 2012. The source of the nitrate is likely agricultural fields immediately east of the CCP impoundment.



Graph showing nitrate concentrations as a function of time. Non-detects are plotted as zero.

5.3.5 Constituents That Were Rarely or Not Detected

The following constituents had concentrations below their respective reporting limits in all samples: antimony, beryllium, cadmium, chromium, cobalt, copper, cyanide, lead, mercury, nickel, silver, and thallium. Zinc concentrations were below the reporting limit in six to seven of the eight sample events, with a maximum concentration of 0.053 mg/L at APW-2 during the first sample event in November 2010.

5.4 Boron Loading to the Mississippi River

The ultimate destination for groundwater in this region is the Mississippi River. A mixing calculation was performed to conservatively estimate the impact of boron discharge to the river on concentrations in river water. The loading rate was calculated by multiplying the volume of groundwater flowing into the river by the concentration of boron in the groundwater.

$$L = C * Q \text{ and}$$

$$Q = K * I * A$$

Where

C = boron concentration in groundwater. To be conservative, the highest single boron concentration in groundwater monitoring wells at the site was used in this calculation (Cmax), rather than an average or a median.

Q = the volume of groundwater discharging to the river.

K =the hydraulic conductivity of the aquifer. Site-specific data are not available. As a surrogate, data from Ameren's Venice Ash Ponds 2 and 3 were used. The Venice ponds are in a hydrogeologically similar position as Grand Tower. Specifically, both are situated close to the Mississippi River, and both overlie a geologic sequence of fine-grained overbank deposits over coarse-grained glacial outwash that fills the valley.

I = the maximum hydraulic gradient for the site when groundwater flow was toward the river.

A = the cross-sectional area through which this groundwater discharge to the river occurs. To be conservative, it was assumed that the maximum concentration (Cmax) occurred over the entire thickness of the aquifer, and along the entire length of the CCP impoundment parallel to the river, plus 500 feet north and south of the impoundment. In reality, concentration will decrease with depth in the aquifer and with distance north and south of the impoundment.

The loading rate (L) was then divided by the 7-day 10-year low flow ($Q_{7,10}$) at Chester, IL (approximately 27 river miles north of Grand Tower) to estimate the incremental boron concentration increase (d_B) in the river due to discharge from the Grand Tower CCP impoundment. Due to the size of the Mississippi River, it is unlikely that concentration would initially be distributed across the entire width of the river. Therefore, an additional calculation was performed to calculate the incremental boron increase assuming that mixing occurred within 50 feet of the shoreline. This calculation was performed by multiplying d_B by 2,300/50 (2,300 feet being total river width and 50 feet being the assumed mixing width).

The result of this calculation (Appendix F) is a very conservative estimate of the increase in boron loading to the Mississippi River. This result (0.0002 mg/L) is lower than the instrument detection limit for boron as listed by the United States Environmental Protection Agency in method SW-846, 6010c, and is therefore not measurable.

6 CONCLUSIONS

6.1 Conclusions

The primary conclusion from voluntary monitoring of groundwater at the Grand Tower CCP impoundment is that operation of the impoundment has caused exceedances of Class I groundwater quality standards for boron and sulfate. The Class I standards for manganese and iron are also exceeded in places, although these concentrations are attributed to naturally occurring causes. Exceedances of Class I standards for pH and TDS are also not related to CCP impoundment operation. Furthermore:

- The surficial lithologic unit at the site consists of fine-grained alluvium; CCP indicator constituent concentrations in underlying groundwater indicate that there is a vertical migration pathway through the surficial deposits.
- Groundwater flow at the site is dependent on Mississippi River stage. Flow is inland during periods of high stage, and toward the river during periods of low stage.
- Due to occasional groundwater flow reversals, there is potential for off-site migration toward the closest property boundary southeast of the CCP impoundment. This potential for off-site migration during groundwater flow reversals also suggests that the town of Grand Tower community water supply wells cannot be ruled out as potential receptors; although this would be a large distance (1.3 miles) for groundwater to migrate from the CCP impoundment.
- Arsenic and barium had elevated concentrations relative to background in APW-2, a monitoring well between the impoundment and the river; and selenium had elevated concentrations in APW-4, which is located west of (inland from) the impoundment. The barium and selenium concentrations were lower than Class I groundwater quality standards, and the arsenic concentrations were lower than the Class I standard in effect at the time of sampling, although the first two arsenic samples had concentrations that would be higher than the standard that went into effect in October 2012. Chloride and TDS also have downgradient concentrations that, while lower than Class I standards, appear to reflect impacts from the CCP impoundment.
- A conservative estimate of boron loading to the Mississippi River suggests that the incremental boron concentration increase in the river caused by leachate released from the CCP impoundment is not measurable.

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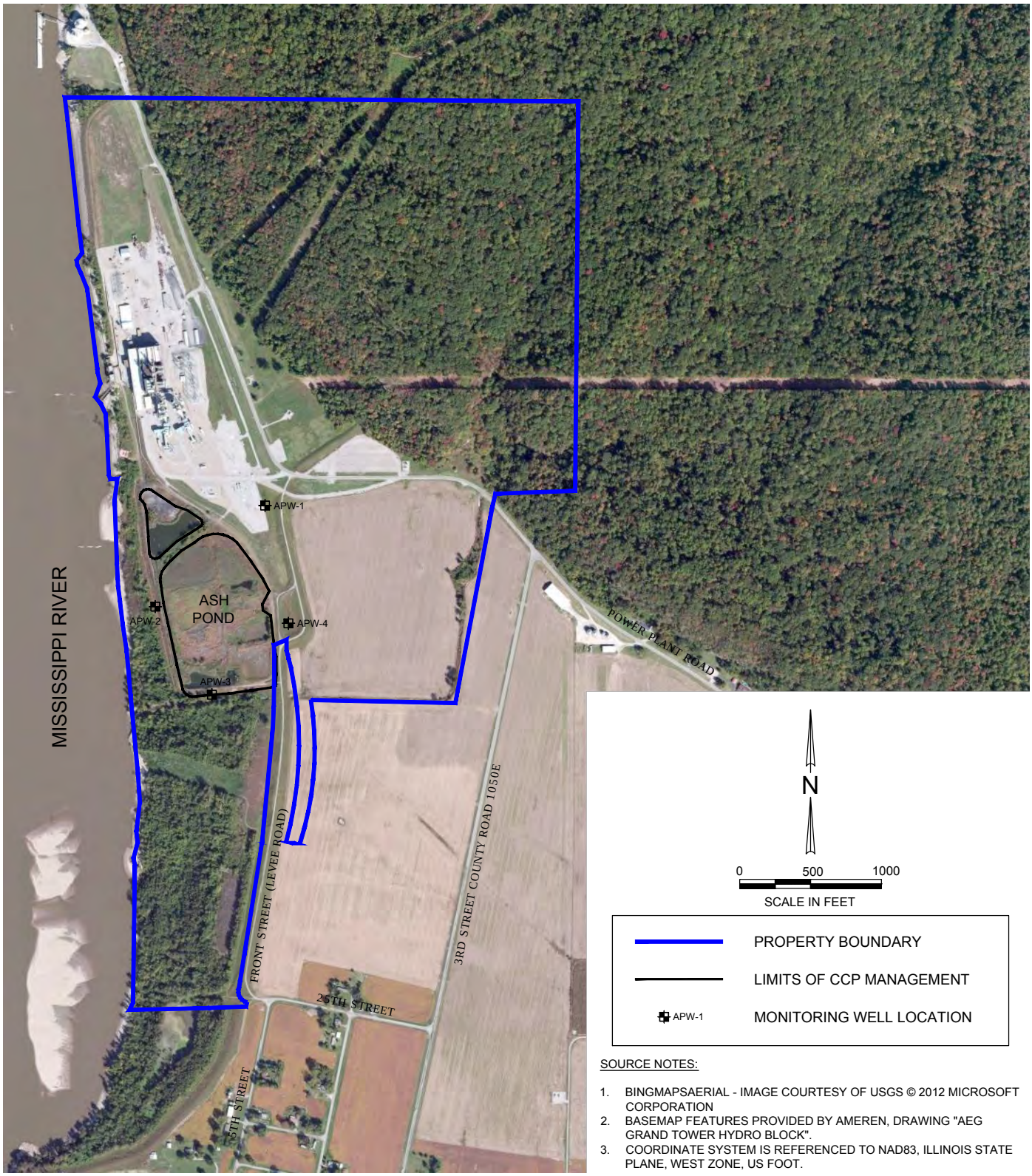
FIGURES



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SITE OVERVIEW MAP

NATURAL RESOURCE TECHNOLOGY

PHASE 1 HYDROGEOLOGIC ASSESSMENT
AMEREN ENERGY GENERATING
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

PROJECT NO.
2123/2.0

DRAWING NO.
2123-2-A01C-SITE OVER

FIGURE NO.
1

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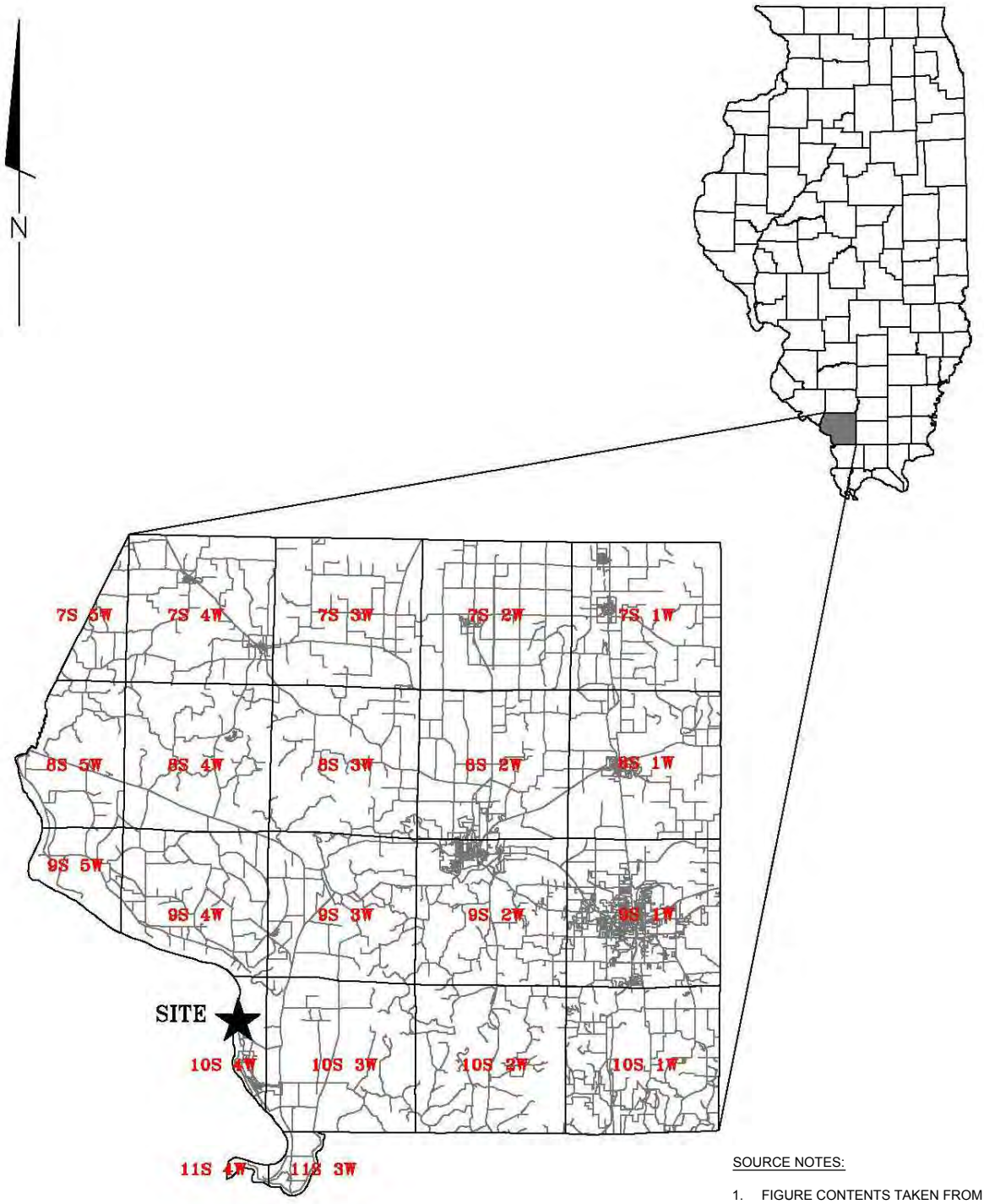

SOURCE NOTES:

1. FIGURE CONTENTS TAKEN FROM RAPPS ENGINEERING & APPLIED SCIENCE, INC. SITE LOCATION MAP, FIGURE 1 FROM PROJECT: SA09035, DRAWING: LOCMAP, DATED 11/09.

SITE LOCATION MAP

NATURAL RESOURCE TECHNOLOGY

PHASE 1 HYDROGEOLOGIC ASSESSMENT
AMEREN ENERGY GENERATING
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

PROJECT NO.
2123/2.0

DRAWING NO.
2123-2-A02C-SITE LOC

FIGURE NO.
2

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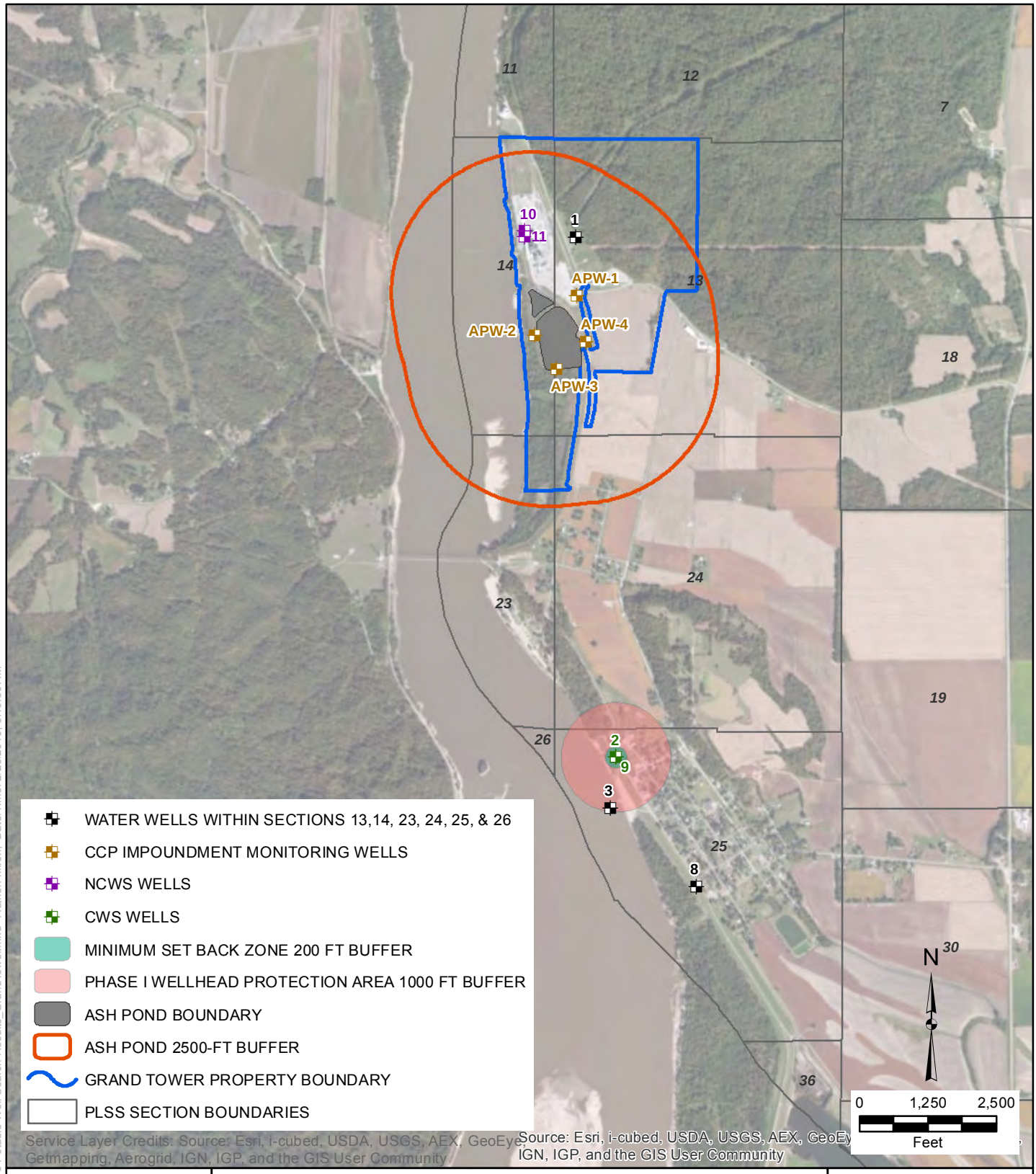

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DRAWN BY/DATE:
NDK 2/12/13
REVIEWED BY/DATE:
TDC 2/12/13
APPROVED BY/DATE:
BRH 2/15/13

POTABLE WELL SEARCH RESULTS

PHASE I HYDROGEOLOGIC ASSESSMENT
AMEREN ENERGY GENERATING
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

PROJECT NO: 2123

FIGURE NO: 3

NATURAL RESOURCE TECHNOLOGY

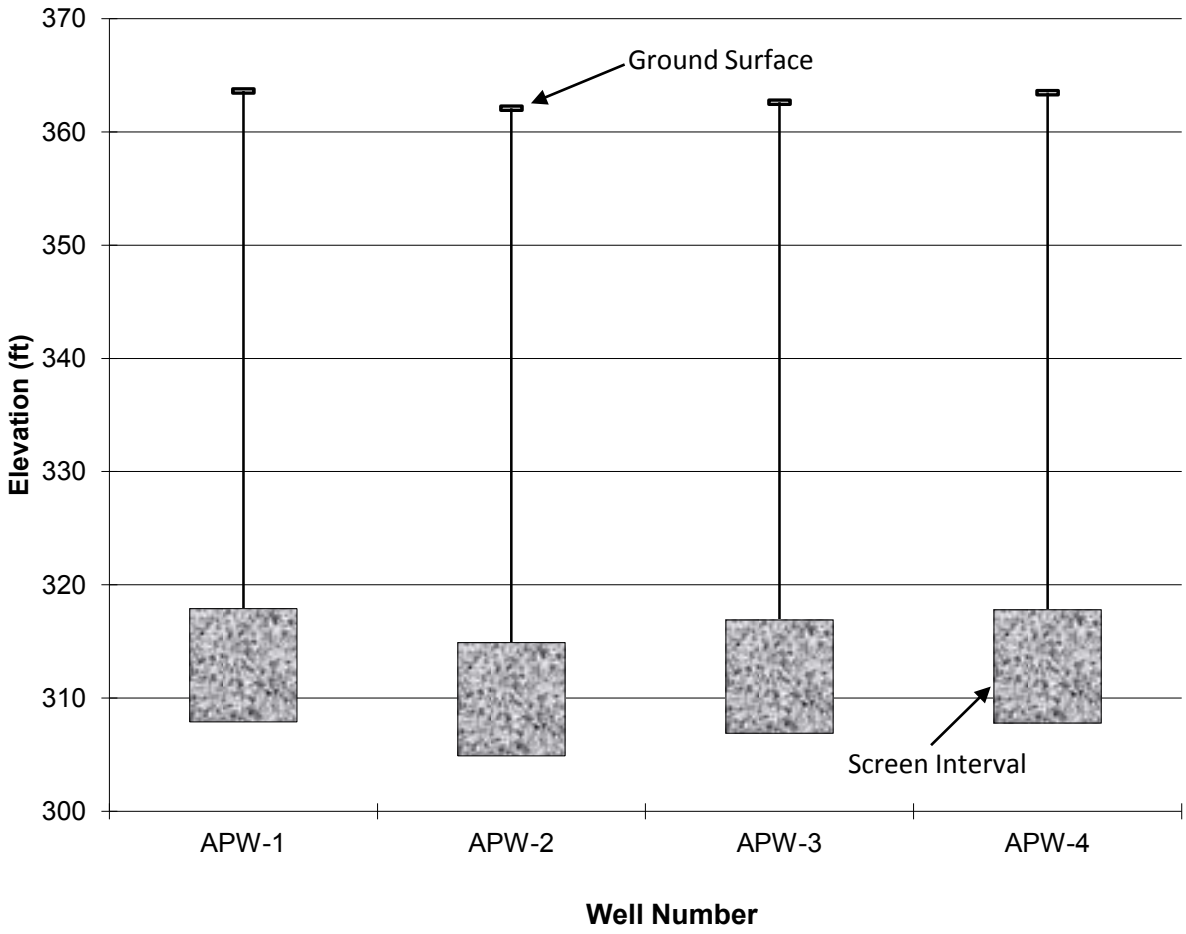


Figure 4. Monitoring Well Screen Elevations.

NATURAL RESOURCE TECHNOLOGY

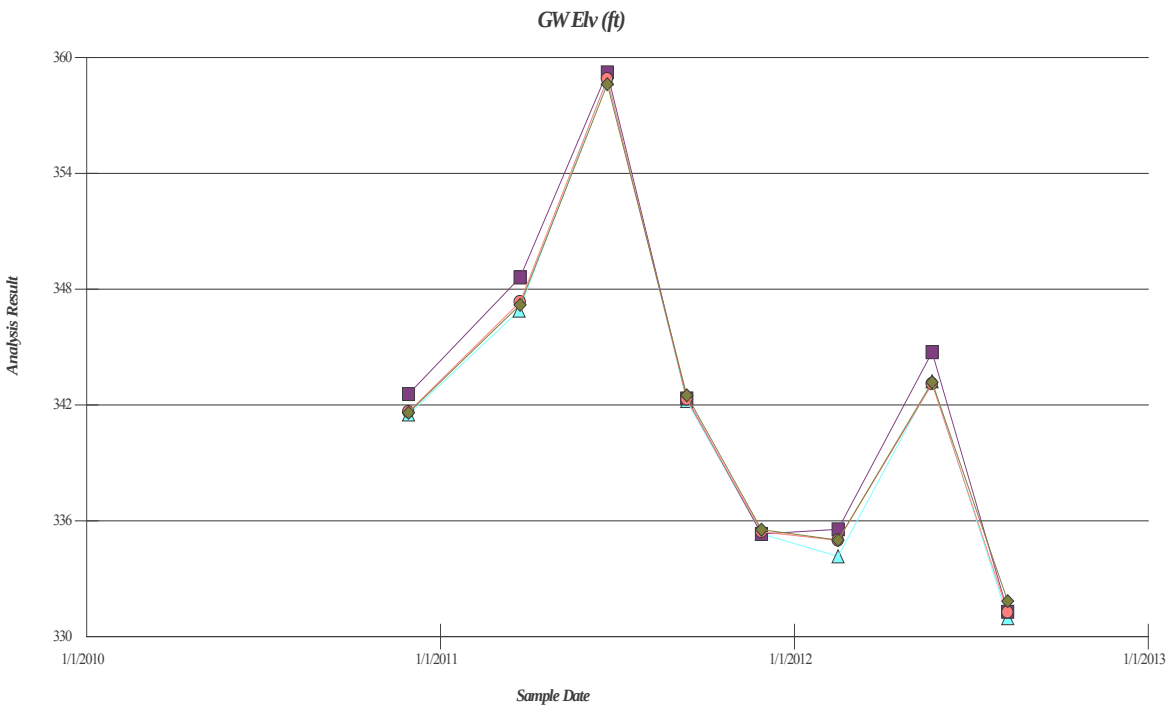
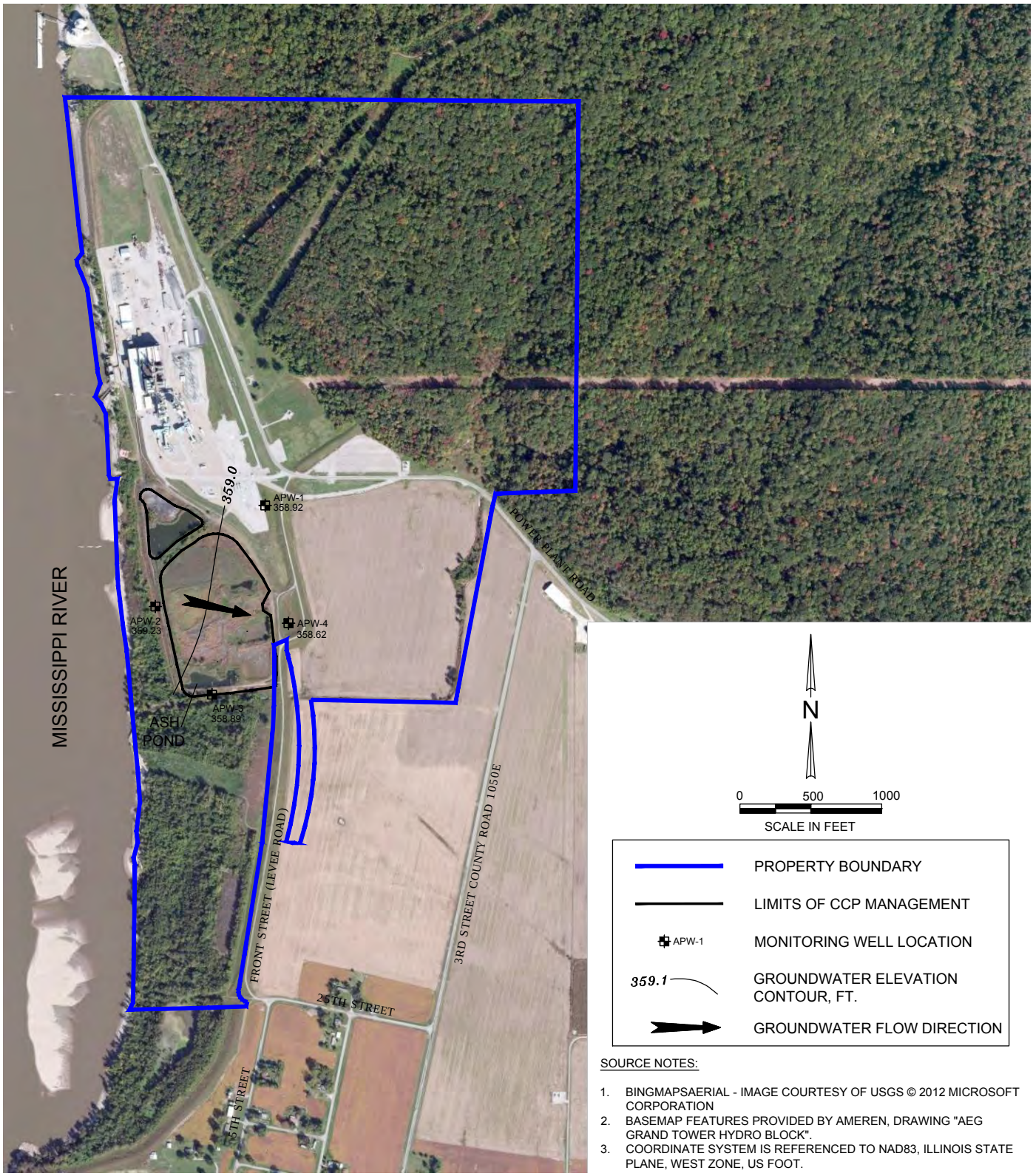


Figure 5. Groundwater Elevation Time Series.

NATURAL RESOURCE TECHNOLOGY



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GROUNDWATER ELEVATION CONTOURS
JUNE 22, 2011

NATURAL RESOURCE TECHNOLOGY

PHASE 1 HYDROGEOLOGIC ASSESSMENT
AMEREN ENERGY GENERATING
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

PROJECT NO.
2123/2.0

DRAWING NO.
2123-2-A06C-GW-JUNE

FIGURE NO.
6

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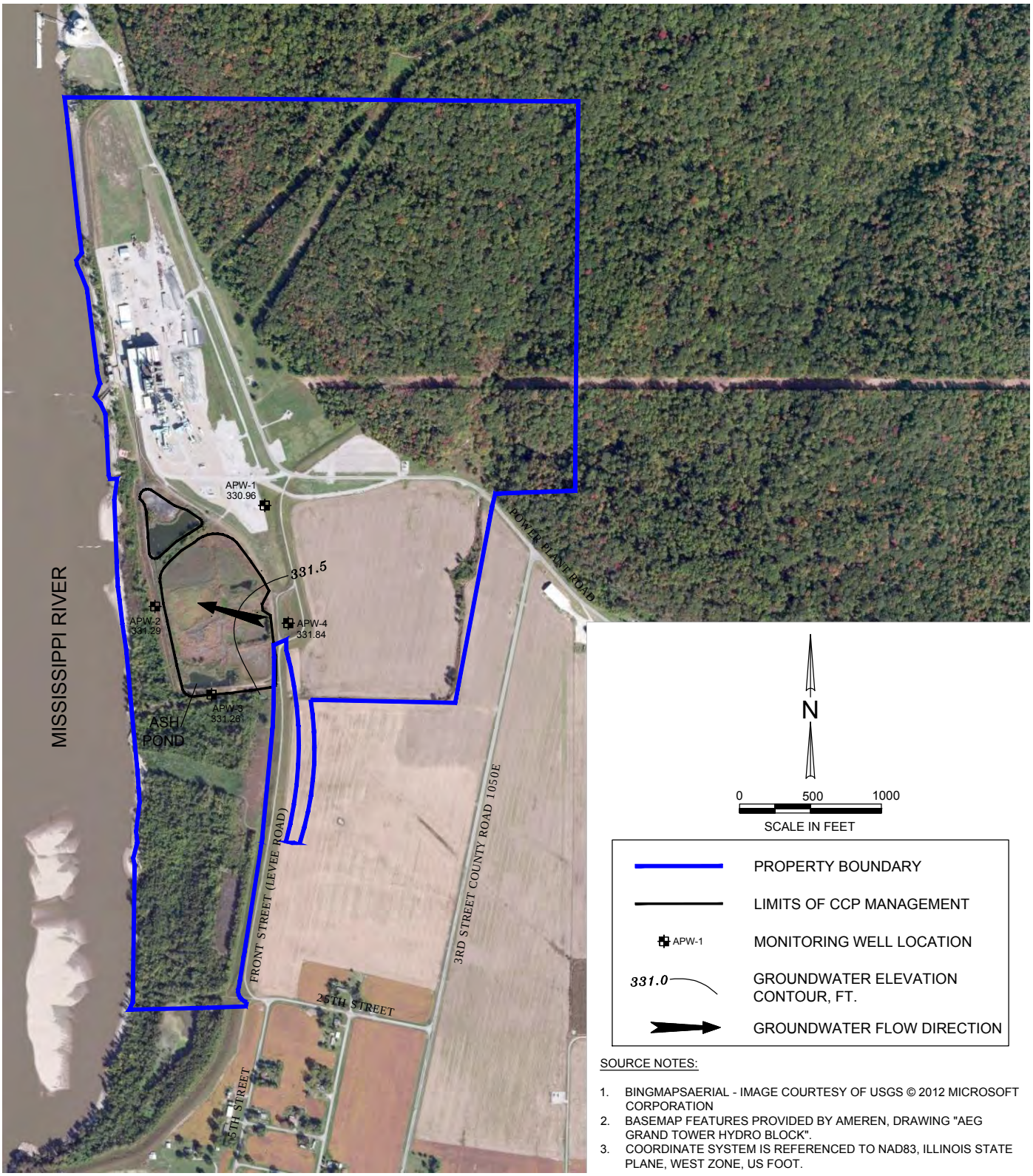

SOURCE NOTES:

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2. BASEMAP FEATURES PROVIDED BY AMEREN, DRAWING "AEG GRAND TOWER HYDRO BLOCK".
3. COORDINATE SYSTEM IS REFERENCED TO NAD83, ILLINOIS STATE PLANE, WEST ZONE, US FOOT.

GROUNDWATER ELEVATION CONTOURS
AUGUST 8, 2012

NATURAL RESOURCE TECHNOLOGY

PHASE 1 HYDROGEOLOGIC ASSESSMENT
AMEREN ENERGY GENERATING
GRAND TOWER ENERGY CENTER
JACKSON COUNTY, ILLINOIS

PROJECT NO.
2123/2.0

DRAWING NO.
2123-2-A07C-GW-AUG

FIGURE NO.
7

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TABLES

Table 1. Monitoring Well Construction Details

Phase 1 Hydrogeologic Assessment
Grand Tower Power Station; Grand Tower, IL

Monitoring Well Number	Installation Date[1,2]	Top of Well Riser Elevation	Ground Elevation	Screen Top Depth (BGS)	Screen Bottom Depth (BGS)	Screen Top Elevation	Screen Bottom Elevation	Bottom of Boring Elevation	Slotted Screen Length	Bottom Screen Depth from Ground Surface	Bottom Screen Depth from Top of Casing	Total Boring Depth
APW-1	10/11/10	366.56	363.61	45.7	55.7	317.9	307.9	307.6	10	55.7	58.7	56.0
APW-2	11/15/10	365.24	362.09	47.2	57.2	314.9	304.9	304.6	10	57.2	60.3	57.5
APW-3	10/09/10	365.59	362.62	45.7	55.7	316.9	306.9	306.6	10	55.7	58.7	56.0
APW-4	10/09/10	367.20	363.46	45.7	55.7	317.8	307.8	307.5	10	55.7	59.4	56.0

Monitoring Well Number	Northing[3]	Easting[3]
APW-1	360,625.8	2,487,059.5
APW-2	359,912.4	2,486,285.3
APW-3	359,291.2	2,486,684.9
APW-4	359,794.7	2,487,224.5

Notes:

All depth and elevation measurements are in feet relative to NAVD 1988.

BGS = below ground surface.

1 Drilling and well installation by Geotechnology, Inc.

2 All wells constructed with 2-inch diametrer, 10-slot, Schedule 40 PVC screens.

3 Coordinates are referenced to Illinois State Plane Coordinates, East Zone - NAD 1983.

Table 2. Groundwater Levels and Elevations

Phase 1 Hydrogeologic Assessment
Grand Tower Power Station; Grand Tower, Illinois

Monitoring Well Number	Ground Surface Elevation[1] (feet)	Measuring Point Elevation[1] (feet)	Groundwater Depth (feet below measuring point)							
			1 11/29/10	2 03/23/11	3 06/22/11	4 09/12/11	5 11/28/11	6 02/15/12	7 05/22/12	8 08/08/12
APW-1	363.61	366.56	25.05	19.67	7.64	24.35	31.24	32.40	23.33	35.60
APW-2	362.09	365.24	22.67	16.63	6.01	22.90	29.92	29.68	20.50	33.95
APW-3	362.62	365.59	23.95	18.25	6.70	23.30	30.16	30.60	22.50	34.33
APW-4	363.46	367.20	25.60	20.01	8.58	24.70	31.66	32.20	24.02	35.36

Monitoring Well Number	Groundwater Depth (feet below ground surface)							
	1 11/29/10	2 03/23/11	3 06/22/11	4 09/12/11	5 11/28/11	6 02/15/12	7 05/22/12	8 08/08/12
APW-1	22.10	16.72	4.69	21.40	28.29	29.45	20.38	32.65
APW-2	19.52	13.48	2.85	19.75	26.77	26.53	17.35	30.80
APW-3	20.98	15.28	3.73	20.33	27.19	27.63	19.53	31.36
APW-4	21.86	16.27	4.84	20.96	27.92	28.46	20.28	31.62

Monitoring Well Number	Groundwater Elevation (feet)							
	1 11/29/10	2 03/23/11	3 06/22/11	4 09/12/11	5 11/28/11	6 02/15/12	7 05/22/12	8 08/08/12
APW-1	341.51	346.89	358.92	342.21	335.32	334.16	343.23	330.96
APW-2	342.57	348.61	359.23	342.34	335.32	335.56	344.74	331.29
APW-3	341.64	347.34	358.89	342.29	335.43	334.99	343.09	331.26
APW-4	341.60	347.19	358.62	342.50	335.54	335.00	343.18	331.84

Notes:

[1] All depth and elevation measurements are in feet relative to NAVD 1988.

Table 3. Field and Laboratory Groundwater Monitoring Parameters

Phase 1 Hydrogeologic Assessment
Grand Tower Power Station; Grand Tower, Illinois

Field Parameters			Analysis Method
Groundwater Elevation		in-situ	
pH (field)	1	in-situ	SM 21st ed. 4500-H^+
Specific Conductance		in-situ	SM 21st ed. 2520-B
Temperature		in-situ	SM 21st ed. 2550
General Chemistry Parameters[2]			**Analysis Method**
Chloride	1	dissolved	SM21 4500CL C
Total Cyanide	1	total	EPA 335.4
Fluoride	1	dissolved	SM4500 F-B-C
Nitrate as N	1	dissolved	EPA 353.2
Sulfate	1	dissolved	ASTM516-90,02
Total Dissolved Solids	1	dissolved	SM21 2540 C
METALS[2]			**Analysis Method[3]**
Antimony	1,3	dissolved	SW846 6010C
Arsenic	1,3	dissolved	SW846 6010C
Barium	1,3	dissolved	SW846 6010C
Beryllium	1,3	dissolved	SW846 6010C
Boron	1,3	dissolved	SW846 6010C
Cadmium	1,3	dissolved	SW846 6010C
Chromium	1,3	dissolved	SW846 6010C
Cobalt	1,3	dissolved	SW846 6010C
Copper	1,3	dissolved	SW846 6010C
Iron	1,3	dissolved	SW846 6010C
Lead	1,3	dissolved	SW846 6010C
Manganese	1,3	dissolved	SW846 6010C
Mercury	1,3	dissolved	SW846 7470A
Nickel	1,3	dissolved	SW846 6010C
Selenium	1,3	dissolved	SW846 6010C
Silver	1,3	dissolved	SW846 6010C
Thallium	1,3	dissolved	SW846 6010C
Zinc	1,3	dissolved	SW846 6010C

Notes:

[1] Groundwater quality parameters for Class I: Potable Resource Groundwater (IAC 35 Part 620 Section 410).

[2] Samples preserved in field and filtered (except Cyanide) by laboratory.

[3] Sample prep method reference: SW846 3010A.

Table 4. Statistical Summary of Groundwater Quality Data for Period of November 2010 - August 2012

Phase 1 Hydrogeologic Assessment
Grand Tower Power Station; Grand Tower, Illinois

Parameter, Unit	Class I GW Standard	Monitoring Well APW-1[1]						Monitoring Well APW-2[1]						Monitoring Well APW-3[1]						Monitoring Well APW-4[1]					
		Mean	Median	Maximum	Minimum	Std Dev	% of Non-Detects	Mean	Median	Maximum	Minimum	Std Dev	% of Non-Detects	Mean	Median	Maximum	Minimum	Std Dev	% of Non-Detects	Mean	Median	Maximum	Minimum	Std Dev	% of Non-Detects
Field Parameters																									
pH, Std Units	6.5 / 9.0*	**6.44**	**6.46**	6.94	**5.76**	0.37	N/A	6.92	7.04	7.30	**5.93**	0.45	N/A	7.60	7.76	8.01	**6.43**	0.49	N/A	7.24	7.40	7.51	**6.05**	0.49	N/A
General Chemistry Parameters (totals)																									
Chloride, mg/L	200	2.2	2.0	4.0	<1.0	1.0	12.5	21	22	24	16	3.0	0	19	19	22	17	1.6	0	10	10	13	4.5	2.7	0
Cyanide, mg/L	0.2	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Fluoride, mg/L	4	0.27	0.29	0.31	0.20	0.036	12.5	0.27	0.29	0.31	0.20	0.036	0	0.35	0.37	0.39	0.26	0.045	0	0.25	0.23	0.35	0.21	0.047	0
Nitrate, mg/L	10	2.3	2.2	3.3	1.4	0.61	0	1.0	0.080	4.3	<0.011	1.7	62.5	nc	nc	nc	nc	nc	100	1.6	0.78	5.1	0.24	1.7	0
Sulfate, mg/L	400	46	47	61	36	12	0	391	391	**469**	311	52	0	232	229	285	210	24	0	184	170	316	120	66	0
Total Dissolved Solids, mg/L	1,200	399	275	**1,310**	182	373	0	825	829	892	712	58	0	435	457	536	216	99	0	553	568	627	388	73	0
Metals (dissolved)																									
Antimony, mg/L	0.006	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Arsenic, mg/L	0.01	nc	nc	nc	nc	nc	100	0.025	0.025	0.034	<0.010	0.007	62.5	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Barium, mg./L	2	0.14	0.14	0.18	0.10	0.026	0	0.30	0.31	0.38	0.18	0.057	0	0.16	0.076	0.76	0.07	0.24	0	0.16	0.16	0.20	0.13	0.023	0
Beryllium, mg/L	0.004	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Boron, mg/L	2	0.28	0.26	0.44	0.19	0.085	0	**7.1**	**7.0**	**8.6**	**5.8**	1.0	0	**4.7**	**4.7**	**4.9**	**4.6**	0.12	0	**4.8**	**4.0**	**8.9**	**2.1**	2.3	0
Cadmium, mg/L	0.005	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Chromium, mg/L	0.1	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Cobalt, mg/L	1.0	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Copper, mg/L	0.65	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Iron, mg/L	5	nc	nc	nc	nc	nc	100	**5.6**	**6.1**	**10**	0.72	3.6	0	0.45	0.45	0.67	0.16	0.14	0	0.051	0.10	0.024	<0.01	0.041	87.5
Lead, mg/L	0.0075	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Manganese, mg/L	0.15	0.034	0.006	0.12	<0.005	0.050	62.5	**0.60**	**0.66**	**0.77**	0.10	0.21	0	**0.28**	**0.28**	**0.32**	**0.25**	0.022	0	0.12	0.10	**0.25**	0.064	0.059	0
Mercury, mg/L	0.002	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Nickel, mg/L	0.1	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Selenium, mg/L	0.05	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	0.043	0.050	0.050	<0.050	0.013	50
Silver, mg/L	0.05	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Thallium, mg/L	0.002	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100	nc	nc	nc	nc	nc	100
Zinc, mg/L	5	0.014	0.010	0.010	<0.010	0.005	87.5	0.019	0.013	0.053	<0.010	0.015	75	nc	nc	nc	nc	nc	100	0.014	0.011	0.012	<0.010	0.006	87.5

Notes:
[1] Eight quarterly samples collected for analysis on 11/29/10, 03/23-24/11, 06/22/11, 09/12/11, 11/28/11, 02/15/12, 05/22/12, and 08/08/12.
Groundwater quality standards for Class I: Potable Resource Groundwater (IAC 35 Part 620 Section 410).
Statistics calculated with replacement of non-detect concentrations at 1X reported non-detect concentration: nc indicates that statistics were not calculated because all values were below reporting limits.
Detected Concentration(s) Exceeds Class I Groundwater Quality Standard at time of sampling.
Parameter is 100% Non-Detect in all 4 monitoring wells.
< = Below method reporting limit. N/A = not applicable.
* Lower and Upper limits for pH is the Class I groundwater quality standard of 6.5 and 9.0 Standard Units.
- - Not calculated due to variability in non-detect data limits.

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APPENDIX A

REGIONAL GEOLOGY

A REGIONAL GEOLOGY

Regional geologic information was previously presented in the site characterization and groundwater monitoring plan developed by Rapps Engineering & Applied Services (November 2009), and is repeated here for completeness.

A.1 Physiography

Illinois is situated in the south-central part of the great Central Lowland Province near the confluence of two major lines of drainage, the Mississippi and Ohio Rivers, making it the lowest of the north-central states with a mean elevation of about 600 feet above sea-level and a total relief of only 973 feet (Leighton et al., 1948). The GTEC lies at the western edge of the Shawnee Hills section of the Interior Low Plateaus Province, a complex dissected upland underlain by Mississippian and Pennsylvanian bedrock of varied lithology (Appendix A [Figure 3]). The Shawnee Hills are a preglacial land surface separating Illinoian glacial drift to the north from overlapping Coastal Plain sediments to the south. Their erosional history continued during the glacial period, when the principal events were loess deposition and valley alluviation, and the regional structure has been changed through widespread folding and faulting.

A.2 Unlithified Geology

The GTEC is located in the Mississippi Valley, where Quaternary deposits consist of glacial outwash of the Henry Formation overlain by channel and floodplain deposits of the Cahokia Formation (Appendix A [Figure 5]) (Berg and Kempton, 1987; Lineback, 1979). The outwash constituting the Henry Formation consists of sorted and stratified water-laid material that is dominantly sand and gravel. These outwash sediments were deposited by debris-laden meltwater flowing away from the ice fronts during both the advances and retreats of glaciers during the Wisconsinan Age (Wilman and Frye, 1970) and were previously classified with the Mackinaw Member, sand and gravel outwash deposited as valley trains. The lithogenetic Mackinaw Member is now an informal sedimentary facies (Hansel and Johnson, 1996). The Henry Formation generally increases in thickness from the edge of the valley, near the bluffs, towards the center, but its thickness varies due to erosion and irregularities in the bedrock surface. Well logs suggest that the Henry Formation attains a maximum thickness of approximately 150 to 200 feet in vicinity of the GTEC.

The Cahokia Formation consists of deposits in the floodplains and channels of modern rivers and streams, and is comprised of mostly poorly sorted sand, silt, and clay with wood and shell fragments, and local deposits of sandy gravel (Lineback, 1979). The upper part consists of overbank silts and clays, while the coarser-textured lower portion is mainly sandy channel and lateral accretion deposits. The Cahokia is

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present along all Illinois streams, although locally absent where active stream erosion is occurring. In major valleys, it commonly overlies the well-sorted deposits of the Henry Formation (Willman and Frye, 1970). The Cahokia Formation is generally greater than 20 feet thick in the vicinity of the GTEC (Berg and Kempton, 1987).

A.3 Bedrock

The GTEC and surrounding areas are underlain by Mississippian age rocks of the Upper Valmeyeran Series and the Upper and Lower Chesterian Series (Appendix A [Figure 4]) (Swann, 1963; Willman et al., 1967). These rocks were described in detail by Willman et al. (1975). The following geologic descriptions are based on this report. The Valmeyeran Series, named for Valmeyer, Monroe County, near the location where the series is exposed, is the middle series of the Mississippian System and includes strata from the top of the Chouteau Limestone upward to the base of the Shelterville Member of the Renault Limestone. It is thickest, over 1800 feet, in southeastern Illinois, and thins to 600 feet or less before being truncated by erosion in northern Illinois. Upper Valmeyeran Formations present in the study area include the Warsaw Shale and the Salem and St. Louis Limestones (Kolata, 2005). The Warsaw Shale is a fossiliferous gray shale containing beds of argillaceous limestone that is widely present in the bluffs of the Mississippi and Illinois Valleys in western and southwestern Illinois. It is overlain by the Salem Limestone, a biocalcarenite consisting of whole fossils and fossil fragments, often with banded overgrowths, embedded in a matrix ranging from micrite to sparite. The St. Louis Limestone, which overlies the Salem, is characterized by fine-grained, micritic to lithographic, cherty limestone, although it contains beds of crystalline and fossiliferous limestone as well as dolomite and evaporites.

The Chesterian Series is the uppermost series of the Mississippian System and is named for Chester, Randolph County, where it is well exposed in the Mississippi River bluffs. It extends from the base of the Pennsylvanian System (marked by the sub-Absaroka unconformity) down to the base of the Shelterville Member of the Renault Formation, which is the top of the Valmeyeran Series. It consists of alternating limestone-shale and sandstone-shale formations depicting cyclic sedimentation sequences resulting from lateral shifts in the mouth of the ancient Michigan River, which transported the clastic sediments in the Chesterian Series, and the position of the shoreline during the progressive sinking of the Illinois Basin. Fossils are ubiquitous in most Chesterian limestones and shales. Sandstones were likely deposited in deltaic environments and are less fossiliferous, but tend to contain thin coal seams. Chesterian strata are more than 1400 feet thick in the southern part of the Illinois Basin and crop out in western and southern Illinois from near Valmeyer south to Grand Tower, then east through Hardin County to the Ohio River.

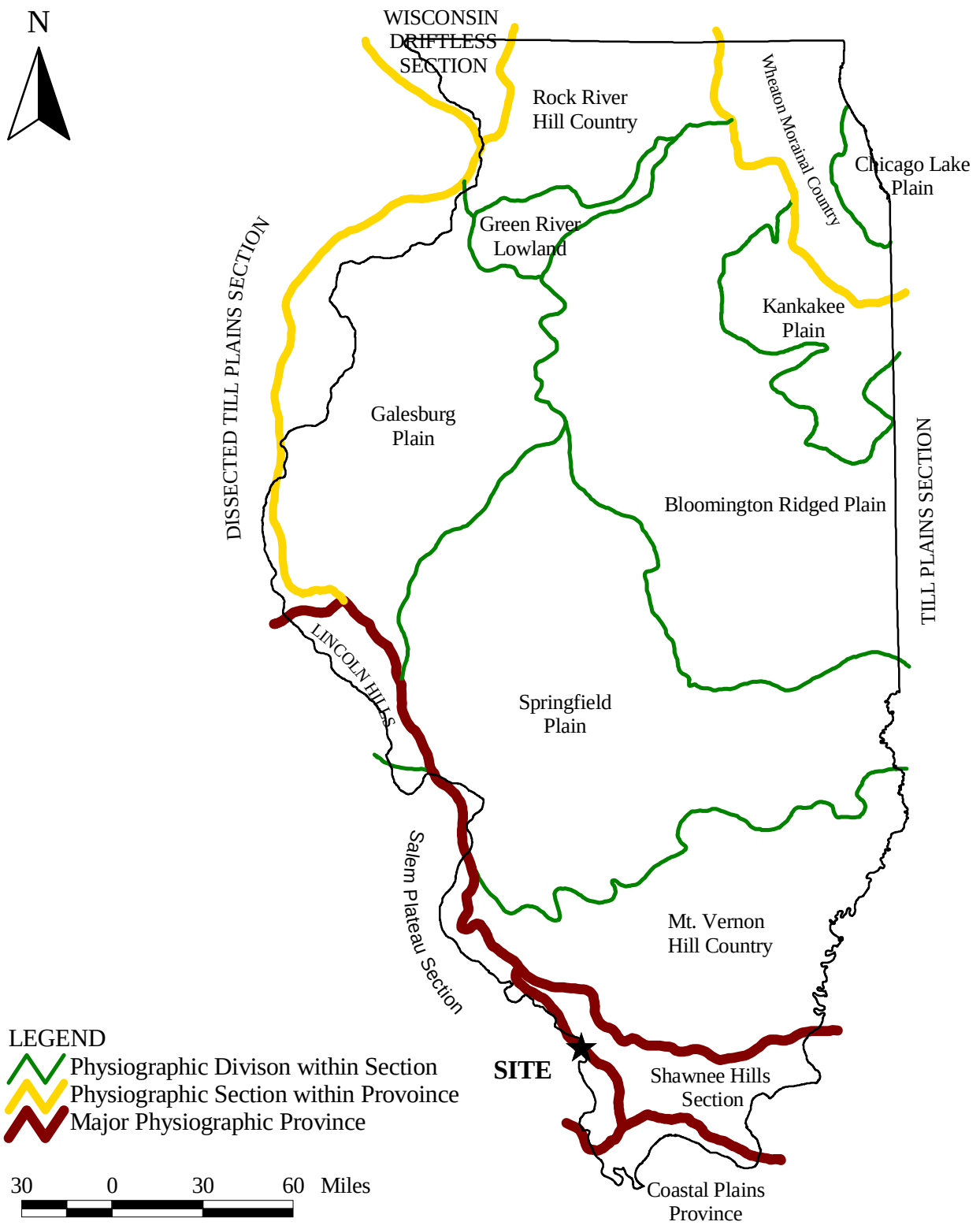

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FIGURE 3

PHYSIOGRAPHIC DIVISIONS OF ILLINOIS
(LEIGHTON ET AL, 1948)

AMERENENERGY GENERATING COMPANY
GRAND TOWER POWER STATION
JACKSON COUNTY, ILLINOIS

PROJECT: SA09035 DRAWING: Physio DATE: 11/09

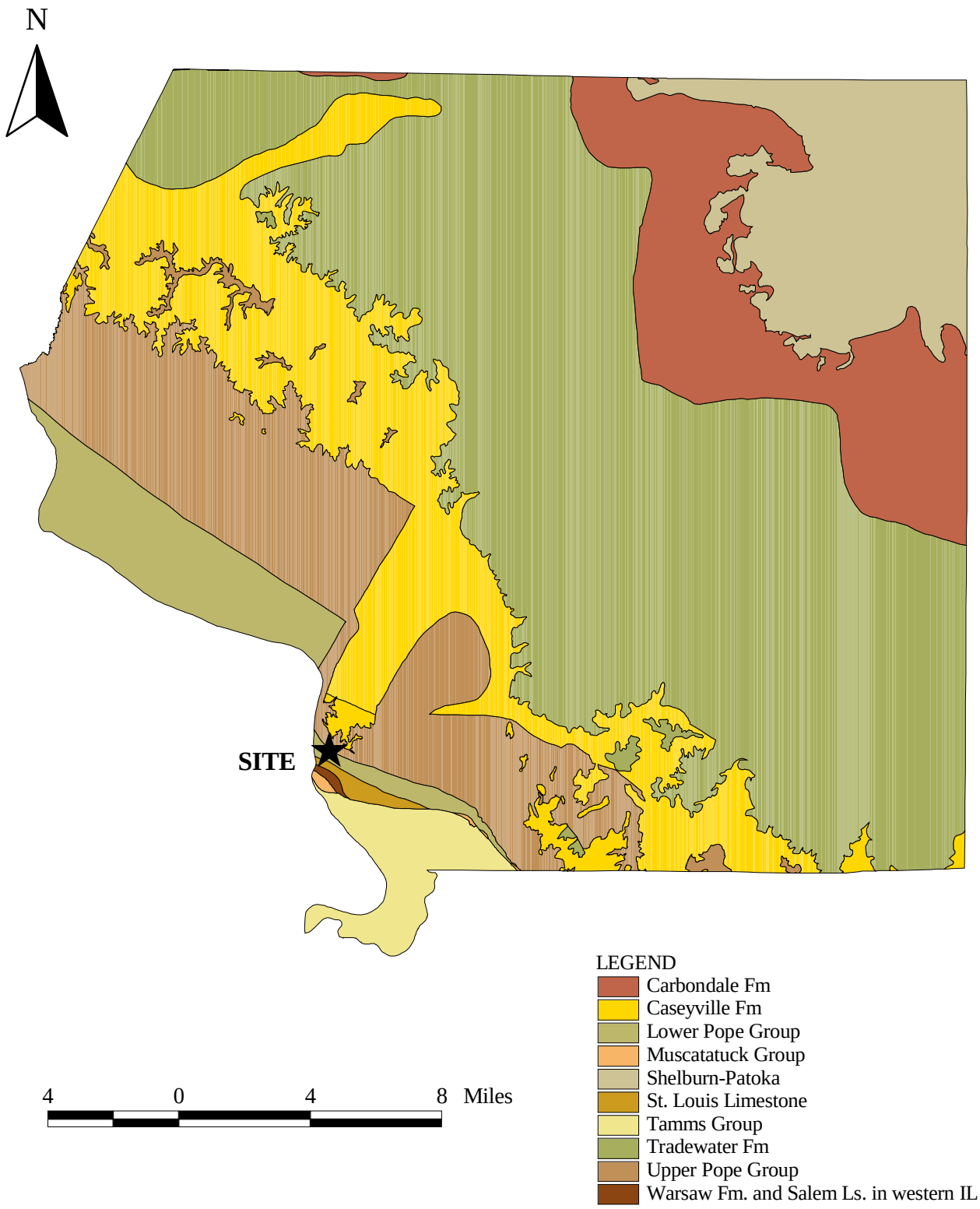

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FIGURE 4
BEDROCK GEOLOGY
(HORBERG, 1950)
AMERENENERGY GENERATING COMPANY
GRAND TOWER POWER STATION
JACKSON COUNTY, ILLINOIS

PROJECT: SA09035 DRAWING: Bedgeo DATE: 11/09

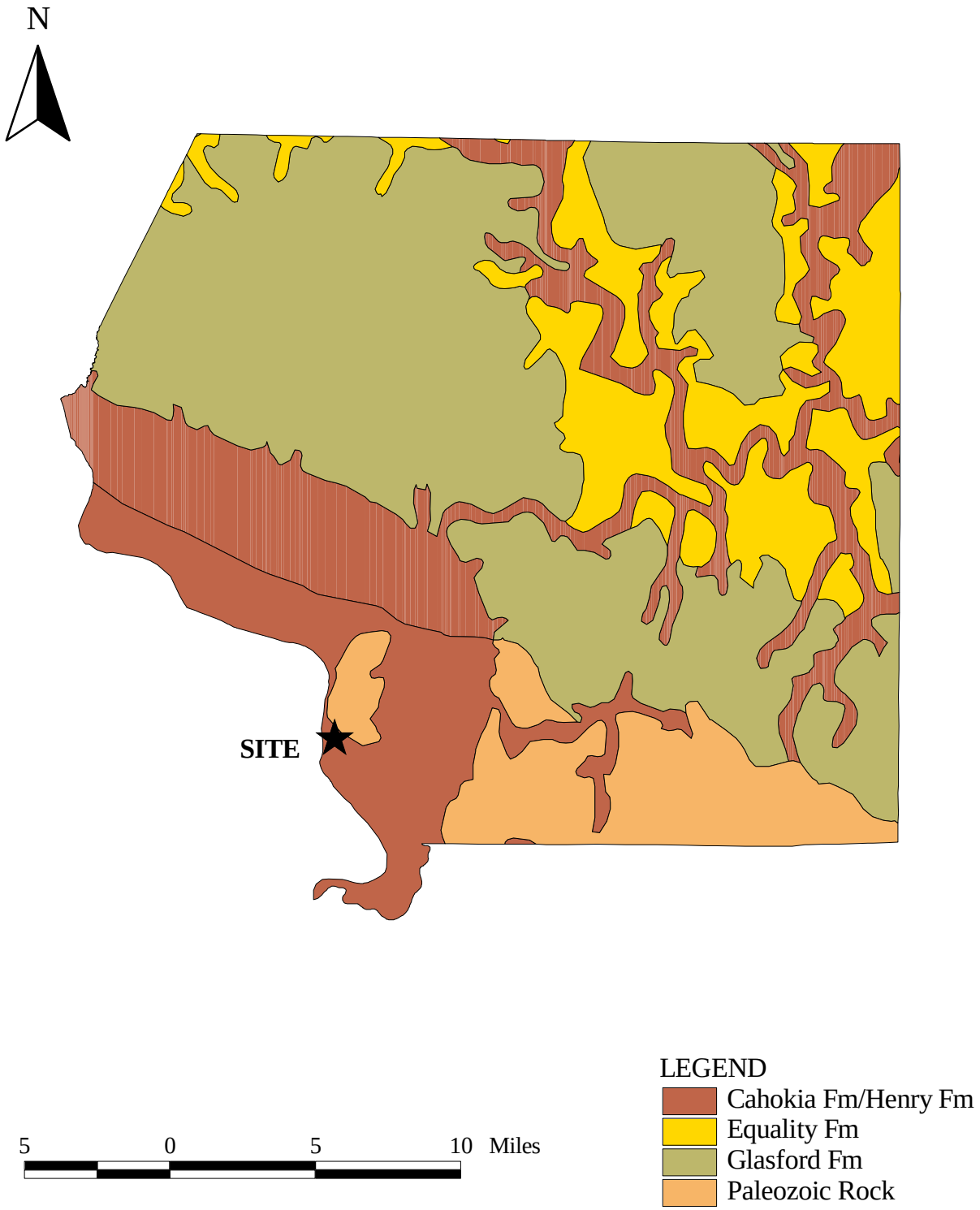

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FIGURE 5
QUATERNARY DEPOSITS
(HANSEL AND JOHNSON, 1996)
AMERENENERGY GENERATING COMPANY
GRAND TOWER POWER STATION
JACKSON COUNTY, ILLINOIS

PROJECT: SA09035 DRAWING: Quat DATE: 11/09

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APPENDIX B

WELL SURVEY RESULTS

B WELL SEARCH

B.1 Well Search Overview

The following sources of information were utilized in order to determine community water source and water well locations:

- Illinois State Geological Survey-Water Well Database Query;
- Illinois State Water Survey private well database;
- Illinois EPA web-based Geographic Information System (GIS) files;
- Illinois Department of Public Health; and
- Jackson County Health Department.

B.2 Illinois State Geological Survey (ISGS)

The ISGS website provided an ArcIMS View Map as well as a database query for water wells. ISGS database information including any boring logs and well construction information is provided in this Appendix..

B.3 Illinois State Water Survey (ISWS)

All of the wells found through the ISWS Domestic Well Database, were previously identified on the ISGS website. Records contained within the ISWS database, consisting of public, industrial, and commercial water wells, were not all received as of the date of this report. Since the ISWS database generally contains the same well information as the ISGS and Illinois EPA databases, some ISWS well entries on the Appendix B-1 Table were marked as pending. Should any new information be acquired from the ISWS including additional water wells not previously identified from the other sources of the well information, it will be provided as an addendum to this report. Table B-2 lists wells located by RAPPS Engineering & Applied Science, Inc. that were not located and identified in the current well search for this report.

Wells 4 through 7 in Appendix Table B-1 were located from the ISWS database; however, wells 4 through 7 are not mapped in Figure 3 due to insufficient location information provided by the ISWS database. These four wells appear to be owned by Ameren and are Industrial/Commercial wells. Wells 4 through 7 were not found in either the ISGS or IEPA databases.

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B.4 Illinois Environmental Protection Agency (IEPA)

The Illinois EPA database website provided ArcIMS Viewer Maps showing information on community, non-community, and public water supply wells as defined on the Illinois EPA website:

- Community Water Supply (CWS): a public water supply that serves or is intended to serve at least 15 service connections used by residents or regularly serves at least 25 residents.
- Non-Community Water Supply (NCWS): a public water supply that is not a community water supply.
- Public Water Supply: all mains, pipes and structures through which water is obtained and distributed to the public, including wells and well structures, intakes and cribs, pumping stations, treatment plants, reservoirs, storage tanks and appurtenances, collectively or severally, actually used or intended for use for the purpose of furnishing water for drinking or general domestic use and which serve at least 15 service connections or which regularly serve at least 25 persons at least 60 days per year. A public water supply is either a community water supply or a non-community water supply.

Based on the IEPA maps, two CWS wells, wells 2 and 9, are located within Section 25 in the town of Grand Tower. Both CWS wells include a Minimum Setback Zone (MSZ) and a Phase I wellhead protection area (WHPA). A MSZ is an area of 200 or 400 radial feet surrounding a water well supplying public water system through which contaminants from a source are theoretically likely to move and reach the well. A Phase I WHPA was also developed to extend the surface and subsurface area surrounding the water well to 1,000 radial feet. The two CWS wells were also identified in the ISGS database.

Two NCWS wells owned by Ameren were also identified in the IEPA database, located within Section 14, and on the Grand Tower Power Plant property (Figure 3). No MSZ or WHPA were established for these two NCWS wells. The two NCWS were not identified on the ISGS database.

B.5 Jackson County Health Department

Personnel from the Jackson County Health Department confirmed the two CWS well systems and the two NCWS wells located in the area. No additional information was provided about the area.

Table B-1. Other Water Wells, Precise Location Not Available
Phase I Hydrogeologic Assessment
Grand Tower Power Station

Map Well #	Source of Well Information				Location Name at Time of Well Completion	Well Depth	County	Location				Year Drilled	Aquifer Type	Formation	Well Use
	ISGS	ISWS***	IEPA	Other				Township	Range	Section	Subsection				
1	120770159500	209156	01595	--	Weber, Walter	155	Jackson	10S	4W	13	NW	1964	--	--	FD
2	120770175500	***	01755	--	Village of Grand Tower	155	Jackson	10S	4W	25	NENENW	1971	--	--	CWS
3	120770137300	***	01373	--	Kunce, James	60	Jackson	10S	4W	25	NW(A)	1950	--	--	FD
4	--	209157*	--	--	C.i.p.s. Co.	96	Jackson	10S	4W	14	--	1923	--	--	IC
5	--	209158*	--	--	C.i.p.s. Co.	92	Jackson	10S	4W	14	--	1924	--	--	IC
6	--	209159*	--	--	C.i.p.s. Co.	102	Jackson	10S	4W	14	--	1957	--	--	IC
7	--	209160*	--	--	C.i.p.s. Co.	117	Jackson	10S	4W	14	--	1979	--	--	IC
8	120770137400	***	01374	--	King, Norman	60	Jackson	10S	4W	25	NW	1950	--	--	FD
9	120772615100	***	26151	--	City of Grand Tower	156	Jackson	10S	4W	25	NE	1951	unconsolidated	sand and gravel	CWS
10	--	***	7700040	--	Ameren/CIPS	--	Jackson	10S	4W	14	--	--	--	--	NCWS
11	--	***	7700057	--	Ameren/CIPS	--	Jackson	10S	4W	14	--	--	--	--	NCWS

Sources of Information

IEPA	Illinois Environmental Protection Agency
ISGS	Illinois State Geological Survey
ISWS	Illinois State Water Survey
SWA	IEPA Source Water Assessment

Well Use

FD	Farm and/or Domestic Water Well
IC	Industrial/Commercial Water Well
CWS	Community Water Supply
NCWS	Non-Community Water Supply

Notes

- -	Not applicable or no information available
***	ISWS data pending
A	Well is mislocated in ISGS and/or IEPA databases
#*	insufficient data to map locations

Table B-2. Other Water Wells, Precise Location Not Available
Phase I Hydrogeologic Assessment
Grand Tower Power Station

Well ID	Depth	Location			Well Use	Driller	Date Drilled
		Township	Range	Section			
401812		10S	4W	14			
401813		10S	4W	14			
401814		10S	4W	14			
401815		10S	4W	14			
401816		10S	4W	14			

Notes:
none specified

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ILLINOIS STATE GEOLOGICAL SURVEY

Municipal Water Supply	Top	Bottom
sandy clay	0	33
fine blue, gray silt	33	56
blue, gray sand	56	69
fine blue, gray silt	69	102
gray sand with gravel	102	105
red sand	105	117
gray brown sand some gravel	117	154
no record	154	156
Total Depth		**156**

Casing: 10" CASING from -1' to 103'
8" CASING from -3' to 150'
Screen: 10' of 7.5" diameter .04 slot

Static level 15' below casing top which is 3' above GL
Pumping level 24' when pumping at 255 gpm for 8 hours

Address of well: within WTP (south well)

Permit Date: **Permit #:**

COMPANY Weldon Well Company
FARM Grand Tower, City
DATE DRILLED July 1, 1951 **NO.** 1
ELEVATION 366 **COUNTY NO.** 26151
LOCATION 500'S 4100'W NE/c
LATITUDE 37.632184 **LONGITUDE** -89.506438
COUNTY **Jackson** **API** **120772615100** **25 - 10S - 4W**

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ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
Total Depth		**155**
Driller's Log filed		
Sample set # 57668 (0' - 155') Received: October 19, 1971		

Permit Date: **Permit #:**

COMPANY Luhr Brothers, Inc.
FARM Vlge Of Grnd Towr
DATE DRILLED August 1, 1971 **NO.** 2
ELEVATION 0 **COUNTY NO.** 01755
LOCATION 500'N line, 4100'E line of section
LATITUDE 37.632184 **LONGITUDE** -89.506438
COUNTY **Jackson** **API** **120770175500** **25 - 10S - 4W**

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ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
Total Depth		**155**
Driller's Log filed		

Permit Date: **Permit #:**

COMPANY Gwin Drilling
FARM Weber Walter
DATE DRILLED March 1, 1964 **NO.**
ELEVATION 0 **COUNTY NO.** 01595
LOCATION 1800'N line, 400'W line of NW
LATITUDE 37.658254 **LONGITUDE** -89.508711
COUNTY **Jackson** **API** **120770159500** **13 - 10S - 4W**

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ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
Total Depth		**60**
Driller's Log filed		
Sample set # 20923 (0' - 60') Received: January 1, 1950		

Permit Date: **Permit #:**

COMPANY
FARM King Norman
DATE DRILLED January 1, 1950 **NO.** 1
ELEVATION 0 **COUNTY NO.** 01374
LOCATION
LATITUDE 37.625675 **LONGITUDE** -89.501443
COUNTY **Jackson** **API** **120770137400** **25 - 10S - 4W**

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ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	Top	Bottom
Total Depth		**60**
Driller's Log filed		
Sample set # 20914 (0' - 55') Received: January 1, 1950		

Permit Date: **Permit #:**

COMPANY
FARM Kunce James N
DATE DRILLED January 1, 1950 **NO.** 1
ELEVATION 0 **COUNTY NO.** 01373
LOCATION NW
LATITUDE 37.629627 **LONGITUDE** -89.506823
COUNTY **Jackson** **API** **120770137300** **25 - 10S - 4W**

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APPENDIX C

BORING LOGS WITH WELL DIAGRAMS

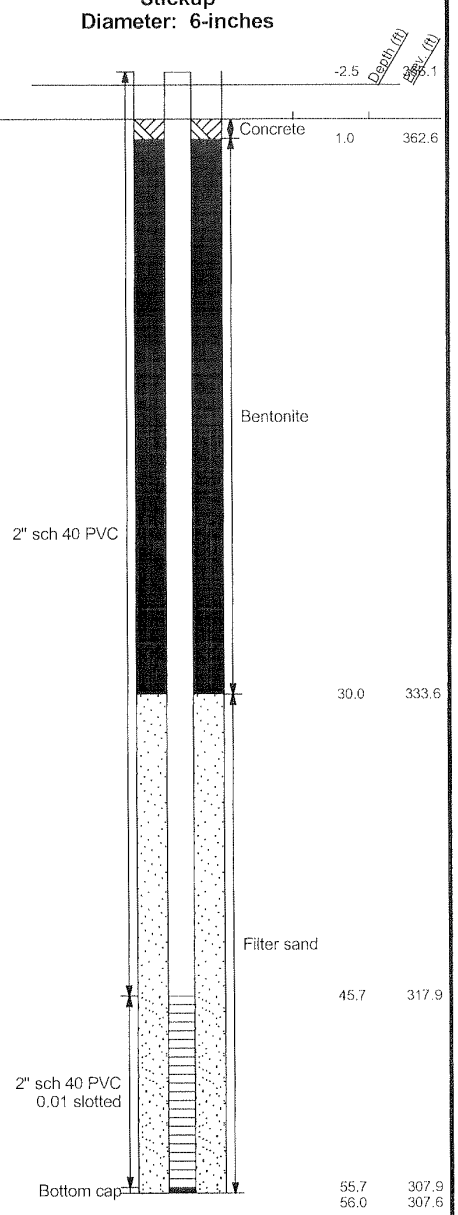
Surface Elevation: 363.61 | Completion Date: 10/11/10

Datum msl | Northing: 360625.76 | Easting: 2487059.46

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: brown, silty clay, trace organics	3-3-4	SS1
		3-4-5	SS2
5	Brown, silty CLAY - CL	3-3-5	SS3
		3-5-5	SS4
	Brown, fine, silty SAND - SM	1-3-2	SS5
	Brown CLAY - CH	1-2-4	SS6
10	Brown, silty CLAY, trace fine sand - CL	1-2-2	SS7
	Brown, clayey SILT - ML	0-0-0	SS8
	Brown, silty CLAY, trace fine sand - CL	0-1-2	SS9
	Brown CLAY - CH	0-2	SS10
15	Brown, fine, sandy SILT - ML	0-0-0	SS11
	Brown CLAY with occasional seams of clayey silt - CH	0-0-0	SS12
20		0-2-3	SS13
		0-2-3	SS14
		2-2-3	SS15
	Brown, fine, sandy SILT - ML	1-3-3	SS16
25		0-0-0	SS17
		0-0-0	SS18
		0-1-2	SS19
30		0-0-1	SS20
		0-0-0	SS21
	Brown, silty, fine SAND - SM	5-3-5	SS22
35	Brown, fine SAND - SP	1-2-3	SS23
		1-0-0	SS24
		4-6-6	SS25
	Brown, fine to coarse SAND - SW	5-5-5	SS26
40	Logging terminated at 40 feet.		
45			
50			
55			
	Boring terminated at 58 feet.		

WELL DIAGRAM

Stickup
Diameter: 6-inches



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by DTK	App'vd. by RSP
Date: 10/18/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

AmerenUE
Grand Tower

LOG OF BORING: APW-1

Project No. J017150.01.1004A

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01ENV - GRAND TWR.GPJ GTINC 0638301.GPJ 12/13/11

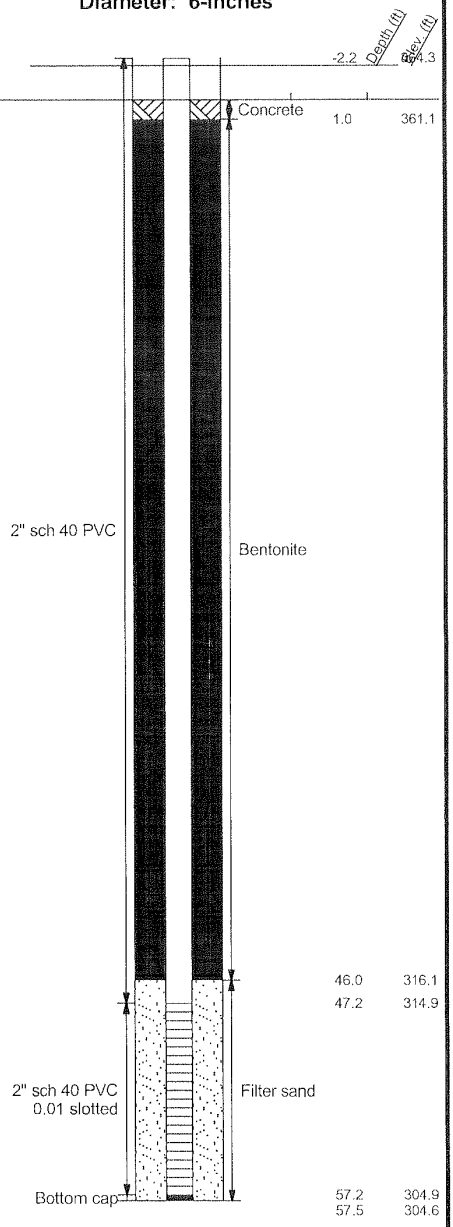
Surface Elevation: 362.09 | Completion Date: 11/15/10

Datum msl | Northing: 359912.43 | Easting: 2486285.25

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: silty clay, crushed rock, silty fine sand, and fine sand	1-2-3	SS1
		50/1"	SS2
5		3-4-3	SS3
		3-5-7	SS4
		2-3-2	SS5
	Gray, fine, sandy SILT - ML	2-2-3	SS6
10	Brown, fine SAND - SP	2-3-3	SS7
	Gray and brown, silty, fine SAND - SM	0-1-2	SS8
		0-1-2	SS9
15	Gray, sandy CLAY - CL	0-1-3	SS10
	Gray CLAY - CH	0-1-2	SS11
		0-2-2	SS12
20		1-1-1	SS13
	Gray, fine, sandy SILT, trace clay - ML	0-0-0	SS14
		1-2-1	SS15
		1-1-2	SS16
25		1-2-1	SS17
		1-1-1	SS18
		1-1-1	SS19
30		1-2-1	SS20
	Gray, silty, fine SAND - SM	0-0-0	SS21
		0-1-1	SS22
35		2-2-3	SS23
		1-2-3	SS24
		1-2-3	SS25
40	Logging terminated at 40 feet.	1-2-2	SS26
45			
50			
55	Boring terminated at 58 feet.		

WELL DIAGRAM

Above Ground Diameter: 6-inches



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM

WASHBORING FROM ___ FEET

MB DRILLER LAH LOGGER

CME 550X DRILL RIG

HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTC	App'vd. by: RBS
Date: 10/18/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

AmerenUE
Grand Tower

LOG OF BORING: APW-2B

Project No. J017150.01.1004A

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01ENV - GRAND TWR.GPJ GTINC 0638301.GPJ 12/13/11

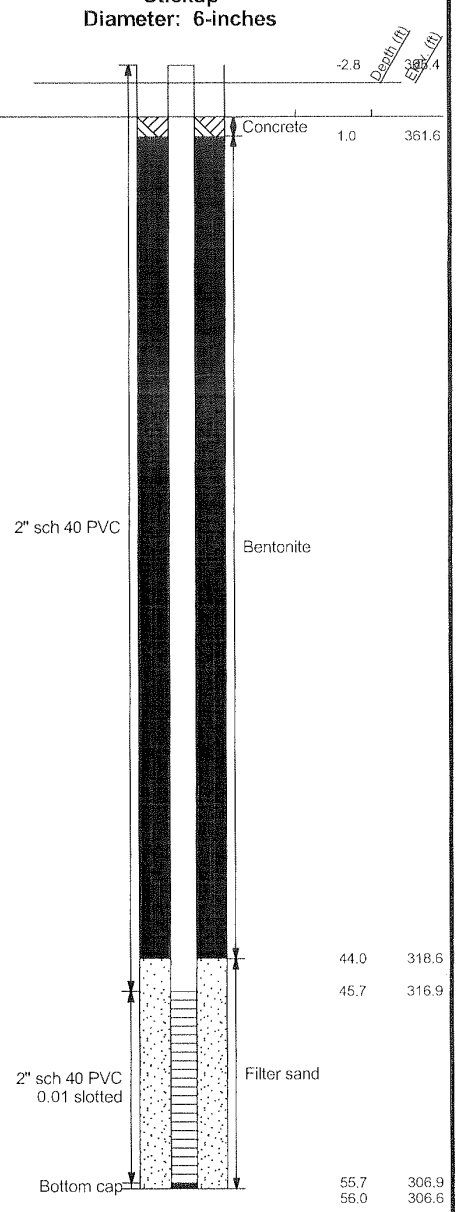
Surface Elevation: 362.62 | Completion Date: 10/9/10

Datum msl | Northing: 359291.23 | Easting: 2486684.92

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: brown, silyt clay, some sand and crushed rock	3-5-15	SS1
		5-5-7	SS2
5	Gray, silty CLAY - CL	5-6-7	SS3
	Gray CLAY with occasional fine sand seams - CH	4-4-5	SS4
		3-3-7	SS5
		5-5-6	SS6
10	Gray and brown, silty CLAY - CL	0-3-4	SS7
	Brownish-gray CLAY - CH	2-2-3	SS8
	Brownish-gray, silty CLAY - CL	1-2-2	SS9
15		0-1-2	SS10
	Grayish-brown, fine, sandy SILT - ML	1-1-1	SS11
		0-0-2	SS12
20		0-1-1	SS13
		1-1-2	SS14
	Brown, silty, fine SAND - SM	0-2-2	SS15
		0-1-1	SS16
25		0-0-0	SS17
		2-2-5	SS18
		0-2-2	SS19
30		2-2-2	SS20
		1-2-2	SS21
		3-3-2	SS22
35		1-2-2	SS23
		2-3-7	SS24
		4-8-9	SS25
	Gray, fine to medium SAND - SP	7-4-15	SS26
40	Logging terminated at 40 feet.		
45			
50			
55			
	Boring terminated at 58 feet.		

WELL DIAGRAM

Stickup
Diameter: 6-inches



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by DTK	App'vd. by RSP
Date: 10/18/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

AmerenUE
Grand Tower

LOG OF BORING: APW-3

Project No. J017150.01.1004A

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

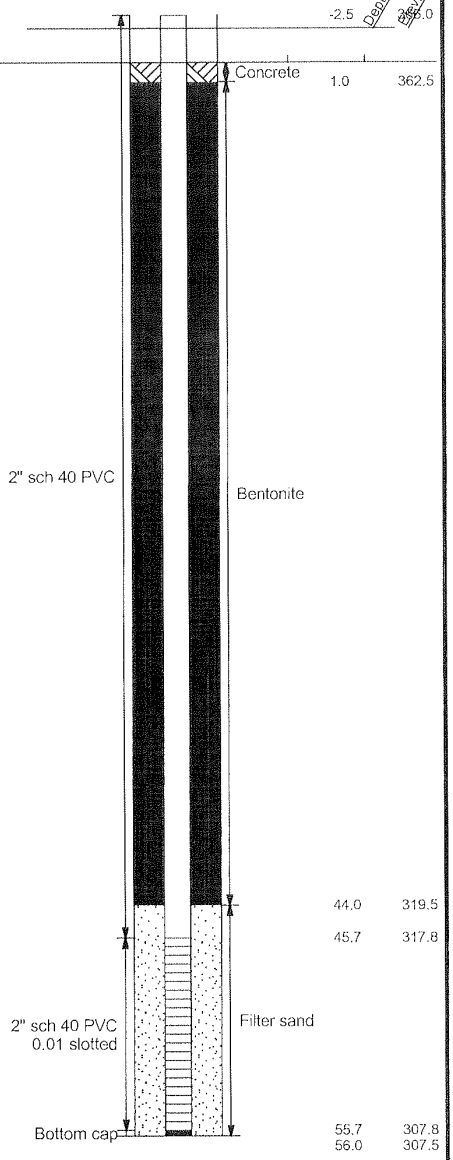
LOG OF BORING 2002 WL J017150.01ENV - GRAND TWR.GPJ GTINC 0638301.GPJ 12/13/11

Surface Elevation: 363.46 | Completion Date: 10/11/10
Datum msl | Northing: 359794.71 | Easting: 2487224.5

DEPTH IN FEET	DESCRIPTION OF MATERIAL	DRY UNIT WEIGHT (pcf) SPT BLOW COUNTS CORE RECOVERY/RQD	SAMPLES
	FILL: brown, silty clay, trace organics	6-6-9	SS1
		5-5-6	SS2
5		4-5-5	SS3
		3-6-6	SS4
	Brown, silty CLAY - CL	2-4-4	SS5
		2-3-4	SS6
10		1-2-2	SS7
		2-1-2	SS8
		0-2-2	SS9
15		1-1-2	SS10
	Brown, fine, sandy SILT - ML	0-2-3	SS11
	Grayish-brown CLAY - CH	0-2-2	SS12
20	Brown, fine, sandy SILT with occasional layers of clay and silty fine sand - ML	0-0-2	SS13
		0-2-2	SS14
		3-2-4	SS15
		0-1-2	SS16
25		0-0-0	SS17
		0-4-4	SS18
	Brown, silty, fine SAND with occasional layers of fine, sandy silt - SM	0-3-2	SS19
30		0-1-1	SS20
		0-2-3	SS21
		3-3-5	SS22
35		2-4-5	SS23
	Brown and gray, fine to coarse SAND, trace gravel - SW	7-21-24	SS24
		3-5-11	SS25
40	Logging terminated at 40 feet.	9-13-12	SS26
45			
50			
55	Boring terminated at 58 feet.		

WELL DIAGRAM

Above Ground
Diameter: 6-inches



GROUNDWATER DATA

X FREE WATER NOT ENCOUNTERED DURING DRILLING

DRILLING DATA

___ AUGER 4 1/4" HOLLOW STEM
WASHBORING FROM ___ FEET
MB DRILLER LAH LOGGER
CME 550X DRILL RIG
HAMMER TYPE Auto

REMARKS:

Drawn by: KSA	Checked by: DTK	App'vd. by: RBP
Date: 10/18/10	Date: 2/17/11	Date: 2/17/11

GEOTECHNOLOGY INC
FROM THE GROUND UP

AmerenUE
Grand Tower

LOG OF BORING: APW-4

Project No. J017150.01.1004A

NOTE: STRATIFICATION LINES REPRESENT THE APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES AND THE TRANSITION MAY BE GRADUAL. GRAPHIC LOG FOR ILLUSTRATION PURPOSES ONLY.

LOG OF BORING 2002 WL J017150.01ENV - GRAND TWR.GPJ GTINC 0638301.GPJ 12/13/11

Electronic Filing - Recived, Clerk's Office : 04/09/2013 - * * * R2013-019 * * *

APPENDIX D

GROUNDWATER QUALITY DATA SUMMARY

December 18, 2012
8:42:48 AM

Groundwater Monitoring Data: November 2010 - August 2012

Date Range: 11/29/2010 to 08/08/2012

Well Id	Date Sampled	Lab Id	Ag, diss, mg/L	As, diss, mg/L	B, diss, mg/L	Ba, diss, mg/L	Be, diss, mg/L	Cd, diss, mg/L
APW-1	11/29/2010		<0.005	<0.004	0.444	0.101	<0.004	<0.004
	03/23/2011		<0.005	<0.004	0.297	0.130	<0.004	<0.004
	06/22/2011		<0.005	<0.004	0.345	0.134	<0.004	<0.004
	09/12/2011		<0.010	<0.025	0.271	0.122	<0.001	<0.002
	11/28/2011		<0.010	<0.025	0.241	0.170	<0.001	<0.002
	02/15/2012		<0.010	<0.025	0.219	0.146	<0.001	<0.002
	05/22/2012		<0.010	<0.025	0.208	0.156	<0.001	<0.002
	08/08/2012		<0.010	<0.025	0.185	0.182	<0.001	<0.002
APW-2	11/29/2010		<0.005	0.031	6.160	0.313	<0.004	<0.004
	03/24/2011		<0.005	0.034	7.930	0.382	<0.004	<0.004
	06/22/2011		<0.005	0.010	8.610	0.309	<0.004	<0.004
	09/12/2011		<0.010	<0.025	7.060	0.273	<0.001	<0.002
	11/28/2011		<0.010	<0.025	5.840	0.314	<0.001	<0.002
	02/15/2012		<0.010	<0.025	6.970	0.308	<0.001	<0.002
	05/22/2012		<0.010	<0.025	8.070	0.327	<0.001	<0.002
	08/08/2012		<0.010	<0.025	6.100	0.180	<0.001	<0.002
APW-3	11/29/2010		<0.005	<0.004	4.590	0.077	<0.004	<0.004
	03/24/2011		<0.005	<0.004	4.900	0.076	<0.004	<0.004
	06/22/2011		<0.005	<0.004	4.790	0.077	<0.004	<0.004
	09/12/2011		<0.010	<0.025	4.650	0.760	<0.001	<0.002
	11/28/2011		<0.010	<0.025	4.680	0.072	<0.001	<0.002
	02/15/2012		<0.010	<0.025	4.900	0.069	<0.001	<0.002
	05/22/2012		<0.010	<0.025	4.640	0.083	<0.001	<0.002
	08/08/2012		<0.010	<0.025	4.680	0.070	<0.001	<0.002
APW-4	11/29/2010		<0.005	<0.004	4.010	0.144	<0.004	<0.004
	03/24/2011		<0.005	<0.004	7.010	0.185	<0.004	<0.004
	06/22/2011		<0.005	<0.004	8.900	0.197	<0.004	<0.004
	09/12/2011		<0.010	<0.025	6.170	0.181	<0.001	<0.002
	11/28/2011		<0.010	<0.025	3.910	0.163	<0.001	<0.002
	02/15/2012		<0.010	<0.025	2.970	0.165	<0.001	<0.002
	05/22/2012		<0.010	<0.025	3.240	0.142	<0.001	<0.002
	08/08/2012		<0.010	<0.025	2.060	0.133	<0.001	<0.002

December 20, 2012
9:15:37 AM

Groundwater Monitoring Data: November 2010 - August 2012

Date Range: 11/29/2010 to 08/08/2012

Well Id	Date Sampled	Lab Id	Cl, diss, mg/L	CN, total, mg/L	Co, diss, mg/L	Cr, diss, mg/L	Cu, diss, mg/L	F, diss, mg/L
APW-1	11/29/2010		2.000	<0.010	<0.050	<0.010	<0.025	0.220
	03/23/2011		1.200	<0.010	<0.050	<0.010	<0.025	0.260
	06/22/2011		2.000	<0.010	<0.050	<0.010	<0.025	0.190
	09/12/2011		<1.000	<0.007	<0.010	<0.010	<0.010	0.170
	11/28/2011		2.000	<0.007	<0.010	<0.010	<0.010	0.140
	02/15/2012		4.000	<0.007	<0.010	<0.010	<0.010	<0.100
	05/22/2012		3.000	<0.007	<0.010	<0.010	<0.010	0.120
	08/08/2012		2.000	<0.007	<0.010	<0.010	<0.010	0.150
APW-2	11/29/2010		22.000	<0.010	<0.050	<0.010	<0.025	0.310
	03/24/2011		19.200	<0.010	<0.050	<0.010	<0.025	0.200
	06/22/2011		21.000	<0.010	<0.050	<0.010	<0.025	0.240
	09/12/2011		22.000	<0.007	<0.010	<0.010	<0.010	0.290
	11/28/2011		16.000	<0.007	<0.010	<0.010	<0.010	0.260
	02/15/2012		24.000	<0.007	<0.010	<0.010	<0.010	0.280
	05/22/2012		24.000	<0.007	<0.010	<0.010	<0.010	0.290
	08/08/2012		17.000	<0.007	<0.010	<0.010	<0.010	0.300
APW-3	11/29/2010		20.500	<0.010	<0.050	<0.010	<0.025	0.370
	03/24/2011		18.700	<0.010	<0.050	<0.010	<0.025	0.260
	06/22/2011		18.500	<0.010	<0.050	<0.010	<0.025	0.310
	09/12/2011		19.000	<0.007	<0.010	<0.010	<0.010	0.380
	11/28/2011		18.000	<0.007	<0.010	<0.010	<0.010	0.370
	02/15/2012		22.000	<0.007	<0.010	<0.010	<0.010	0.390
	05/22/2012		20.000	<0.007	<0.010	<0.010	<0.010	0.340
	08/08/2012		17.000	<0.007	<0.010	<0.010	<0.010	0.380
APW-4	11/29/2010		4.500	<0.010	<0.050	<0.010	<0.025	0.210
	03/24/2011		10.200	<0.010	<0.050	<0.010	<0.025	0.350
	06/22/2011		10.000	<0.010	<0.050	<0.010	<0.025	0.270
	09/12/2011		7.000	<0.007	<0.010	<0.010	<0.010	0.280
	11/28/2011		11.000	<0.007	<0.010	<0.010	<0.010	0.220
	02/15/2012		12.000	<0.007	<0.010	<0.010	<0.010	0.220
	05/22/2012		13.000	<0.007	<0.010	<0.010	<0.010	0.240
	08/08/2012		10.000	<0.007	<0.010	<0.010	<0.010	0.220

December 18, 2012
8:42:49 AM

Groundwater Monitoring Data: November 2010 - August 2012

Date Range: 11/29/2010 to 08/08/2012

Well Id	Date Sampled	Lab Id	Fe, diss, mg/L	GW Depth (TOC), ft	Hg, diss, mg/L	Mn, diss, mg/L	Ni, diss, mg/L	NO3, diss, mg/L
APW-1	11/29/2010		<0.100	25.050	<0.0002	0.121	<0.040	1.400
	03/23/2011		<0.100	19.670	<0.0002	0.108	<0.040	1.800
	06/22/2011		<0.100	7.640	<0.0002	<0.015	<0.040	3.300
	09/12/2011		<0.020	24.350	<0.0002	<0.005	<0.010	1.890
	11/28/2011		<0.020	31.240	<0.0002	<0.005	<0.010	2.060
	02/15/2012		<0.020	32.400	<0.0002	0.006	<0.010	2.830
	05/22/2012		<0.020	23.330	<0.0002	<0.005	<0.010	2.360
	08/08/2012		<0.020	35.600	<0.0002	<0.005	<0.010	2.430
APW-2	11/29/2010		7.440	22.670	<0.0002	0.774	<0.040	<0.011
	03/24/2011		10.100	16.630	<0.0002	0.678	<0.040	3.300
	06/22/2011		4.680	6.010	<0.0002	0.654	<0.040	<0.110
	09/12/2011		3.780	22.900	<0.0002	0.691	<0.010	<0.050
	11/28/2011		0.720	29.920	<0.0002	0.660	<0.010	<0.050
	02/15/2012		8.530	29.680	<0.0002	0.636	<0.010	<0.050
	05/22/2012		8.670	20.500	<0.0002	0.643	<0.010	0.407
	08/08/2012		0.902	33.950	<0.0002	0.096	<0.010	4.260
APW-3	11/29/2010		0.162	23.950	<0.0002	0.315	<0.040	<0.011
	03/24/2011		0.668	18.250	<0.0002	0.290	<0.040	<0.110
	06/22/2011		0.399	6.700	<0.0002	0.268	<0.040	<0.110
	09/12/2011		0.497	23.300	<0.0002	0.252	<0.010	<0.050
	11/28/2011		0.465	30.160	<0.0002	0.266	<0.010	<0.050
	02/15/2012		0.424	30.600	<0.0002	0.281	<0.010	<0.170
	05/22/2012		0.546	22.500	<0.0002	0.311	<0.010	<0.050
	08/08/2012		0.423	34.330	<0.0002	0.273	<0.010	<0.050
APW-4	11/29/2010		<0.100	25.600	<0.0002	0.253	<0.040	0.240
	03/24/2011		<0.100	20.010	<0.0002	0.091	<0.040	0.360
	06/22/2011		<0.100	8.580	<0.0002	0.064	<0.040	0.420
	09/12/2011		<0.020	24.700	<0.0002	0.099	<0.010	0.597
	11/28/2011		<0.020	31.660	<0.0002	0.104	<0.010	0.955
	02/15/2012		0.024	32.200	<0.0002	0.155	<0.010	2.180
	05/22/2012		<0.020	24.020	<0.0002	0.087	<0.010	2.940
	08/08/2012		<0.020	35.360	<0.0002	0.114	<0.010	5.070

December 20, 2012
8:44:05 AM

Groundwater Monitoring Data: November 2010 - August 2012

Date Range: 11/29/2010 to 08/08/2012

Well Id	Date Sampled	Lab Id	Pb, diss, mg/L	pH (field), STD	Sb, diss, mg/L	Se, diss, mg/L	SO4, diss, mg/L	Spec. Cond. (field),
APW-1	11/29/2010		<0.0050	5.760	<0.006	<0.010	37.100	571.000
	03/23/2011		<0.0050	6.250	<0.006	<0.010	35.600	386.000
	06/22/2011		<0.0050	6.690	<0.006	<0.010	47.500	366.000
	09/12/2011		<0.0020	6.730	<0.005	<0.050	36.000	374.000
	11/28/2011		<0.0020	6.560	<0.005	<0.050	46.000	416.000
	02/15/2012		<0.0020	6.940	<0.005	<0.050	61.000	448.000
	05/22/2012		<0.0020	6.360	<0.005	<0.050	57.000	414.000
	08/08/2012		<0.0020	6.210	<0.005	<0.050	50.000	438.000
APW-2	11/29/2010		<0.0050	5.930	<0.006	<0.010	342.000	1,062.000
	03/24/2011		<0.0050	6.860	<0.006	<0.010	425.000	1,129.000
	06/22/2011		<0.0050	7.300	<0.006	<0.010	428.000	1,060.000
	09/12/2011		<0.0020	7.290	<0.005	<0.050	372.000	949.000
	11/28/2011		<0.0020	6.770	<0.005	<0.050	369.000	1,235.000
	02/15/2012		<0.0020	6.960	<0.005	<0.050	410.000	1,051.000
	05/22/2012		<0.0020	7.170	<0.005	<0.050	469.000	970.000
	08/08/2012		<0.0020	7.110	<0.005	<0.050	311.000	886.000
APW-3	11/29/2010		<0.0050	6.430	<0.006	<0.010	211.000	665.000
	03/24/2011		<0.0050	7.550	<0.006	<0.010	226.000	656.000
	06/22/2011		<0.0050	7.800	<0.006	<0.010	231.000	641.000
	09/12/2011		<0.0020	8.010	<0.005	<0.050	210.000	621.000
	11/28/2011		<0.0020	7.750	<0.005	<0.050	231.000	728.000
	02/15/2012		<0.0020	7.660	<0.005	<0.050	240.000	652.000
	05/22/2012		<0.0020	7.840	<0.005	<0.050	285.000	677.000
	08/08/2012		<0.0020	7.770	<0.005	<0.050	222.000	618.000
APW-4	11/29/2010		<0.0050	6.050	<0.006	0.014	135.000	697.000
	03/24/2011		<0.0050	7.180	<0.006	0.035	244.000	898.000
	06/22/2011		<0.0050	7.510	<0.006	0.049	316.000	844.000
	09/12/2011		<0.0020	7.490	<0.005	0.050	176.000	744.000
	11/28/2011		<0.0020	7.400	<0.005	<0.050	177.000	864.000
	02/15/2012		<0.0020	7.380	<0.005	<0.050	163.000	760.000
	05/22/2012		<0.0020	7.510	<0.005	<0.050	140.000	694.000
	08/08/2012		<0.0020	7.400	<0.005	<0.050	120.000	668.000

December 18, 2012
8:42:50 AM

Groundwater Monitoring Data: November 2010 - August 2012

Date Range: 11/29/2010 to 08/08/2012

Well Id	Date Sampled	Lab Id	TDS, mg/L	Temp (Fahrenheit),	Tl, diss, mg/L	Zn, diss, mg/L
APW-1	11/29/2010		1,310.000	57.920	<0.002	<0.020
	03/23/2011		225.000	57.380	<0.002	<0.020
	06/22/2011		237.000	60.260	<0.002	<0.020
	09/12/2011		272.000	60.080	<0.002	<0.010
	11/28/2011		314.000	51.980	<0.002	<0.010
	02/15/2012		182.000	53.420	<0.002	<0.010
	05/22/2012		278.000	61.160	<0.002	0.010
	08/08/2012		370.000	60.080	<0.002	<0.010
APW-2	11/29/2010		712.000	59.180	<0.002	0.053
	03/24/2011		789.000	57.740	<0.002	<0.020
	06/22/2011		806.000	61.520	<0.002	<0.020
	09/12/2011		834.000	61.160	<0.002	<0.010
	11/28/2011		884.000	57.380	<0.002	<0.010
	02/15/2012		824.000	57.920	<0.002	<0.010
	05/22/2012		892.000	60.800	<0.002	0.016
	08/08/2012		860.000	61.160	<0.002	<0.010
APW-3	11/29/2010		452.000	60.440	<0.002	<0.020
	03/24/2011		400.000	58.280	<0.002	<0.020
	06/22/2011		423.000	62.240	<0.002	<0.020
	09/12/2011		462.000	61.700	<0.002	<0.010
	11/28/2011		216.000	57.200	<0.002	<0.010
	02/15/2012		478.000	57.380	<0.002	<0.010
	05/22/2012		536.000	61.340	<0.002	<0.010
	08/08/2012		514.000	61.520	<0.002	<0.010
APW-4	11/29/2010		388.000	58.100	<0.002	<0.023
	03/24/2011		583.000	57.200	<0.002	<0.020
	06/22/2011		627.000	60.080	<0.002	<0.020
	09/12/2011		570.000	62.060	<0.002	<0.010
	11/28/2011		604.000	56.480	<0.002	<0.010
	02/15/2012		564.000	56.480	<0.002	<0.010
	05/22/2012		524.000	60.080	<0.002	0.012
	08/08/2012		566.000	60.080	<0.002	<0.010

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APPENDIX E

EXCEEDANCES OF CLASS 1 GROUNDWATER STANDARDS

December 27, 2012
8:22:36 AM

Exceedances of Class I Groundwater Standards: November 2010 - August 2012

Date Range: 11/01/2010 to 09/01/2012

LimitType	Parameter	Code	Units	Location	Sample Date	Analysis Result	Lower Limit	Upper Limit
State Std	B, diss	01020	mg/L	APW-2	11/29/2010	6.160		2.000
					03/24/2011	7.930		2.000
					06/22/2011	8.610		2.000
					09/12/2011	7.060		2.000
					11/28/2011	5.840		2.000
					02/15/2012	6.970		2.000
					05/22/2012	8.070		2.000
					08/08/2012	6.100		2.000
				APW-3	11/29/2010	4.590		2.000
					03/24/2011	4.900		2.000
					06/22/2011	4.790		2.000
					09/12/2011	4.650		2.000
					11/28/2011	4.680		2.000
					02/15/2012	4.900		2.000
					05/22/2012	4.640		2.000
					08/08/2012	4.680		2.000
				APW-4	11/29/2010	4.010		2.000
					03/24/2011	7.010		2.000
					06/22/2011	8.900		2.000
					09/12/2011	6.170		2.000
					11/28/2011	3.910		2.000
					02/15/2012	2.970		2.000
					05/22/2012	3.240		2.000
					08/08/2012	2.060		2.000
	Fe, diss	01046		APW-2	11/29/2010	7.440		5.000
					03/24/2011	10.100		5.000
					02/15/2012	8.530		5.000
					05/22/2012	8.670		5.000
	Mn, diss	01056			11/29/2010	0.774		0.150
					03/24/2011	0.678		0.150
					06/22/2011	0.654		0.150
					09/12/2011	0.691		0.150
					11/28/2011	0.660		0.150
					02/15/2012	0.636		0.150
					05/22/2012	0.643		0.150
				APW-3	11/29/2010	0.315		0.150
					03/24/2011	0.290		0.150

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December 27, 2012
8:22:36 AM

Exceedances of Class I Groundwater Standards: November 2010 - August 2012

Date Range: 11/01/2010 to 09/01/2012

LimitType	Parameter	Code	Units	Location	Sample Date	Analysis Result	Lower Limit	Upper Limit
State Std	Mn, diss	01056	mg/L	APW-3	06/22/2011	0.268		0.150
					09/12/2011	0.252		0.150
					11/28/2011	0.266		0.150
					02/15/2012	0.281		0.150
					05/22/2012	0.311		0.150
					08/08/2012	0.273		0.150
				APW-4	11/29/2010	0.253		0.150
					02/15/2012	0.155		0.150
	pH (field)	00400	STD	APW-1	11/29/2010	5.760	6.500	
					03/23/2011	6.250	6.500	
					05/22/2012	6.360	6.500	
					08/08/2012	6.210	6.500	
				APW-2	11/29/2010	5.930	6.500	
				APW-3	11/29/2010	6.430	6.500	
				APW-4	11/29/2010	6.050	6.500	
	SO4, diss	00946	mg/L	APW-2	03/24/2011	425.000		400.000
					06/22/2011	428.000		400.000
					02/15/2012	410.000		400.000
					05/22/2012	469.000		400.000
	TDS	00515		APW-1	11/29/2010	1,310.000		1,200.000

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APPENDIX F

HYDRAULIC GRADIENT AND BORON LOADING CALCULATIONS

Appendix F
Mixing Calculation Showing Effect of Boron Loading on Mississippi River Quality at Low Flow

7-day 10-year low flow at Chester, IL		47600	cfs	Source: http://il.water.usgs.gov/drought/lowflow.html, 1988 data
	$Q_{7,10}$ =	1.2E+11	L/day	
Boron loading rate				
Maximum Boron Concentration in Groundwater (Cmax)		8.9	mg/L	APW-4
Maximum Hydraulic Conductivity		0.0045	cm/s	Based on data from Ameren's Venice Ponds 2 and 3
Hydraulic Gradient		0.00061		Maximum observed gradient toward river
Aquifer Thickness		100	ft	Assumed
Length of Impoundment + 500 feet (each way) north and south		2,600	ft	
Q = KIA				
K = Max Hydraulic Conductivity		1.5E-04	ft/s	
I = Hydraulic Gradient		0.00061		
A = Cross-Sectional Area		260,000	ft^2	
Q (per second)		0.02342	cfs	
Q (per day)		57,287.74	L/day	
Loading Rate (L)		5.1E+05	mg/day	= Cmax * Q
	L =	1.12	lb/day	
Boron concentration increase in Mississippi River at low flow due to loading CCP Impoundment				
	d_B =	4.4E-06	mg/L	= $L/Q_{7,10}$
Boron concentration increase near-shore in Mississippi River at low flow due to loading from CCP Impoundment				
Assumes loading distributed within 50 feet of east bank		0.0002	mg/L	relative to a total river width of 2,300 feet
Typical boron laboratory detection limit		0.0038	mg/L	Source: USEPA SW-846 Method 6010c

Conclusion:

The calculated boron concentration increase in the Mississippi River at ***low flow*** due to groundwater loading from the CCP impoundment is below our ability to measure, even if we only consider a small portion of the river. These calculations indicate that the effects of boron loading in groundwater discharge to the Mississippi River are negligible.

NATURAL RESOURCE TECHNOLOGY

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

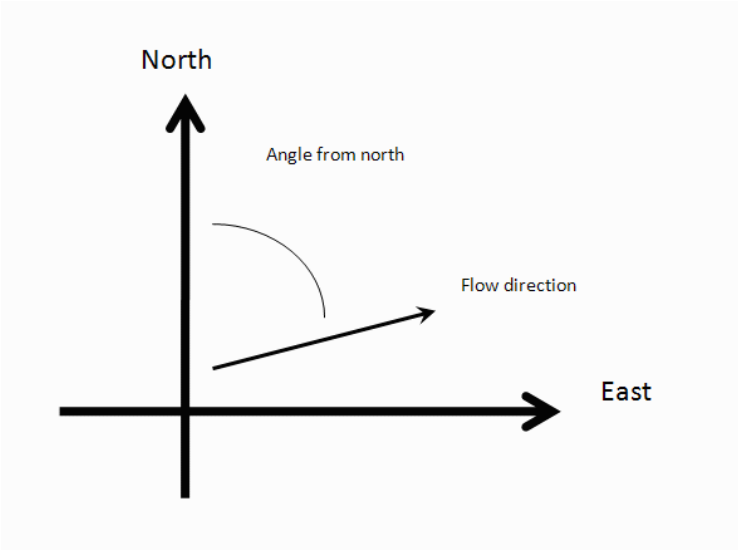
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 8/8/12 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	330.96
2) APW-2	2486285.3	359912.40	331.29
3) APW-3	2486684.9	359291.23	331.26
4) APW-4	2487224.5	359794.71	331.84
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.2682
Gradient Magnitude (i)	0.0006050
Flow direction as degrees from North (positive y axis)	312.7
Coefficient of Determination (R^2)	0.449

WCMS

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

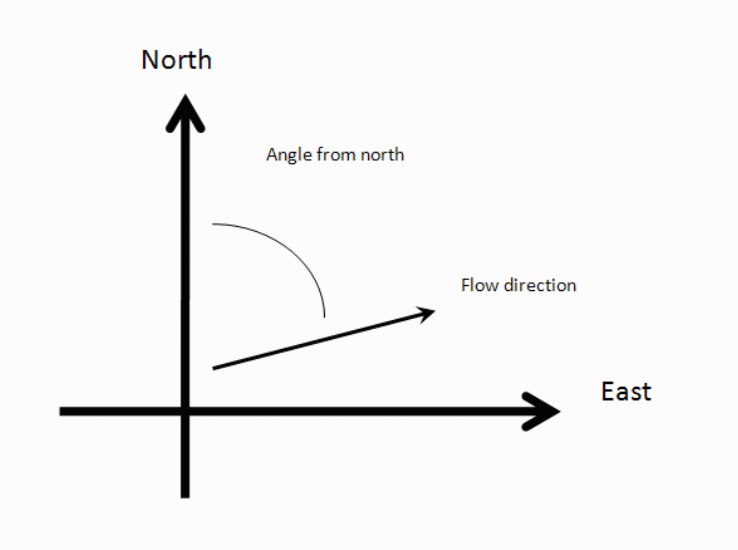
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 5/22/12 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	343.23
2) APW-2	2486285.3	359912.40	344.74
3) APW-3	2486684.9	359291.23	343.09
4) APW-4	2487224.5	359794.71	343.18
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.5029
Gradient Magnitude (i)	0.001795
Flow direction as degrees from North (positive y axis)	106.3
Coefficient of Determination (R^2)	0.766

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

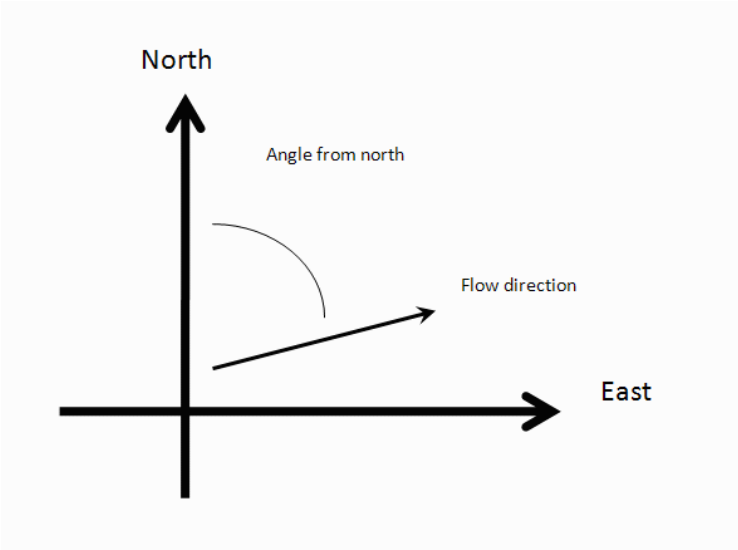
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 2/15/12 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	334.16
2) APW-2	2486285.3	359912.40	335.56
3) APW-3	2486684.9	359291.23	334.99
4) APW-4	2487224.5	359794.71	335.00
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.4267
Gradient Magnitude (i)	0.0009035
Flow direction as degrees from North (positive y axis)	57.87
Coefficient of Determination (R^2)	0.670

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Last updated on Tuesday, December 11, 2012

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

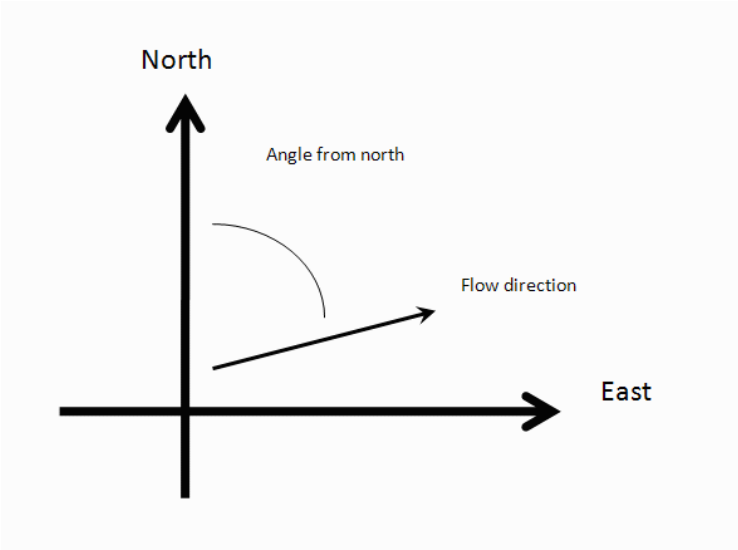
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 11/28/11 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	335.32
2) APW-2	2486285.3	359912.40	335.32
3) APW-3	2486684.9	359291.23	335.43
4) APW-4	2487224.5	359794.71	335.54
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.06706
Gradient Magnitude (i)	0.0002515
Flow direction as degrees from North (positive y axis)	306.0
Coefficient of Determination (R^2)	0.876

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

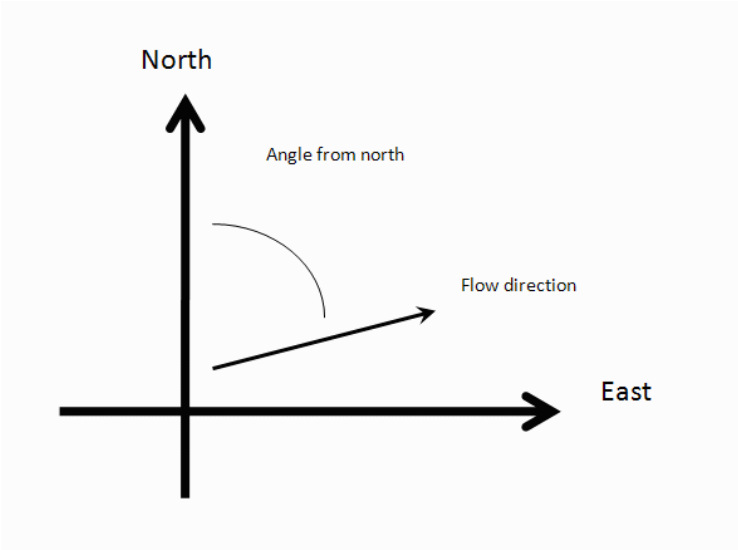
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 9/12/11 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	342.21
2) APW-2	2486285.3	359912.40	342.34
3) APW-3	2486684.9	359291.23	342.29
4) APW-4	2487224.5	359794.71	342.50
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.08839
Gradient Magnitude (i)	0.0001693
Flow direction as degrees from North (positive y axis)	313.6
Coefficient of Determination (R^2)	0.319

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

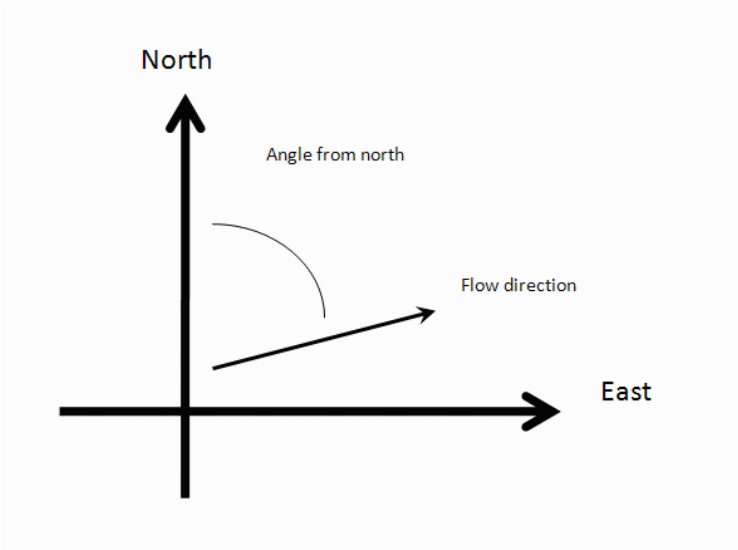
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 6/22/11 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	358.92
2) APW-2	2486285.3	359912.40	359.23
3) APW-3	2486684.9	359291.23	358.89
4) APW-4	2487224.5	359794.71	358.62
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.1859
Gradient Magnitude (i)	0.0006499
Flow direction as degrees from North (positive y axis)	107.9
Coefficient of Determination (R^2)	0.995

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

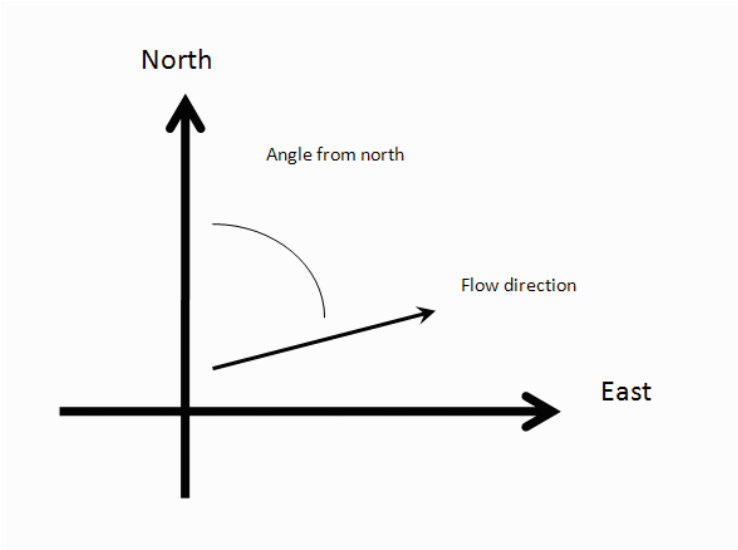
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 3/23/11 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	346.89
2) APW-2	2486285.3	359912.40	348.61
3) APW-3	2486684.9	359291.23	347.34
4) APW-4	2487224.5	359794.71	347.19
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.5243
Gradient Magnitude (i)	0.001623
Flow direction as degrees from North (positive y axis)	91.43
Coefficient of Determination (R^2)	0.786

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Last updated on Tuesday, December 11, 2012

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EPA On-line Tools for Site Assessment Calculation

Hydraulic Gradient -- Magnitude and Direction

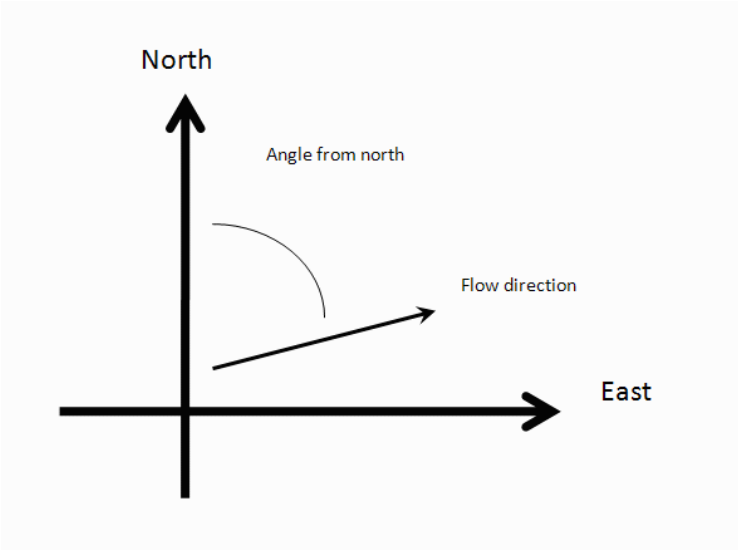
Gradient Calculation from fitting a plane to as many as thirty points

$a\,x_1 + b\,y_1 + c = h_1$
$a\,x_2 + b\,y_2 + c = h_2$
$a\,x_3 + b\,y_3 + c = h_3$
. . .
$a\,x_{30} + b\,y_{30} + c = h_{30}$

where (x_i,y_i) are the coordinates of the well and
h_i is the head

i = 1,2,3, ... , 30
The coefficients a, b, and c are calculated by a least-squares fitting of the the data to a plane

The gradient is calculated from the square root of $(a^2 + b^2)$ and the angle from the arctangent of a/b or b/a depending on the quadrant



Inputs

Example Data Set 1 | Example Data Set 2 | Calculate | Clear
Save Data | Recall Data | Go Back

Site Name: Grand Tower
Date: 11/29/10 Current Date
Calculation basis: Head
Coordinates: ft

I.D.	x-coordinate	y-coordinate	head ft
1) APW-1	2487059.5	360625.76	341.51
2) APW-2	2486285.3	359912.40	342.57
3) APW-3	2486684.9	359291.23	341.64
4) APW-4	2487224.5	359794.71	341.60
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Results

Number of Points Used in Calculation	4
Max. Difference Between Head Values	0.3231
Gradient Magnitude (i)	0.001101
Flow direction as degrees from North (positive y axis)	98.19
Coefficient of Determination (R^2)	0.778

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Last updated on Tuesday, December 11, 2012

Appendix 2

Violation Notice W-2012-00062, August 14, 2012

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

1021 NORTH GRAND AVENUE EAST, P.O. BOX 19276, SPRINGFIELD, ILLINOIS 62794-9276 • (217) 782-3397
PAT QUINN, GOVERNOR JOHN J. KIM, INTERIM DIRECTOR

217/785-0561

June 27, 2012

CERTIFIED MAIL # 7010 2780 0002 1163 7131
RETURN RECEIPT REQUESTED

Mr. John C. Pozzo
Managing Supervising Engineer
1 Ameren Plaza
1901 Chouteau Ave.
St. Louis, Mo 63103

Re: Violation Notice: Ameren; Grand Tower Generating Station
Identification No.: 6285
Violation Notice No.: W-2012-00062

Dear Mr. Pozzo:

This constitutes a Violation Notice pursuant to Section 31(a)(1) of the Illinois Environmental Protection Act ("Act"), 415 ILCS 5/31(a)(1), and is based upon a review of available information and an investigation by representatives of the Illinois Environmental Protection Agency ("Illinois EPA").

confidential
Rockland Capital

The Illinois EPA hereby provides notice of alleged violations of environmental laws, regulations, or permits as set forth in Attachment A to this notice. Attachment A includes an explanation of the activities that the Illinois EPA believes may resolve the specified alleged violations. Due to the nature and seriousness of the alleged violations, please be advised that resolution of the violations may also require the involvement of a prosecutorial authority for purposes that may include, among others, the imposition of statutory penalties.

A written response, which may include a request for a meeting with representatives of the Illinois EPA, must be submitted via certified mail to the Illinois EPA within 45 days of receipt of this letter. If a meeting is requested, it shall be held within 60 days of receipt of this notice. The response must include information in rebuttal, explanation, or justification of each alleged violation and a statement indicating whether or not the facility wishes to enter into a Compliance Commitment Agreement ("CCA") pursuant to Section 31(a) of the Act. If the facility wishes to enter into a CCA, the written response must also include proposed terms for the CCA that includes dates for achieving each commitment and may include a statement that compliance has been achieved for some or all of the alleged violations. The proposed terms of the CCA should contain sufficient detail and must include steps to be taken to achieve compliance and the necessary dates by which compliance will be achieved.

The Illinois EPA will review the proposed terms for a CCA provided by the facility and, within 30 days of receipt, will respond with either a proposed CCA or a notice that no CCA will be issued by the Illinois EPA. If the Illinois EPA sends a proposed CCA, the facility must respond in writing by either agreeing to and signing the proposed CCA or by notifying the Illinois EPA that the facility rejects the terms of the proposed CCA.

If a timely written response to this Violation Notice is not provided, it shall be considered a waiver of the opportunity to respond and meet, and the Illinois EPA may proceed with referral to a prosecutorial authority.

Written communications should be directed to:

Illinois EPA – Division of Public Water Supplies
Attn: Andrea Rhodes, CAS #19
P.O. BOX 19276
Springfield, IL 62794-9276

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Rockland Capital

All communications must include reference to this Violation Notice number, W-2012-00062.

Questions regarding this Violation Notice should be directed to Andrea Rhodes at 217/785-0561.

Sincerely,

Michael Crumly
Manager, Compliance Assurance Section
Division of Public Water Supplies
Bureau of Water

Attachments

CASE ID: 2012-007

ATTACHMENT A

AMEREN, GRAND TOWER GENERATING STATION, ID:6285
VIOLATION NOTICE NO. W-2012-00062:

A review of information available to the Illinois EPA indicates the following on-going violations of statutes, regulations, or permits. Included with each type of violation is an explanation of the activities that the Illinois EPA believes may resolve the violation.

Groundwater Quality

No person shall cause, threaten or allow the release of any contaminant to a resource groundwater such that: treatment or additional treatment is necessary to continue an existing use or to assure a potential use of such groundwater; or an existing or potential use of such groundwater is precluded. No person shall cause, threaten or allow the release of any contaminant to groundwater so as to cause a groundwater quality standard to be exceeded. Ameren must take actions to mitigate existing contamination and prevent the continuing release of contaminants into the environment.

Violation Description

Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well APW-1 for the following constituents:

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Parameter	Sample Value	GW Standard	Collection Date
pH	6.25 su	6.5-9.0 su	03/23/2011
pH	5.76 su	6.5-9.0 su	11/29/2010
TDS	1,310 mg/l	1,200 mg/l	11/29/2010

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

Violation Description

Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well APW-2 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	5.93 su	6.5-9.0 su	11/29/2010
Boron	6.97 mg/l	2.0 mg/l	02/15/2012
Boron	5.84 mg/l	2.0 mg/l	11/28/2011
Boron	7.06 mg/l	2.0 mg/l	09/12/2011
Boron	8.61 mg/l	2.0 mg/l	06/22/2011
Boron	7.93 mg/l	2.0 mg/l	03/24/2011
Boron	6.16 mg/l	2.0 mg/l	11/29/2010

ATTACHMENT A

AMEREN, GRAND TOWER GENERATING STATION, ID:6285
VIOLATION NOTICE NO. W-2012-00062:

Violation
Description
APW-2 continued

Parameter	Sample Value	GW Standard	Collection Date
Iron	8.53 mg/l	5.0 mg/l	02/15/2012
Iron	10.1 mg/l	5.0 mg/l	03/24/2011
Iron	7.44 mg/l	5.0 mg/l	11/29/2010
Manganese	0.636 mg/l	0.15 mg/l	02/15/2012
Manganese	0.660 mg/l	0.15 mg/l	11/28/2011
Manganese	0.691 mg/l	0.15 mg/l	09/12/2011
Manganese	0.654 mg/l	0.15 mg/l	06/22/2011
Manganese	0.678 mg/l	0.15 mg/l	03/24/2011
Manganese	0.774 mg/l	0.15 mg/l	11/29/2010
Sulfate	410 mg/l	400 mg/l	02/15/2012
Sulfate	428 mg/l	400 mg/l	06/22/2011
Sulfate	425 mg/l	400 mg/l	03/24/2011

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

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Violation
Description
Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well APW-3 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.43 su	6.5-9.0 su	11/29/2010
Boron	4.90 mg/l	2.0 mg/l	02/15/2012
Boron	4.68 mg/l	2.0 mg/l	11/28/2011
Boron	4.65 mg/l	2.0 mg/l	09/12/2011
Boron	4.79 mg/l	2.0 mg/l	06/22/2011
Boron	4.90 mg/l	2.0 mg/l	03/24/2011
Boron	4.59 mg/l	2.0 mg/l	11/29/2010
Manganese	0.281 mg/l	0.15 mg/l	02/15/2012
Manganese	0.266 mg/l	0.15 mg/l	11/28/2011
Manganese	0.252 mg/l	0.15 mg/l	09/12/2011
Manganese	0.268 mg/l	0.15 mg/l	06/22/2011
Manganese	0.290 mg/l	0.15 mg/l	03/24/2011
Manganese	0.315 mg/l	0.15 mg/l	11/29/2010

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

ATTACHMENT A

AMEREN, GRAND TOWER GENERATING STATION, ID:6285
VIOLATION NOTICE NO. W-2012-00062:

Violation
Description

Operations at ash impoundments have resulted in violations of the Groundwater Quality Standards at monitoring well APW-4 for the following constituents:

Parameter	Sample Value	GW Standard	Collection Date
pH	6.05 su	6.5-9.0 su	11/29/2010
Boron	2.97 mg/l	2.0 mg/l	02/15/2012
Boron	3.91 mg/l	2.0 mg/l	11/28/2011
Boron	6.17 mg/l	2.0 mg/l	09/12/2011
Boron	8.90 mg/l	2.0 mg/l	06/22/2011
Boron	7.01 mg/l	2.0 mg/l	03/24/2011
Boron	4.01 mg/l	2.0 mg/l	11/29/2010
Manganese	0.253 mg/l	0.15 mg/l	11/29/2010

Rule/Reg. Section 12 of the Act, 415 ILCS 5/12, 35 Ill. Adm. Code 620.115, 620.301, 620.401, 620.405, and 620.410.

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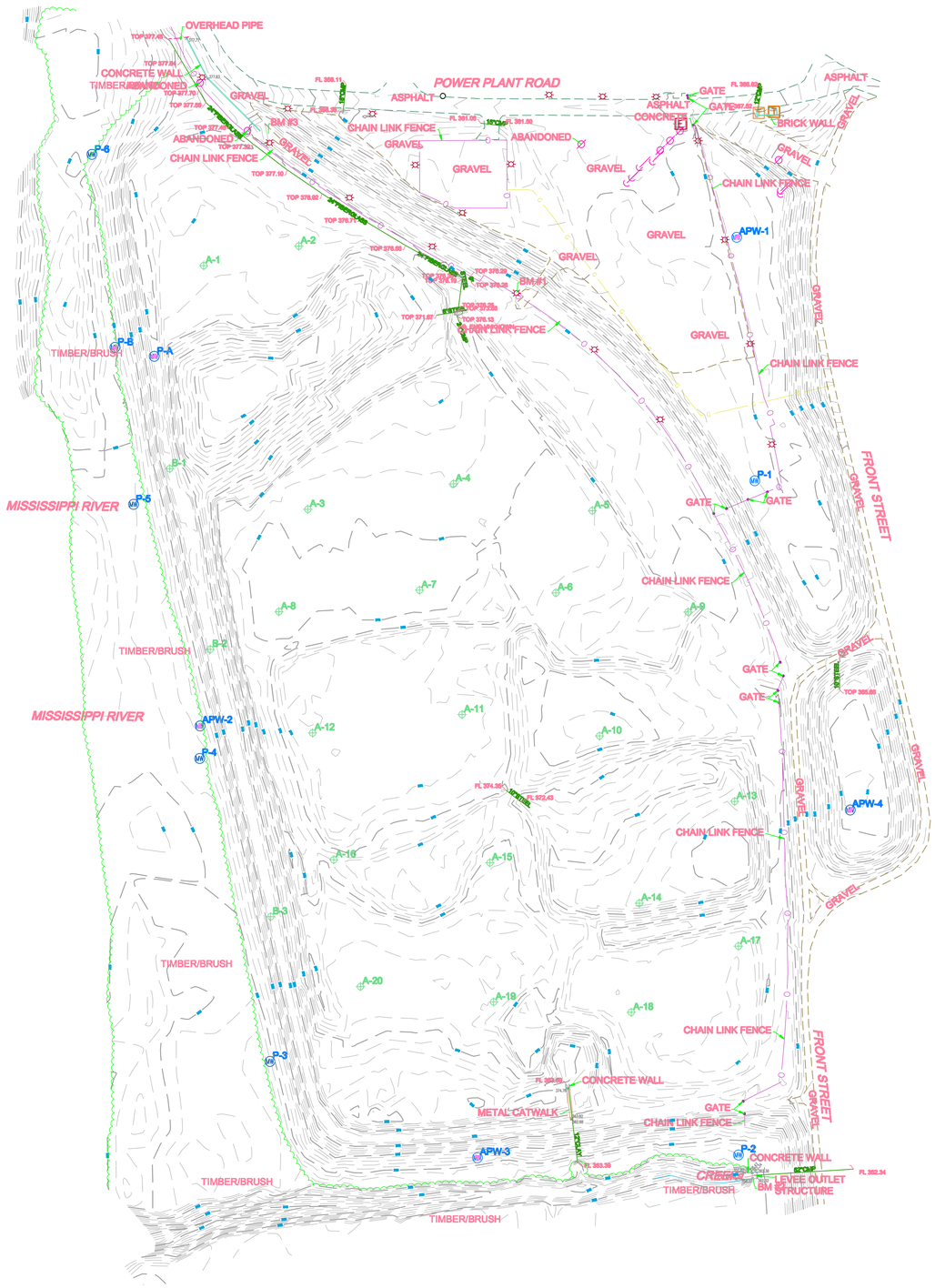
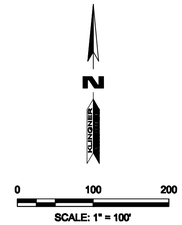
Appendix 3

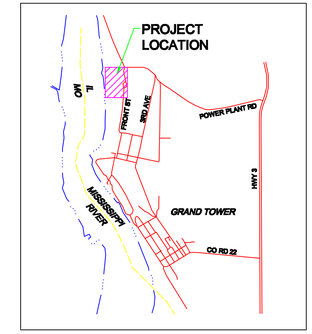
Closure Design Plans





LEGEND

- CHAIN LINK FENCE
- STREAM
- EDGE OF PAVEMENT
- EDGE OF TIMBER/BRUSH
- TELEPHONE PEDESTAL
- ELECTRIC RISER
- UTILITY POLE
- LIGHT STANDARD
- GUY WIRE
- INDEX CONTOURS
- A-1 BORE
- APW-1 MONITORING WELL



VICINITY MAP
(NOT TO SCALE)

EXISTING BORE & MONITORING WELL DATA
DEC 2015/JAN 2016 - PROJ. NO. 15-1091

Bore/Well	Northing	Easting	Elevation
A-1	360582.524	2486287.308	372.28
A-2	360610.971	2486425.294	372.27
A-3	360229.106	2486438.368	375.05
A-4	360266.044	2486649.835	376.01
A-5	360227.140	2486851.241	374.40
A-6	360107.897	2486798.213	373.82
A-7	360111.684	2486600.504	374.34
A-8	360080.525	2486396.540	374.47
A-9	360080.027	2486990.023	372.14
A-10	359990.231	2486861.754	381.73
A-11	359931.221	2486662.047	372.62
A-12	359904.580	2486445.280	372.18
A-13	359805.209	2487057.697	366.43
A-14	359657.611	2486919.283	366.93
A-15	359716.331	2486702.585	374.29
A-16	359720.637	2486475.828	376.76
A-17	359595.265	2487063.104	371.39
A-18	359499.240	2486907.601	371.43
A-19	359514.270	2486707.961	372.11
A-20	359536.594	2486514.739	371.46
APW-1	360624.248	2487061.029	366.82
APW-2	359914.781	2486282.010	364.61
APW-3	359288.359	2486684.455	365.79
APW-4	359792.520	2487225.084	367.44
B-1	360288.009	2486237.987	373.39
B-2	360025.802	2486296.648	372.43
B-3	359637.992	2486384.422	372.03
P-1	360270.669	2487086.965	368.80
P-2	359292.599	2487062.643	361.25
P-3	359428.143	2486383.486	360.97
P-4	359867.522	2486281.418	363.81
P-5	360236.222	2486185.446	363.19
P-6	360743.922	2486125.071	362.16
P-A	360451.112	2486215.540	377.52
P-B	360464.118	2486158.528	362.81

NOTE: ELEVATIONS ARE TOP OF PVC, NORTH SIDE

This professional service conforms to the current Illinois minimum standards for topographic surveys.

Stephen P. Mock, Illinois Professional Land Surveyor No. 2784
License expires 11/30/2016.
Design Firm No. 184-2738

BENCHMARKS:

1. CHISELED "□" LIGHT STANDARD NORTH SIDE OF NORTH GATE TO ASH POND - ELEV 380.86
2. CHISELED "□" SOUTHWEST CORNER HEADWALL AT SOUTHEAST CORNER SITE - ELEV 362.40
3. CHISELED "+" ON FLOODWALL (CONTROL POINT #2) - ELEV 377.80

DATUM: ILLINOIS STATE PLANE WEST ZONE, NAVD88

KLINGNER & ASSOCIATES, P.C.
Engineers • Architects • Surveyors
818 North 24th Street, Quincy, IL — Ph 217.223.5570 - Fax 217.223.3803
4010 Park Gravel Road, Hannibal, MO — Ph 573.221.0020 - Fax 573.221.0912
6016 Lake Road, Suite 1, Belleville, IL — Ph 618.233.2520 - Fax 618.233.2585
40 North Prairie Street, Galesburg, IL — Ph 309.342.4042 - Fax 309.341.3781
604 Liberty St, Suite 129, Pella, IA — Ph 515.612.7402
Internet Address: www.klingner.com

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[redacted]

REVISION HISTORY

MARK	REVISION DESCRIPTION	DATE	APPR
	-	-	-

ENVIRONMENTAL RESOURCES MANAGEMENT, INC.

TOPOGRAPHIC SURVEY
CCR INPOUNDMENT
GRAND TOWER, ILLINOIS

Non-Reduced Sheet Size: 22" x 34"
Full sized plans have been prepared using standard scales. Reduced size plans may not conform to standard scales.

DESIGNED -	DRAWN CJH
FIELD JCC/MWJ	FIELD BOOK M26C/7
CHECKED -	CHECK DATE -

SHEET TITLE
SITE OVERVIEW

PROJECT NO. 15-1091

DRAWING ISSUED DATE: 01/21/2016

SHEET 1

GENERAL NOTES

1. THE GENERAL NOTES AND LEGEND PROVIDED ON THIS SHEET APPLY TO ALL DRAWINGS, UNLESS OTHERWISE INDICATED.
2. THESE DRAWINGS ARE INTENDED FOR APPLICATION PURPOSES ONLY, AND ARE NOT RELEASED FOR CONSTRUCTION.
3. SURVEY CONTOUR LINES ARE INDICATED AT 1-FOOT INTERVALS WITH ELEVATIONS MEASURED ABOVE MEAN SEAL LEVEL (MSL) DATUM, UNLESS OTHERWISE INDICATED. PROPOSED CONTOUR LINES ARE INDICATED AT 2-FT INTERVALS.
4. SCALES AS ARE INDICATED ON EACH DRAWING.
5. EXISTING CONTOURS REPRESENT THE TOPOGRAPHY OF THE SITE IN 2016; TOPOGRAPHY PERFORMED BY KLINGNER, HANNIBAL, MO, FIELD WORK PERFORMED NOVEMBER-DECEMBER 2015 DATUM ILLINOIS STATE PLANE WEST ZONE, NAVD88.
6. CONTRACTOR SHALL MANAGE STORMWATER THROUGHOUT CONSTRUCTION ACTIVITIES AND PREVENT THE MIGRATION OF SEDIMENTS FROM THE SITE.
7. CONTRACTOR SHALL INSTALL TEMPORARY, AS REQUIRED, AND THREE PERMANENT BENCHMARKS PRIOR TO CONSTRUCTION. THE LOCATION OF ALL BENCHMARKS SHALL BE FIELD DETERMINED BY THE ENGINEER. ALL BENCHMARKS SHALL BE PROTECTED AND/OR RELOCATED IF A BENCHMARK MUST BE DISTURBED DURING CONSTRUCTION. BENCHMARKS SHALL BE REFERENCED TO THE NATIONAL GEODETIC VERTICAL DATUM (NGVD).
8. SITE TO ASSURE THAT NO ENVIRONMENTAL RELEASES TO OFFSITE AIR AND WATER RESOURCES OCCURS; ANY RELEASES SHALL IMMEDIATELY BE REPORTED TO THE OWNER, ENGINEER AND APPROPRIATE REGULATORY AGENCIES.
9. PROJECT IS LOCATED IN THE MISSISSIPPI RIVER BASIN.
10. EROSION AND SEDIMENT CONTROL CONTACT PERSON: NAME, COMPANY, PHONE NUMBER

GENERAL CONSTRUCTION SEQUENCE

1. A PRE CONSTRUCTION MEETING SHALL TAKE PLACE PRIOR TO THE START OF CONSTRUCTION ACTIVITIES.
2. FIELD SURVEY THE LIMITS OF CONSTRUCTION AND PERFORM SURVEY OF CURRENT ONSITE CONDITIONS
3. BEGIN CLEARING AND GRUBBING SITE. CLEAR AND GRUB ONLY THOSE AREAS NECESSARY FOR INSTALLATION OF THE EROSION CONTROL MEASURES.
4. INSTALL TEMPORARY EROSION CONTROL MEASURES (SILT FENCE, DIVERSION CHANNELS, ETC.) AND SEDIMENT BASIN AS SHOWN ON THE PLANS
5. ONCE EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND PRIOR TO MASS GRADING ACTIVITIES, THE SITE IS TO BE INSPECTED TO REVIEW APPROPRIATE MEASURES
6. GRADE SITE ACCORDING TO CONTRACT DOCUMENTS. MAINTAIN EROSION CONTROL MEASURES AS NEEDED
7. PERFORM SURVEY FINAL ASH GRADES
8. INSTALL 40-MIL LLDPE GEOMEMBRANE LINER AND SURVEY LINER SEAMS AND ANCHOR TRENCH
9. INSTALL GEOCOMPOSITE DRAINAGE LAYER
10. INSTALL ANCHOR TRENCH DRAINAGE PIPE AND DRAINAGE OUTLETS
11. EXCAVATE PERIMETER BERM AND INSTALL PROTECTIVE COVER LAYER AND VEGETATIVE TOP SOIL LAYER
12. PERFORM SURVEY OF PROTECTIVE COVER
13. INSTALL RIP RAP COVER ON SIDE SLOPES TO ELEVATION 372 MSL
14. CONSTRUCT FINAL GRADES AROUND ASH CLOSURE
15. PERFORM FINAL SEEDING

SEDIMENTATION AND EROSION CONTROL

1. THESE CONSTRUCTION PLANS ILLUSTRATE THE EROSION AND CONTROL PLAN APPROVED BY IEPA.
2. INSTALL AND MAINTAIN EROSION CONTROL MEASURES TO THE SATISFACTION OF THE ENGINEER. FAILURE TO DO SO WILL RESULT IN THE STOPPAGE OF ALL OTHER WORK UNTIL SAID MEASURES COMPLY WITH ACCEPTABLE STANDARDS.
3. INSTALL SOIL EROSION AND SEDIMENTATION CONTROL MEASURES IN STRICT ACCORDANCE WITH STANDARDS IN THE CONSTRUCTION DOCUMENTS AND APPLICABLE ENVIRONMENTAL REGULATIONS INCLUDING THOSE SET BY IEPA.
4. ALL STORM WATER MANAGEMENT AND EROSION CONTROL MEASURES SHALL BE INSTALLED AND MADE OPERATIONAL PRIOR TO COMMENCEMENT OF EARTHWORK ACTIVITIES.
5. INITIATE STABILIZATION MEASURES AS SOON AS PRACTICAL IN PORTIONS OF THE SITE WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY OR PERMANENTLY CEASED, BUT IN NO CASE MORE THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS CEASED.
6. A PERMANENT VEGETATIVE COVER SHALL BE ESTABLISHED ON AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL GROUND COVER IS AGREED UPON BY ENGINEER AND OWNER.
7. ADDITIONAL TEMPORARY DITCHES AND/OR DIVERSIONS MAY BE REQUIRED TO PERFORM CONSTRUCTION. WHERE SUCH MEASURES ARE REQUIRED, THEY SHALL BE CONSTRUCTED TO DIRECT RUNOFF FROM DISTURBED AREAS TO THE SEDIMENT BASIN OR OTHER APPROPRIATE CONTROL MEASURES.
8. ALL SEDIMENT CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN CALENDAR DAYS AND AFTER ANY STORM EVENT OF GREATER THAN ONE-HALF INCH OF PRECIPITATION DURING ANY 24 HOUR PERIOD. ALL SEDIMENT CONTROL FEATURES SHALL BE MAINTAINED UNTIL FINAL STABILIZATION HAS BEEN ESTABLISHED.
9. SILT FENCE AND OTHER MEASURES, SHALL BE CHECKED REGULARLY FOR UNDERMINING OR DETERIORATION. CONTRACTOR SHALL REPAIR OR REPLACE AS REQUIRED.
10. RESTORE AND STABILIZE ALL DISTURBED AREAS INCLUDING STOCKPILES AND STORAGE AREAS. CONTRACTOR SHALL REPAIR OR REPLACE AS REQUIRED.
11. PERFORM PERMANENT SEEDING IN ACCORDANCE WITH IDOT AND IEPA STANDARDS AND THE PROJECT SPECIFICATIONS.
12. MAINTAIN THE EROSION CONTROL MEASURES WITHIN THE LIMITS OF DISTURBANCE THROUGHOUT THE DURATION OF THE PROJECT.
13. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED UPON COMPETITION OF THE WORK AND SATISFACTORY GROUND STABILIZATION.
14. PERFORM PERMANENT SEEDING IN ACCORDANCE WITH PROJECT SPECIFICATIONS.

GENERAL SURVEY NOTES

1. TOPOGRAPHIC SURVEYING AND MAPPING PERFORMED BY KLINGNER, HANNIBAL, MO, FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015 DATUM ILLINOIS STATE PLANE WEST ZONE, NAVD88.
2. DRILING SERVICES FOR INSTALLATION OF BORINGS AND WELLS PERFORMED BY KLINGNER, HANNIBAL, MO., FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015.
3. CONDITIONS SHOWN REPRESENT EXISTING SITE CONDITIONS JANUARY 2016 .

BM-# ON SITE BENCHMARK FOR SURVEYING PURPOSES

BENCHMARKS:

1. CHISELED "□" LIGHT STANDARD NORTH SIDE OF NORTH GATE TO ASH POND - ELEV 380.86
2. CHISELED "□" SOUTHWEST CORNER HEADWALL AT SOUTHEAST CORNER SITE - ELEV 362.40
3. CHISELED "+" ON FLOODWALL (CONTROL POINT #2) - ELEV 377.80

DATUM: ILLINOIS STATE PLANE WEST ZONE, NAVD88

LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 — PROPOSED MINOR CONTOUR (2-FT)
- 90 — PROPOSED MAJOR CONTOUR (10-FT)
- TD — TEMPORARY DIVIERSION
- CE — STABILIZED CONSTRUCTION ENTRANCE
- JH — "J" HOOK SILT FENCE OUTLET
- LINER ANCHOR TRENCH
- CONSTRUCTION SAFETY FENCING
- LINER ANCHOR TRENCH DRAIN
- A-11 — BORING ADVANCED IN ASH BASIN LIMITS
- B-1 — SOIL TEST BORING IN WEST BERM
- P-4 — PIEZOMETER/MONITORING WELL INSTALLED
- P-A & P-B — PIEZOMETER/MONITORING WELL INSTALLED BY OTHERS
- APW-2 — EXISTING MONITORING WELL INSTALLED BY OTHERS

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

LICENSE #C-2206
ERM NC, INC.
13720 BIRNHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

GENERAL NOTES

SCALE: NTS
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2018

DRAWING NO. 2
REV. NO.
SHEET 2 OF 12

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

Ground Water Elev.
###.## Normal - Measurements taken on 3-9-16
###.## Flood - Post Flood Measurements taken on 1-19-16

LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 — PROPOSED MINOR CONTOUR (2-FT)
- 90 — PROPOSED MAJOR CONTOUR (10-FT)
- TD — TEMPORARY DIVIERSION
- CE — STABILIZED CONSTRUCTION ENTRANCE
- JH — "J" HOOK SILT FENCE OUTLET
- LINER ANCHOR TRENCH
- CONSTRUCTION SAFETY FENCING
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- A-11 — BORING ADVANCED IN ASH BASIN LIMITS
- B-1 — SOIL TEST BORING IN WEST BERM
- P-4 — PIEZOMETER/MONITORING WELL INSTALLED
- P-A & P-B — PIEZOMETER/MONITORING WELL INSTALLED BY OTHERS
- APW-2 — EXISTING MONITORING WELL INSTALLED BY OTHERS

GEOTECHNICAL LABORATORY RESULTS:

ASH BASIN, CLAY LINER TESTING RESULTS

The following are laboratory testing results for coefficient of permeability testing performed on undisturbed soil samples retrieved at the bottom of deposited ash at A-# boring locations

BORING #	DEPTH BELOW GROUND SURFACE	COEFFICIENT OF PERMEABILITY (k), (CM/SEC)
A-1	28 - 30.5 FT	1.6×10^{-5} cm/sec
A-4	26 - 28.5 FT	8.5×10^{-8} cm/sec
A-6	23 - 25.5 FT	9.3×10^{-6} cm/sec
A-10	32 - 34.5 FT	1.0×10^{-6} cm/sec
A-15	26 - 28.5 FT	8.4×10^{-8} cm/sec
A-19	25 - 27.5 FT	5.9×10^{-8} cm/sec

Laboratory Testing performed by Klingler, Hannibal, MO

SURVEY DATA:

Boring I.D.	Northing	Easting	Ground Surface Elevation	Thickness: Coal Ash	Elevation: Base of Coal Ash	Elevation: Boring Total Depth	Elevation: Bottom of Boring	Notes
A-1	360582.524	248687.308	372.28	20.5	351.8	38	334.3	Shelby tube sample collected A-1(28-30.5)
A-2	360610.971	2486425.294	372.27	22.8	349.5	24	348.3	
A-3	360229.106	2486438.368	375.05	27	348.1	33	342.1	
A-4	360266.044	2486649.835	376.01	24.4	351.6	28.5	347.5	Shelby tube sample collected A-4(26-28.5)
A-5	360227.140	2486851.241	374.40	23.2	351.2	24	350.4	
A-6	360107.897	2486798.213	373.82	21.7	352.1	25.5	348.3	Shelby tube sample collected A-6(23-25.5)
A-7	360111.664	2486600.504	374.34	23.9	350.4	27	347.3	
A-8	360080.525	2486396.540	374.47	25.6	348.9	35	339.5	
A-9	360080.027	2486990.0.23	372.14	18.0	354.1	20	352.1	Near berm
A-10	359900.231	2486861.754	381.73	31.6	350.1	34.5	347.2	Shelby tube sample collected A-10(32-34.5)
A-11	359931.221	2486662.047	372.62	23.7	348.9	26	346.6	
A-12	359904.580	2486445.280	372.18	23.5	348.7	24	348.2	
A-13	359805.209	2487057.697	366.43	13.5	352.9	15	351.4	Near berm
A-14	359657.611	2486919.283	366.93	14.6	352.3	15.5	351.4	
A-15	359713.331	2486702.585	374.29	24.0	350.3	34.5	339.8	Shelby tube sample collected A-15(26-28.5)
A-16	359720.637	2486475.828	376.76	27.5	349.3	32	344.8	
A-17	359595.265	2487063.104	371.39	14.0	357.4	15	356.4	Near berm
A-18	359499.240	2486907.601	371.43	21.8	349.6	23.5	347.9	
A-19	359514.270	248607.961	372.11	23.9	348.2	27.5	344.6	Shelby tube sample collected A-19(25-27.5)
A-20	359536.594	2486514.739	371.46	23.5	348.0	25.5	346.0	
APW-1	360624.248	2487061.029	366.82	UNK	UNK	UNK	UNK	
APW-2	359914.781	2486282.010	364.61	UNK	UNK	UNK	UNK	
APW-3	359288.359	2486684.455	365.79	UNK	UNK	UNK	UNK	
APW-4	359792.520	2487225.084	367.44	UNK	UNK	UNK	UNK	
B-1	360288.009	2486237.987	373.39	NE	NE	25.5	347.9	
B-2	360025.802	2486296.648	372.43	NE	NE	25.5	346.9	
B-3	359637.992	2486384.422	372.02	NE	NE	25.5	346.5	
P-1	360270.669	2487086.965	368.80	NE	NE	35.5	333.3	
P-2	359292.599	2487062.643	361.25	NE	NE	35.5	325.8	
P-3	359428.143	2486383.486	360.97	NE	NE	25.75	335.2	
P-4	359867.522	2486281.418	363.81	NE	NE	25.4	338.4	
P-5	360236.222	2486185.446	363.19	NE	NE	25.1	338.1	
P-6	360743.922	2486125.071	362.16	NE	NE	25.5	336.7	
P-A	360450.112	2486215.540	377.52	UNK	UNK	UNK	UNK	
P-B	360454.118	2486158.528	362.81	UNK	UNK	UNK	UNK	

NE = Not Encountered.
UNK = Unknown.

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

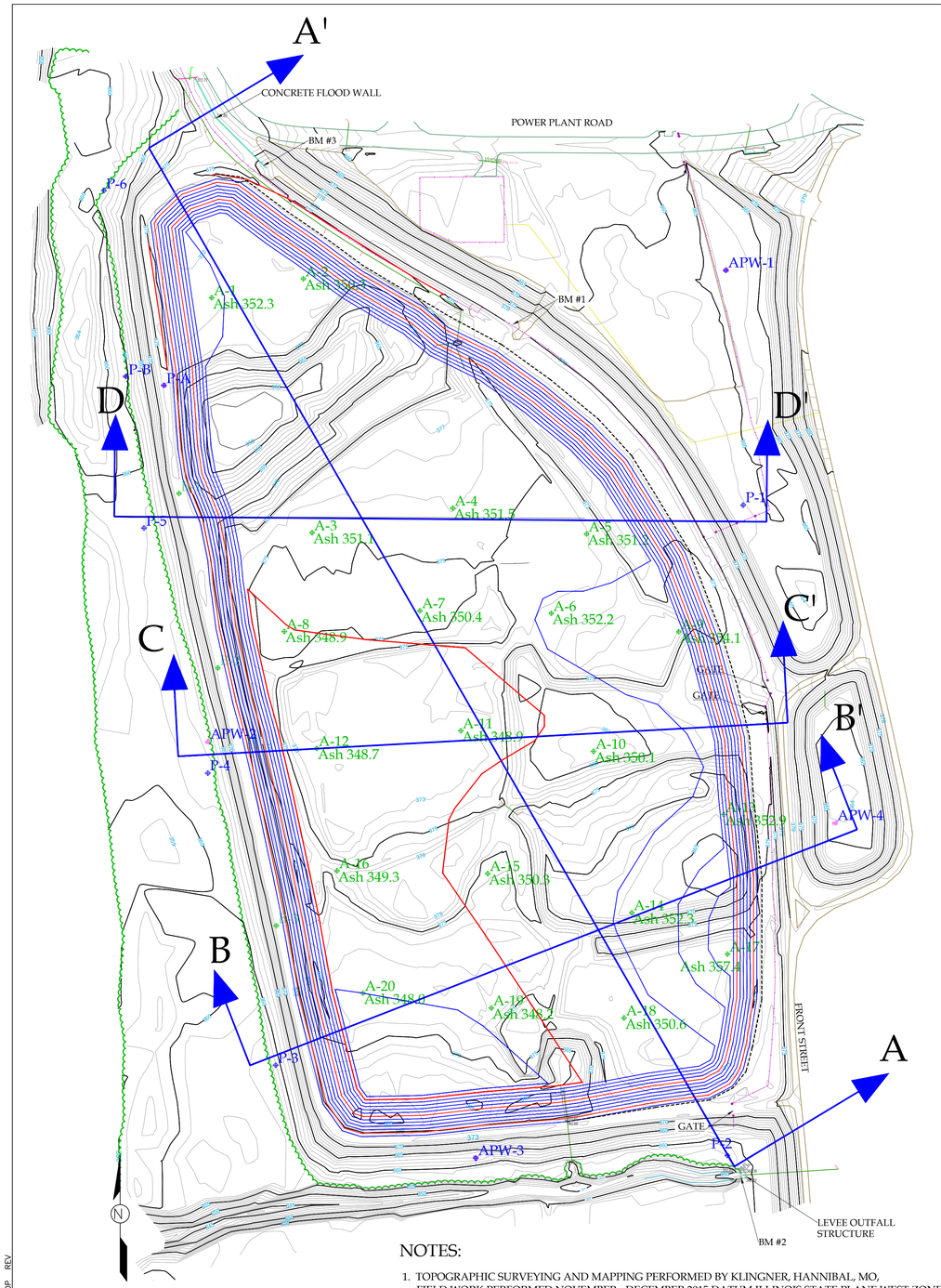
DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

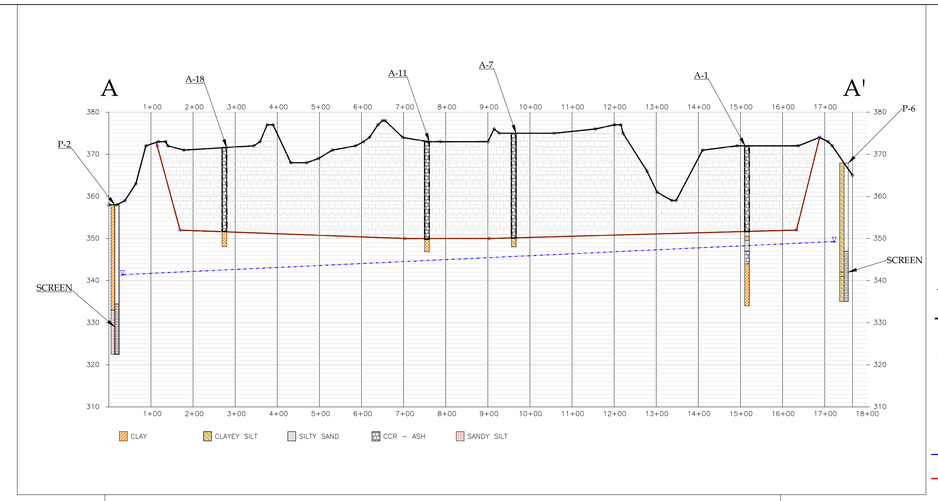
LICENSE #C-2206
ERM NC, INC.
13720 BIRNHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

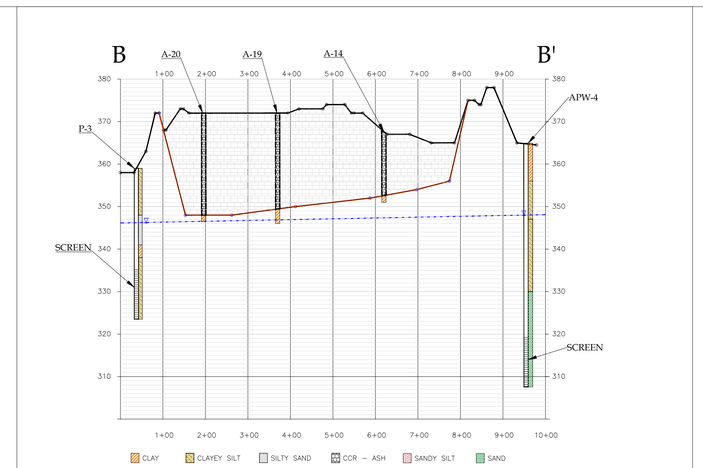
SUBSURFACE EXPLORATION 2015 - 2016

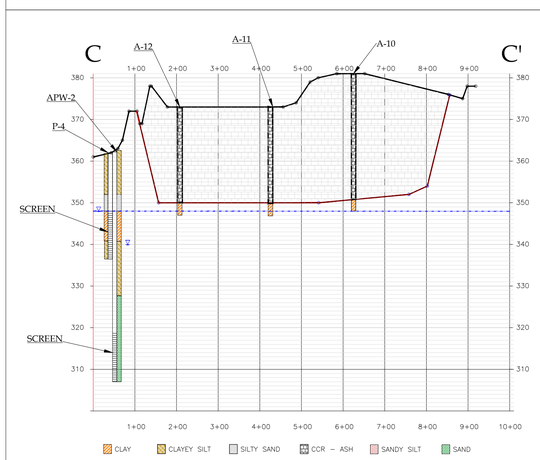
SCALE: 1"=100'
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2018

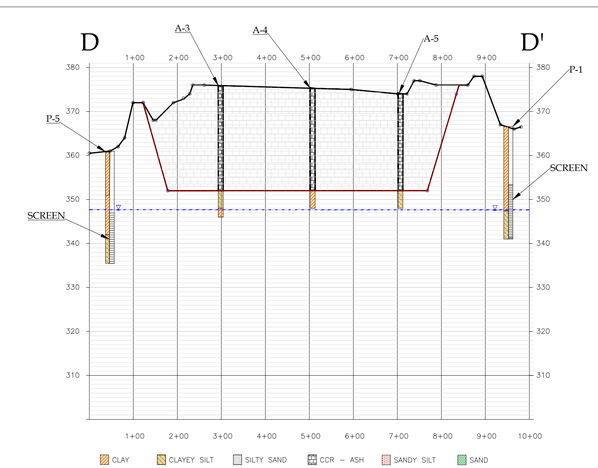
DRAWING NO. 3
REV. NO.
SHEET 3 OF 12











LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 PROPOSED MINOR CONTOUR (2-FT)
- 90 PROPOSED MAJOR CONTOUR (10-FT)
- TD TEMPORARY DIVIERSION
- CE STABILIZED CONSTRUCTION ENTRANCE
- JH "J" HOOK SILT FENCE OUTLET
- LINER ANCHOR TRENCH
- CONSTRUCTION SAFETY FENCING
- LINER ANCHOR TRENCH DRAIN
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- B-1 SOIL TEST BORING IN WEST BERM
- P-4 PIEZOMETER/MONITORING WELL INSTALLED
- P-A & P-B PIEZOMETER/MONITORING WELL INSTALLED BY OTHERS
- APW-2 EXISTING MONITORING WELL INSTALLED BY OTHERS

NOTES:

1. TOPOGRAPHIC SURVEYING AND MAPPING PERFORMED BY KLINGNER, HANNIBAL, MO, FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015 DATUM ILLINOIS STATE PLANE WEST ZONE, NAVD88.
2. DRILING SERVICES FOR INSTALLATION OF BORINGS AND WELLS PERFORMED BY KLINGNER, HANNIBAL, MO., FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015.
3. CONDITIONS SHOWN REPRESENT EXISTING SITE CONDITIONS JANUARY 2016

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY CWM	PROJECT ENGINEER CWM
DESIGN ENGINEER CWM	PROJECT MANAGER DWW

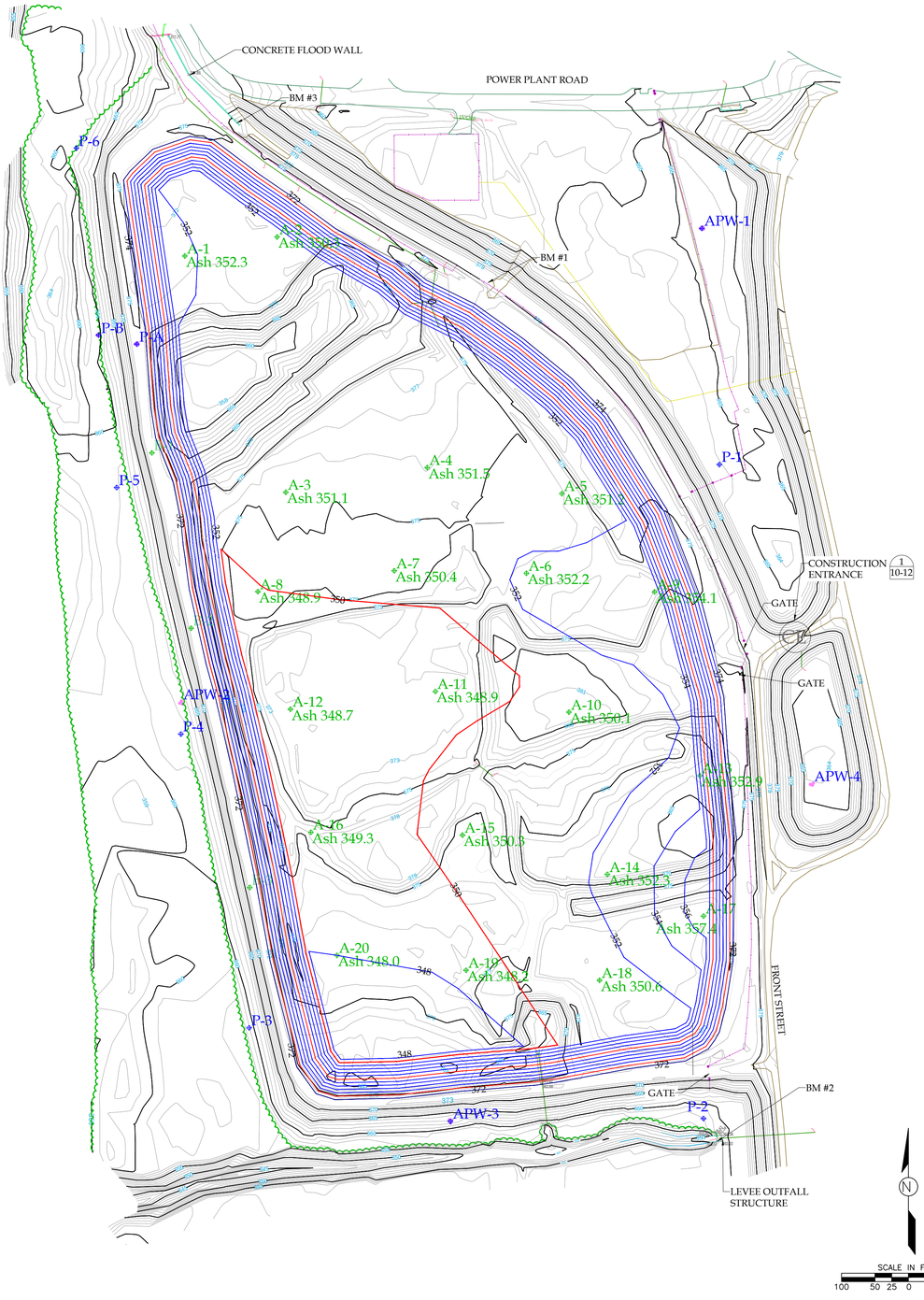
LICENSE #C-2206
ERM NC, INC.
15720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

CROSS SECTIONS - EXISTING SITE CONDITIONS

SCALE 1"=100'	DATE MARCH 22, 2019
PROJECT NO.	AutoCAD 2018

DRAWING NO. 4
REV. NO.
SHEET 4 OF 12

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV



NOTES:

1. BOTTOM OF ASH CONTOURS GENERATED BASED ON SUBSURFACE INFORMATION RETRIEVED FROM A-#'S AND FIELD SURVEY INFORMATION.
2. BASED ON HISTORIC CONSTRUCTION DRAWINGS, EARTHEN BERMS MAY EXIST WITHIN FOOTPRINT THAT SEPARATED PORTIONS OF THE BASIN BUT ARE NOT SHOWN ON THIS DRAWING.

VOLUME OF ASH IN PLACE 650,000 CY

Grand Tower Energy Center (GTEC)
Ash Basin - Volume of Ash Currently in Place

Based on exploration borings and development of bottom of ash plan, determine the amount of ash in place using the contour method

CONTOUR	PERIMETER AREA (SF)	INTERIOR EXISTING BELOW AREA (SF)	ADJUSTED AREA FOR REMOVAL (SF)	AVG. AREA (SF)	THICKNESS (FT)	VOLUME (CF)	VOLUME (CY)
348	32,050	0	32,050				
				116,683	2	233,366	8,643
350	201,316	0	201,316				
				406,228	2	812,456	30,091
352	611,140	0	611,140				
				656,023	2	1,312,045	48,594
354	700,905	0	700,905				
				714,540	2	1,429,080	52,929
356	728,175	0	728,175				
				735,996	2	1,471,992	54,518
358	749,567	5,750	743,817				
				748,864	2	1,497,727	55,471
360	767,864	13,954	753,910				
				758,620	2	1,517,240	56,194
362	786,321	22,991	763,330				
				767,821	2	1,535,641	56,876
364	804,937	32,626	772,311				
				773,858	2	1,547,715	57,323
366	823,714	48,310	775,404				
				751,485	2	1,502,969	55,666
368	842,651	115,086	727,565				
				712,611	2	1,425,222	52,786
370	861,747	164,090	697,657				
				689,619	2	1,379,238	51,083
372	881,004	199,423	681,581				
				526,975	2	1,053,949	39,035
374	483,397	111,029	372,368				
				270,051	2	540,101	20,004
376	0	167,733	167,733				
				107,010	2	214,020	7,927
378	0	46,287	46,287				
				30,934	2	61,867	2,291
380	0	15,580	15,580				
						TOTAL	**649,431 CY**

LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 PROPOSED MINOR CONTOUR (2-FT)
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- P-A & P-B PIEZOMETER/MONITORING WELL INSTALLED BY OTHERS
- APW-2 EXISTING MONITORING WELL INSTALLED BY OTHERS

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY CWM | PROJECT ENGINEER CWM
DESIGN ENGINEER CWM | PROJECT MANAGER DWW

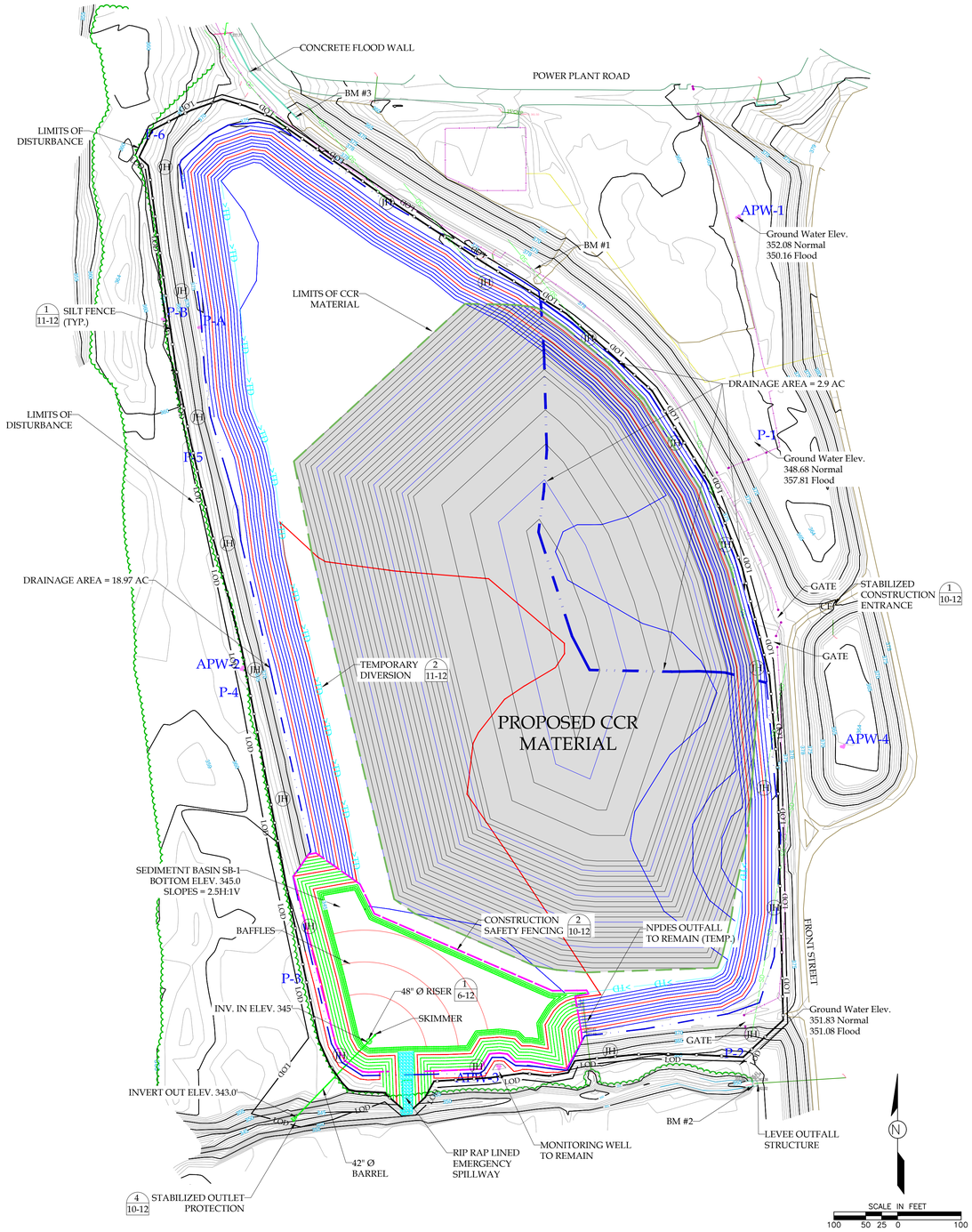
LICENSE #C-2206
ERM NC, INC.
13520 RIVERHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

BOTTOM OF ASH GRADING PLAN

SCALE 1"=100' | DATE MARCH 22, 2019
PROJECT NO. | AutoCAD 2018

DRAWING NO. 5
REV. NO.
SHEET 5 OF 12

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV



LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
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SEDIMENT BASIN SB-1

Basin

Bottom Length (ft)	Bottom Width (ft)	Bottom Elevation (ft)	Length at Riser (ft)	Width at Riser (ft)	Depth (ft)	Side Slopes
407	184	345	300	175	3	2.5:1

Embankment

Top Elevation (ft)	Top Width (ft)	Side slopes
360	12	2.5:1

Emergency Spillway

Width (ft)	Elevation (ft)	Control Section Length (ft)
25	348	25

Riser

Length (ft)	Width (ft)	Height (ft)	Riser Crest Elevation (ft)	Riser Inlet Elevation (ft)	Riser Outlet Elevation
3	4	3	347	345	344

Barrel

Diameter (in)	CSA (sq ft)	Length (ft)
30	4.9	164

Antiflotation Block

L (ft)	W (ft)	D (ft)	Volume (cu ft)
4	4	1	16

Skimmer

Size (in)	Orifice Sz. (in)	Dewater Time (days)
6	5	2.6

Baffles

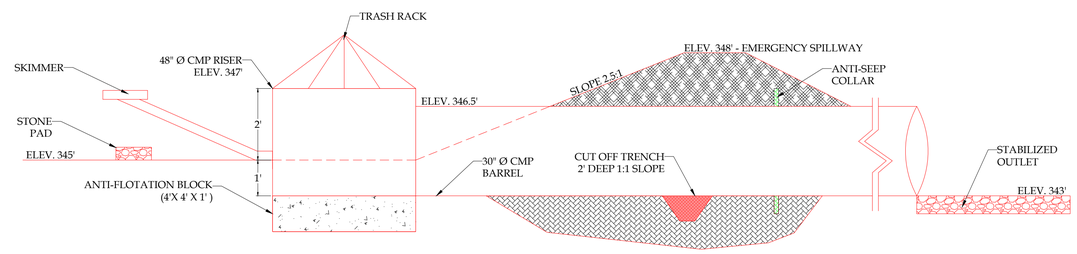
Quantity	Height (ft)	Spacing (ft)
6	5	43

Sediment Basin Principal Spillway Outlet*

Barrel Diameter, do (ft)	Stone Diamater, d50 (ft)	Stone Diameter, dmax (ft)	Apron Thickness, d (ft)	Apron Length, La (ft)	Apron Width (ft)	Elevation (ft)
2.5	0.5	0.75	1.0	20	22.5	343

EROSION AND SEDIMENT CONTROL NOTES

1. A PRE-CONSTRUCTION MEETING SHOULD TAKE PLACE PRIOR TO START OF CONSTRUCTION ACTIVITIES.
2. BEGIN CLEARING AND GRUBBING SITE. CLEAR AND GRUB ONLY THOSE AREAS NECESSARY FOR INSTALLATION OF THE EROSION CONTROL MEASURES.
3. INSTALL SILT FENCE, SEDIMENT BASINS, DIVERSION DITCHES, ETC. BASINS TO BE CLEANED OUT WHEN IT FILLS TO ELEVATION 345.75' AS INDICATED ON THE PLANS.
4. ONCE EROSION CONTROL MEASURES HAVE BEEN INSTALLED AND PRIOR TO MASS GRADING ACTIVITIES, THE SITE IS TO BE INSPECTED BY IEPA.
5. GRADE SITE ACCORDING TO CONTRACT DOCUMENTS. MAINTAIN EROSION CONTROL DEVICES AS NEEDED.
6. INSTALL STORM DRAINAGE AS INDICATED ON PLANS.
7. GRASS OR OTHERWISE STABILIZE ALL AREAS AS THEY ARE BROUGHT TO FINAL GRADES.
8. THE CONTRACTOR SHALL DILIGENTLY AND CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES TO MINIMIZE EROSION. INSPECT AND REPAIR MEASURES AFTER EACH RAINFALL AND AS NEEDED THROUGHOUT THE PROJECT.
9. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTAIN SEDIMENT ONSITE. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED BY THE ENGINEER.
10. ALL EROSION CONTROL MEASURES TO BE IN ACCORDANCE WITH THE ILLINOIS CONSTRUCTION SITE STORM WATER POLLUTION CONTROL MANUAL AND THE ILLINOIS URBAN MANUAL.
11. THE ANGLE FOR GRADED SLOPES AND FILLS SHALL BE NO GREATER THAN THE ANGLE THAT CAN BE RETAINED BY VEGETATIVE COVER OR OTHER ADEQUATE EROSION-CONTROL DEVICES OR STRUCTURES. IN ANY EVENT, SLOPES LEFT EXPOSED WILL, WITHIN 7 OR 14 CALENDAR DAYS OF COMPLETION OF ANY PHASE OF GRADING, BE PLANTED OR OTHERWISE PROVIDED WITH TEMPORARY GROUND COVER, DEVISES OR STRUCTURES SUFFICIENT TO RESTRAIN EROSION. PERMANENT GROUNDCOVER WILL BE PROVIDED FOR ALL DISTURBED AREAS WITHIN 15 WORKING DAYS OR NO MORE THAN 90 CALENDAR DAYS (WHICHEVER IS SHORTER) FOLLOWING COMPLETION OF CONSTRUCTION (SEE STABILIZATION TABLE ON SHEET 10).
12. ADDITIONAL MEASURES TO CONTROL EROSION AND SEDIMENT MAY BE REQUIRED BY A REPRESENTATIVE OF THE IEPA.
13. ANY LAND-DISTURBING ACTIVITY > 1 ACRE REQUIRES COMPLIANCE WITH ALL CONDITIONS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (PERMIT NO. XXXXXXXXX). ANY PERMIT NONCOMPLIANCE IS A VIOLATION OF THE CLEAN WATER ACT AND MAY REQUIRE ENFORCEMENT ACTION BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY.



RISER-BARREL DETAIL 1 -

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

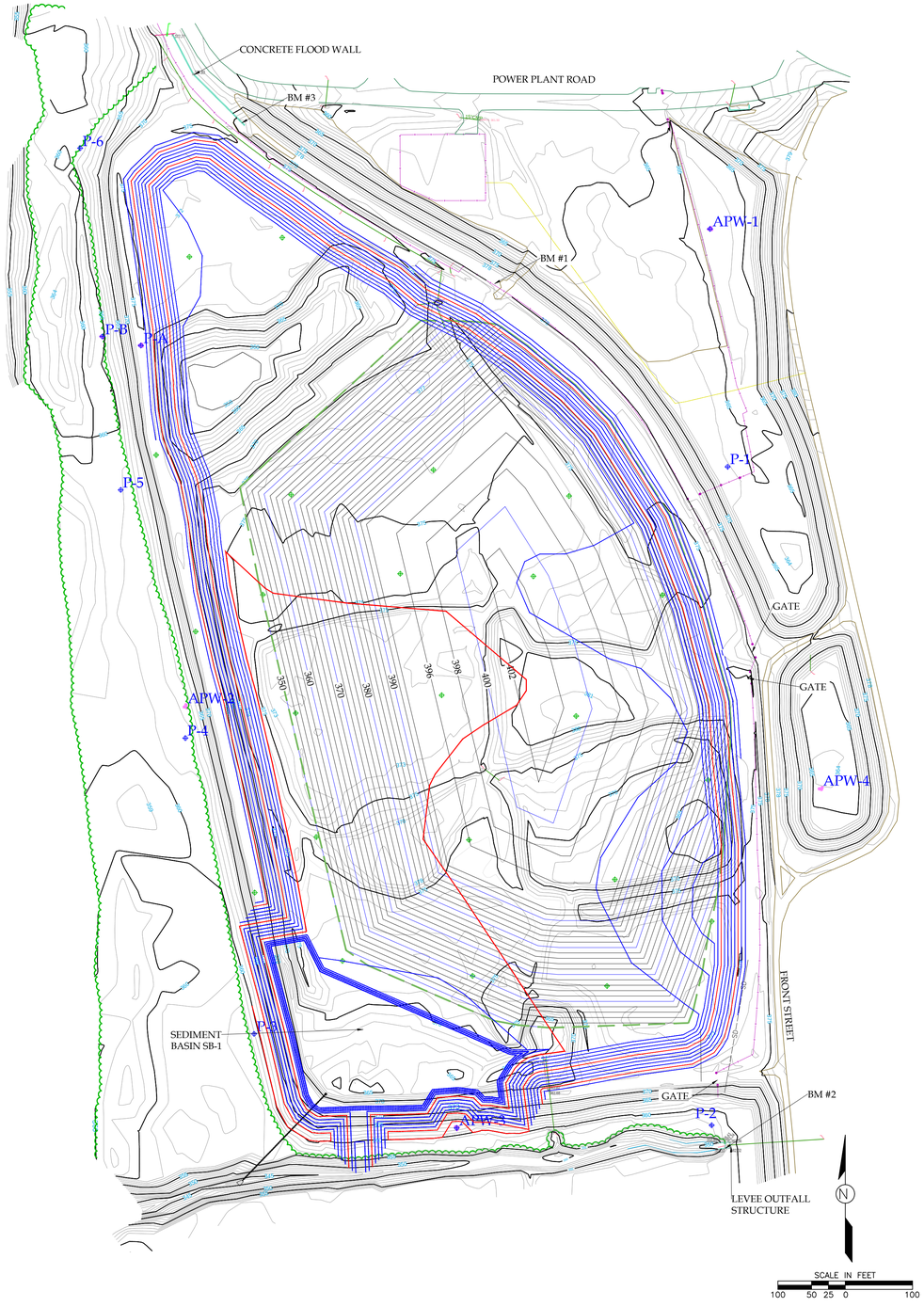
LICENSE #C-2206
ERM NC, INC.
13720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

EROSION AND SEDIMENT CONTROL
GRADING PLAN

SCALE: 1"=100'
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2018

DRAWING NO. 6
REV. NO.
SHEET 6 OF 12

PROJ. NUM. SITE DWG MM/DD/07 1=X DDP REV



LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 PROPOSED MINOR CONTOUR (2-FT)
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- TD TEMPORARY DIVIERSION
- CE STABILIZED CONSTRUCTION ENTRANCE
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NOTES:

1. TOPOGRAPHIC SURVEYING AND MAPPING PERFORMED BY KLINGNER, HANNIBAL, MO, FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015 DATUM ILLINOIS STATE PLANE WEST ZONE, NAVD88.
2. DRILING SERVICES FOR INSTALLATION OF BORINGS AND WELLS PERFORMED BY KLINGNER, HANNIBAL, MO., FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015.
3. CONDITIONS SHOWN REPRESENT EXISTING SITE CONDITIONS JANUARY 2016
4. BOTTOM OF ASH CONTOURS GENERATED BASED ON SUBSURFACE INFORMATION RETRIEVED FROM A-#'S AND FIELD SURVEY INFORMATION.
5. BASED ON HISTORIC CONSTRUCTION DRAWINGS, EARTHEN BERMS MAY EXIST WITHIN FOOTPRINT THAT SEPARATED PORTIONS OF THE BASIN BUT ARE NOT SHOWN ON THIS DRAWING.

VOLUME OF ASH CAPACITY 670,000 CY

Grand Tower Energy Center (GTEC)
Ash Basin - Closure Capacity 13 Acre footprint

Based on exploration borings and development of bottom of ash plan, determine the amount of ash that may be consolidated into a 13 acre footprint

CONTOUR	PERIMETER AREA (SF)	AVG. AREA (SF)	THICKNESS (FT)	VOLUME (CF)	VOLUME (CY)
348	2,781				
		70,579	2	141,159	5,228
350	138,378				
		285,827	2	571,654	21,172
352	433,276				
		462,534	2	925,067	34,262
354	491,791				
		492,262	2	984,525	36,464
356	492,734				
		489,958	2	979,917	36,293
358	487,183				
		482,698	2	965,397	35,755
360	478,214				
		473,556	2	947,112	35,078
362	468,898				
		464,113	2	928,226	34,379
364	459,327				
		454,431	2	908,861	33,662
366	449,534				
		444,530	2	889,059	32,928
368	439,525				
		434,415	2	868,829	32,179
370	429,304				
		424,079	2	848,158	31,413
372	418,854				
		412,122	2	824,243	30,528
374	405,389				
		395,640	2	791,281	29,307
376	385,892				
		376,364	2	752,729	27,879
378	366,837				
		357,531	2	715,063	26,484
380	348,226				
		339,142	2	678,284	25,122
382	330,058				
		321,196	2	642,392	23,792
384	312,334				
		303,694	2	607,388	22,496
386	295,054				
		286,636	2	573,272	21,232
388	278,218				
		270,022	2	540,044	20,002
390	261,827				
		253,854	2	507,709	18,804
392	245,882				
		238,134	2	476,267	17,640
394	230,385				
		208,480	2	416,959	15,443
396	186,574				
		154,538	2	309,075	11,447
398	122,501				
		96,086	2	192,171	7,117
400	69,670				
		49,068	2	98,135	3,635
402	28,465				
		15,024	2	30,048	1,113
404	1,583				
		792	2	1,583	59
				TOTAL	**670,911 CY**

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY: CWM
DESIGN ENGINEER: CWM
PROJECT ENGINEER: CWM
PROJECT MANAGER: DWW

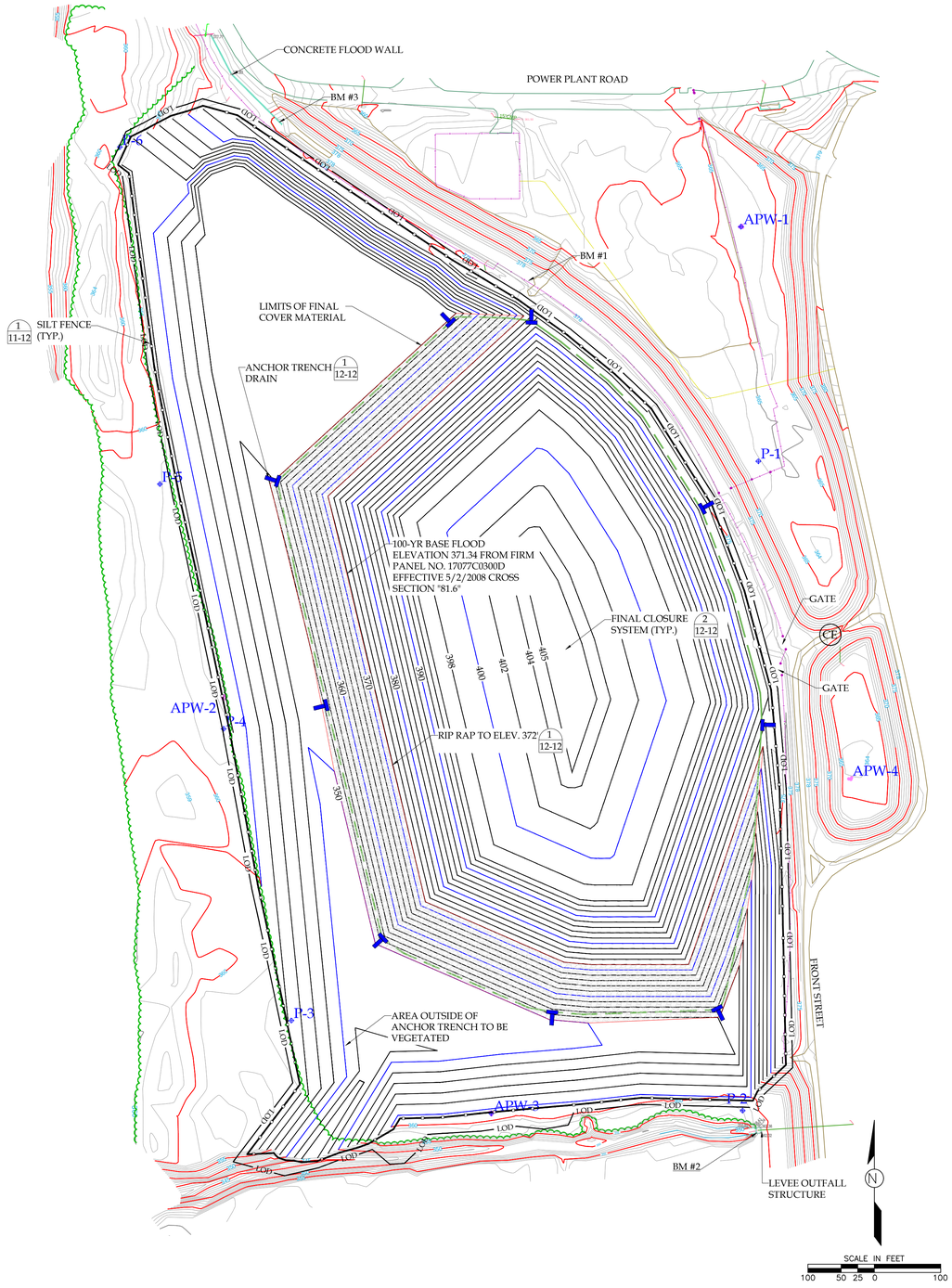
LICENSE #C-2206
ERM NC, INC.
15720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

ASH RE-GRADING PLAN

SCALE: 1"=100'
PROJECT NO.
DATE: MARCH 22, 2019
AutoCAD 2018

DRAWING NO. 7
REV. NO.
SHEET 7 OF 12

PROJ_NUM SITE DWG MM/DD/07 1=X DDP REV



LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 PROPOSED MINOR CONTOUR (2-FT)
- 90 PROPOSED MAJOR CONTOUR (10-FT)
- TD TEMPORARY DIVIERSION
- CE STABILIZED CONSTRUCTION ENTRANCE
- JH "J" HOOK SILT FENCE OUTLET
- LINER ANCHOR TRENCH
- CONSTRUCTION SAFETY FENCING
- LINER ANCHOR TRENCH DRAIN
- A-11 BORING ADVANCED IN ASH BASIN LIMITS
- B-1 SOIL TEST BORING IN WEST BERM
- P-4 PIEZOMETER/MONITORING WELL INSTALLED
- P-A & P-B PIEZOMETER/MONITORING WELL INSTALLED BY OTHERS
- APW-2 EXISTING MONITORING WELL INSTALLED BY OTHERS

NOTES:

1. TOPOGRAPHIC SURVEYING AND MAPPING PERFORMED BY KLINGNER, HANNIBAL, MO, FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015 DATUM ILLINOIS STATE PLANE WEST ZONE, NAVD88.
2. DRILING SERVICES FOR INSTALLATION OF BORINGS AND WELLS PERFORMED BY KLINGNER, HANNIBAL, MO., FIELD WORK PERFORMED NOVEMBER - DECEMBER 2015.
3. CONDITIONS SHOWN BEYOND PROPOSED GRADES REPRESENT EXISTING SITE CONDITIONS JANUARY 2016
4. BOTTOM OF ASH CONTOURS GENERATED BASED ON SUBSURFACE INFORMATION RETRIEVED FROM A-#'S AND FIELD SURVEY INFORMATION.
5. BASED ON HISTORIC CONSTRUCTION DRAWINGS, EARTHEN BERMS MAY EXIST WITHIN FOOTPRINT THAT SEPARATED PORTIONS OF THE BASIN BUT ARE NOT SHOWN ON THIS DRAWING.
6. PROPOSED GRADES REPRESENT RE-GRADED ASH WITH LINER AND 3-FT OF SOIL COVER IN PLACE.
7. PROPOSED SIDE SLOPE GRADES ARE SHOWN AT 4H:1V.
8. PROPOSED GRADES ABOVE ELEVATION 396' ARE SHOWN AT A MINIMUM 5% SLOPE FOR DRAINAGE.

CLOSURE SUMMARY:

EXISTING ASH BASIN FOOTPRINT	20.23 AC
PROPOSED CLOSURE FOOTPRINT	13.04 AC
EXISTING ASH IN PLACE	650,000 CY
CAPACITY OF PROPOSED CLOSURE GRADES	670,000 CY
ASH REQUIRING REMOVAL/RE-GRADING	231,600 CY
COVER SOILS NEEDED FOR FINAL CLOSURE	69,400 CY

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

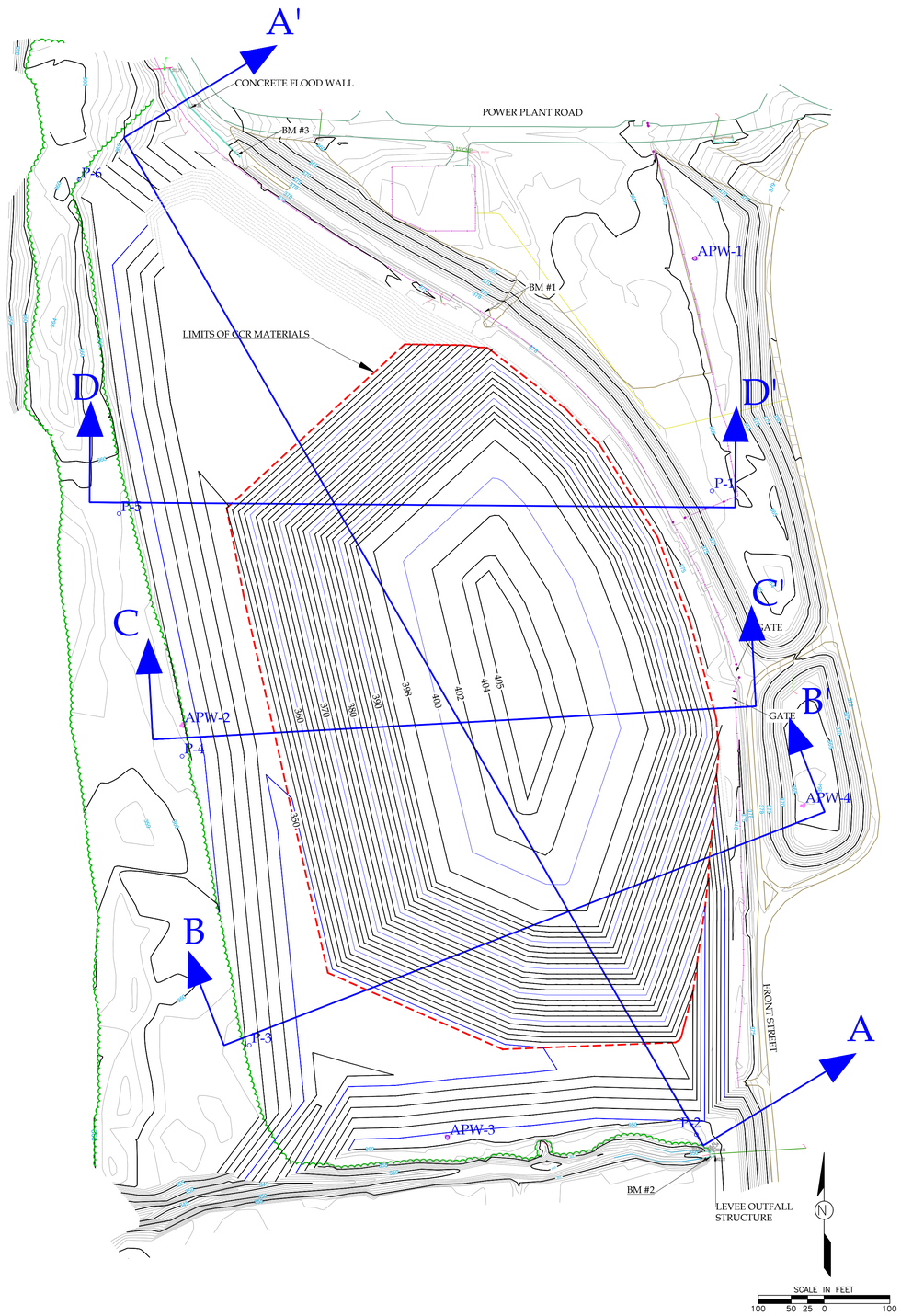
DRAWN BY CWM | PROJECT ENGINEER CWM
DESIGN ENGINEER CWM | PROJECT MANAGER DWW

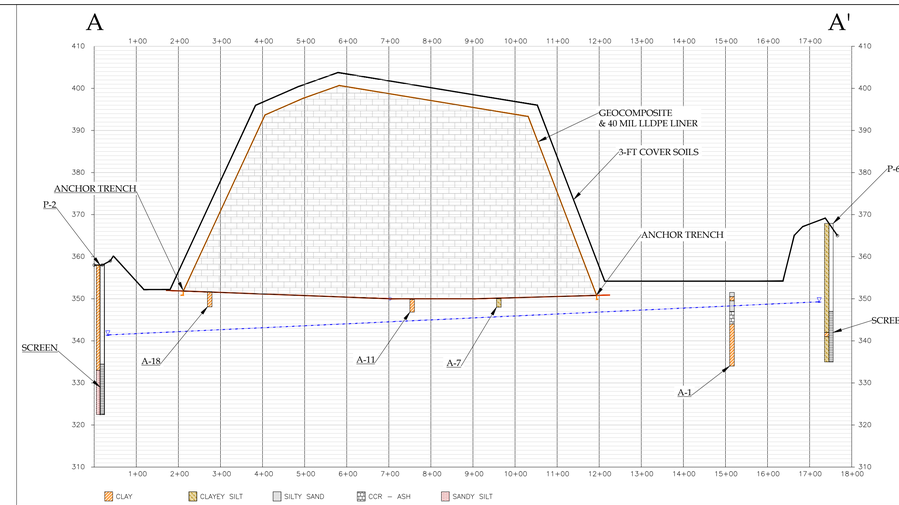
LICENSE #C-2206
ERM NC, INC.
13720 BIRKHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

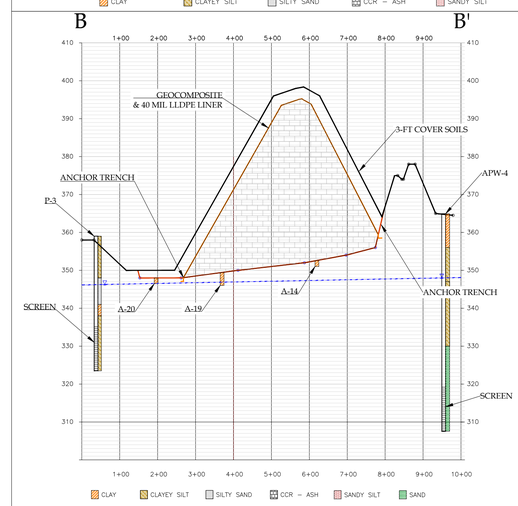
FINAL CLOSURE GRADING PLAN

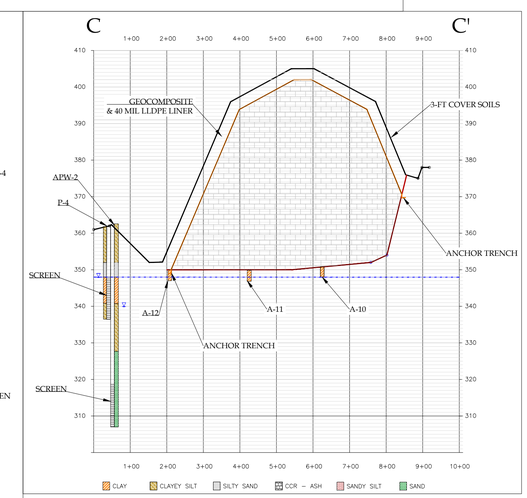
SCALE 1"=100' | DATE MARCH 22, 2019
PROJECT NO. | AutoCAD 2018

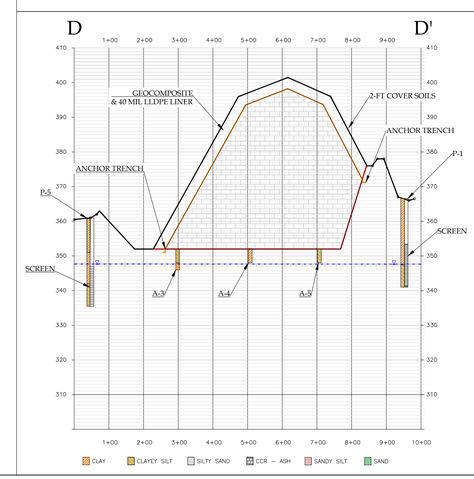
DRAWING NO. 8
REV. NO.
SHEET 8 OF 12











LEGEND

- PROPERTY LINE
- LIMITS OF DISTURBANCE
- SILT FENCING
- SURVEYED 1-FT TOPOGRAPHIC CONTOUR
- SURVEYED 5-FT TOPOGRAPHIC CONTOUR
- BOTTOM OF ASH CONTOUR (2-FT INTERVALS)
- BOTTOM OF ASH CONTOUR (10-FT INTERVALS)
- 92 PROPOSED MINOR CONTOUR (2-FT)
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NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

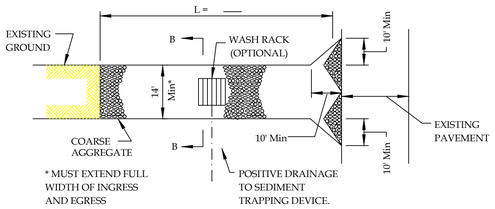
DRAWN BY CWM	PROJECT ENGINEER CWM
DESIGN ENGINEER CWM	PROJECT MANAGER DWW

LICENSE #C-2206
ERM NC, INC.
15720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28227

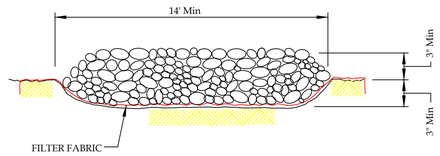
FINAL CLOSURE CROSS SECTION PLAN

SCALE 1"=100'	DATE MARCH 22, 2019
PROJECT NO.	AutoCAD 2018

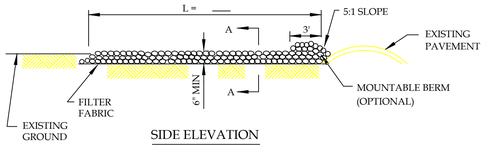
DRAWING NO. 9
REV. NO.
SHEET 9 OF 12



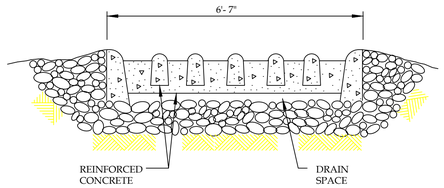
PLAN VIEW



SECTION A-A



SIDE ELEVATION



SECTION B-B

NOTES:

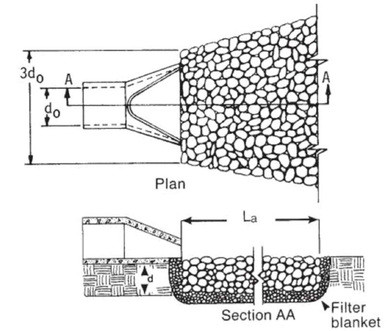
1. FILTER FABRIC SHALL MEET THE REQUIREMENTS OF MATERIAL SPECIFICATION 592 GEOTEXTILE, TABLE I OR 2, CLASS I, II OR III AND SHALL BE PLACED OVER THE CLEARED AREA PRIOR TO THE PLACING OF ROCK.
2. ROCK OR RECLAIMED CONCRETE SHALL MEET ONE OF THE FOLLOWING IDOT COARSE AGGREGATE GRADATION, CA-1, CA-2, CA-3 OR CA-4 AND BE PLACED ACCORDING TO CONSTRUCTION SPECIFICATION 25 ROCKFILL USING PLACEMENT METHOD 1 AND CLASS III COMPACTION.
3. ANY DRAINAGE FACILITIES REQUIRED BECAUSE OF WASHING SHALL BE CONSTRUCTED ACCORDING TO MANUFACTURERS SPECIFICATIONS.
4. IF WASH RACKS ARE USED THEY SHALL BE INSTALLED ACCORDING TO THE MANUFACTURER'S SPECIFICATIONS.

(CE) STABILIZED CONSTRUCTION ENTRANCE

1
10-12

CONSTRUCTION NOTES

1. THE CONTRACTOR SHALL DILIGENTLY AND CONTINUOUSLY MAINTAIN ALL EROSION CONTROL DEVICES AND STRUCTURES TO MINIMIZE EROSION. INSPECT AND REPAIR MEASURES AFTER EACH RAINFALL AND AS NEEDED THROUGHOUT THE PROJECT.
2. CONTRACTOR TO LEAVE ALL EROSION CONTROL DEVICES IN PLACE AT THE CONCLUSION OF HIS CONTRACT. CONTRACTOR IS TO CLEAN-OUT, REPAIR AND GRASS STABILIZE ALL DENUDED AREAS.
3. IT IS THE CONTRACTOR'S RESPONSIBILITY TO CONTAIN SEDIMENT ONSITE. ADDITIONAL EROSION CONTROL MEASURES MAY BE REQUIRED BY THE ENGINEER.
4. ALL EROSION CONTROL MEASURES TO BE IN ACCORDANCE WITH THESE PLANS AND CONSTRUCTION DETAILS.
5. ALL GRADED SLOPES DISTURBED OUTSIDE THE LIMITS OF THE ASH PILE MUST BE SEEDED AND MULCHED WITHIN 15 DAYS OF COMPLETION OF GRADING. ALL REMAINING AREAS OUTSIDE THE LIMITS OF THE ASH PILE ARE TO BE SEEDED AND MULCHED WITHIN 120 DAYS. THE ANGLE FOR GRADED SLOPES AND FILLS SHALL BE NO GREATER THAN THE ANGLE WHICH CAN BE RETAINED BY VEGETATIVE COVER OR OTHER ADEQUATE EROSION CONTROL DEVICES OR STRUCTURES.
6. LAND-DISTURBING ACTIVITY REQUIRES COMPLIANCE WITH ALL CONDITIONS OF THE GENERAL PERMIT TO DISCHARGE STORM WATER UNDER THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (PERMIT NO. XXXXXXXX). ANY PERMIT NONCOMPLIANCE IS A VIOLATION OF THE CLEAN WATER ACT AND MAY REQUIRE ENFORCEMENT ACTION BY THE ILLINOIS ENVIRONMENTAL PROTECTION AGENCY (IEPA).



RIP RAP APRON DIMENSIONS

LENGTH - 20 FT
WIDTH AT PIPE OUTLET - 7.5 FT
WIDTH AT END OF APRON - 22.5 FT

PIPE OUTLET TO FLAT AREA - NO WELL DEFINED CHANNEL

CONSTRUCTION SPECIFICATIONS

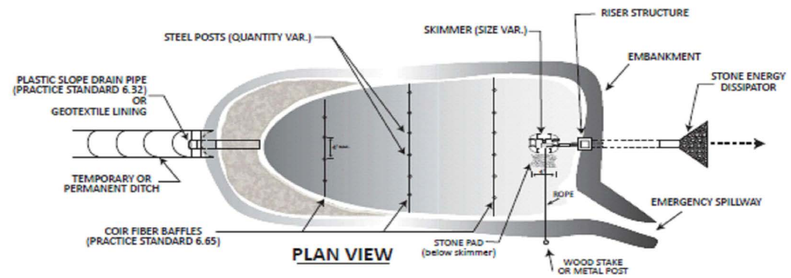
1. ENSURE THAT THE SUBGRADE FOR THE FILTER AND RIPRAP FOLLOWS THE REQUIRED LINES AND GRADES SHOWN IN THE PLAN. COMPACT ANY FILL REQUIRED IN THE SUBGRADE TO THE DENSITY OF THE SURROUNDING UNDISTURBED MATERIAL. LOW AREAS IN THE SUBGRADE ON UNDISTURBED SOIL MAY ALSO BE FILLED BY INCREASING THE RIPRAP THICKNESS.
2. THE RIPRAP AND GRAVEL FILTER MUST CONFORM TO THE SPECIFIED GRADING LIMITS SHOWN ON THE PLANS.
3. FILTER FABRIC (MIRAFI 500X OR APPROVED EQUAL), WHEN USED, MUST MEET DESIGN REQUIREMENTS AND BE PROPERLY PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION. REPAIR ANY DAMAGE BY REMOVING THE RIPRAP AND PLACING ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA. ALL CONNECTING JOINTS SHOULD OVERLAP SO THE TOP LAYER IS ABOVE THE DOWNSTREAM LAYER A MINIMUM OF 1 FOOT. IF THE DAMAGE IS EXTENSIVE, REPLACE THE ENTIRE FILTER CLOTH.
4. RIPRAP MAY BE PLACED BY EQUIPMENT, BUT TAKE CARE TO AVOID DAMAGING THE FILTER.
5. THE MINIMUM THICKNESS OF THE RIPRAP SHOULD BE 1.5 TIMES THE MAX. STONE DIAMETER.
6. RIPRAP MAY BE FILED STONE OR ROUGH QUARRY STONE. IT SHOULD BE HARD, ANGULAR, HIGHLY WEATHER-RESISTANT AND WELL GRADED.
7. CONSTRUCT THE APRON ON ZERO GRAD WITH NO OVERFILL AT THE END. MAKE THE TOP OF THE RIPRAP AT THE DOWNSTREAM END LEVEL WITH THE RECEIVING AREA OR SLIGHTLY BELOW IT.
8. ENSURE THAT THE APRON IS PROPERLY ALIGNED WITH THE RECIEVING STREAM AND PREFERABLY STRAIGHT THROUGHOUT ITS LENGTH. IF A CURVE IS NEEDED TO FIT THE SITE CONDITIONS, PLACE IT IN THE UPPER SECTION OF THE APRON.
9. IMMEDIATELY AFTER CONSTRUCTION, STABILIZE ALL DISTURBED AREAS WITH VEGETATION.

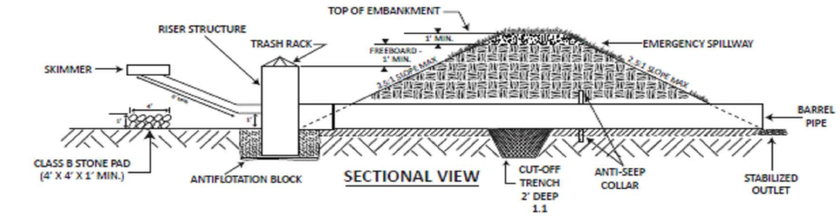
MAINTENANCE

1. INSPECT RIPRAP OUTLET STRUCTURES WEEKLY AND AFTER SIGNIFICANT (0.5 INCH OR GREATER) RAINFALL EVENTS TO SEE IF ANY EROSION AROUND OR BELOW THE RIPRAP HAS TAKEN PLACE, OR IF STONES HAVE BEEN DISLODGED. IMMEDIATELY MAKE ALL NEEDED REPAIRS TO PREVENT FURTHER DAMAGE.

STABILIZED OUTLET DETAIL

4
10-12

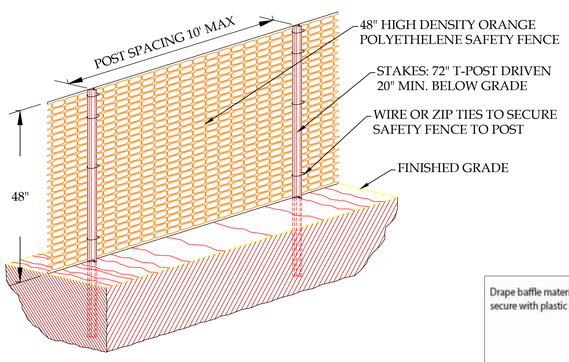




NOTES

1. SEED AND PLACE MATTING FOR EROSION CONTROL ON INTERIOR AND EXTERIOR SIDESLOPES.
2. INSTALL A MINIMUM OF 3 COIR FIBER BAFFLES IN ACCORDANCE WITH PRACTICE STANDARD 6.65.
3. INSTALL SKIMMER AND COUPLING TO RISER STRUCTURE OR DIRECTLY INTO EMBANKMENT 1 FT. FROM BOTTOM OF BASIN.
4. THE ARM PIPE SHALL HAVE A MINIMUM LENGTH OF 6 FT. BETWEEN THE SKIMMER AND COUPLING.

NOT TO SCALE

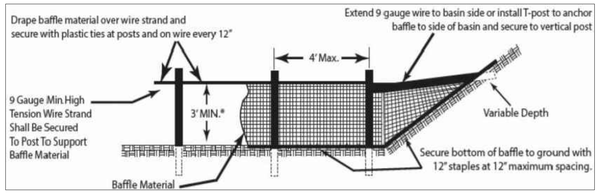


NOTES:

1. ALL SENSITIVE AREAS SHALL BE PROTECTED AS PER PLAN.
2. ALL TREES IN THE CONSTRUCTION AREA NOT SPECIFICALLY DESIGNATED FOR REMOVAL SHALL BE PRESERVED AND PROTECTED WITH HIGH VISIBILITY FENCE AS PER PLAN.
3. WHEN PRACTICABLE, INSTALL HIGH VISIBILITY 3 FEET OUTSIDE OF THE DRIP LINE OF THE TREE.
4. SAFETY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS.
5. THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

CONSTRUCTION SAFETY FENCING

2
10-12



SEDIMENT BASIN WITH BAFFLES DETAIL

3
10-12

CONSTRUCTION

1. GRADE THE BASIN SO THAT THE BOTTOM IS LEVEL FRONT TO BACK AND SIDE TO SIDE.
2. INSTALL THE COIR FIBER BAFFLES IMMEDIATELY UPON EXCAVATION OF THE BASINS. INSTALL POSTS ACROSS THE WIDTH OF THE SEDIMENT BASIN.
3. STEEL POSTS SHOULD BE DRIVEN TO A DEPTH OF 24 INCHES AND SPACED A MAXIMUM OF 4 FEET APART. THE TOP OF THE FABRIC SHOULD BE A MINIMUM OF 6 INCHES HIGHER THAN THE INVERT OF THE SPILLWAY. TOPS OF BAFFLES SHOULD BE A MINIMUM OF 2 INCHES LOWER THAN THE TOP OF THE EARTHEN EMBANKMENT.
4. INSTALL AT LEAST THREE ROWS OF BAFFLES BETWEEN THE INLET AND OUTLET DISCHARGE BASINS LESS THAN 20 FEET IN LENGTH MAY USE 2 BAFFLES.
5. ATTACH A 9 GAUGE HIGH TENSION WIRE STRAND TO THE STEEL POSTS AT A HEIGHT OF 6 INCHES ABOVE THE SPILLWAY ELEVATION WITH PLASTIC TIES OR WIRE FASTENERS TO PREVENT SAGGING. IF THE TEMPORARY SEDIMENT BASIN WILL BE CONVERTED TO A PERMANENT STORMWATER BASIN OF A GREATER DEPTH, THE BAFFLE HEIGHT SHOULD BE BASED ON THE POOL DEPTH DURING USE AS A TEMPORARY SEDIMENT BASIN.
6. EXTEND 9 GAUGE MINIMUM HIGH TENSION WIRE STRAND TO SIDE OF BASIN OR INSTALL STEEL T-POSTS TO ANCHOR BAFFLE TO SIDE OF BASIN AND SECURE TO VERTICAL END POSTS AS SHOWN IN FIGURE.
7. DRAPE THE COIR FIBER MAT OVER THE WIRE STRAND MOUNTED AT A HEIGHT OF 6 INCHES ABOVE THE SPILLWAY ELEVATION. SECURE THE COIR FIBER MAT TO THE WIRE STRAND WITH PLASTIC TIES OR WIRE FASTENERS. ANCHOR THE MATTING TO THE SIDES AND FLOOR OF THE BASIN WITH 12 INCH WIRE STAPLES, APPROXIMATELY 1 FT APART, ALONG THE BOTTOM AND SIDE SLOPES OF THE BASIN.
8. DO NOT SPLICE THE FABRIC, BUT USE A CONTINUOUS PIECE ACROSS THE BASIN
9. ADJUSTMENTS MAY BE REQUIRED IN THE STAPLING REQUIREMENTS TO FIT INDIVIDUAL SITE CONDITIONS.

Culvert Diameter (in)	Minimum Tailwater: Max Conduit Velocity = 5 fps (1.5 mps) IDOT Gradation	Minimum Tailwater: Max Conduit Velocity = 5 fps (1.5 mps) Apron Length (ft)	Minimum Tailwater: Max Conduit Velocity = 10 fps (3.1 mps) IDOT Gradation	Minimum Tailwater: Max Conduit Velocity = 10 fps (3.1 mps) Apron Length (ft)	Maximum Tailwater: Max Conduit Velocity = 5 fps (1.5 mps) IDOT Gradation	Maximum Tailwater: Max Conduit Velocity = 5 fps (1.5 mps) Apron Length (ft)	Maximum Tailwater: Max Conduit Velocity = 10 fps (3.1 mps) IDOT Gradation	Maximum Tailwater: Max Conduit Velocity = 10 fps (3.1 mps) Apron Length (ft)
12 (0.3 m)	RR-3	10 (3.1 m)	RR-3	12 (3.7 m)	RR-3	12 (3.7 m)	RR-3	15 (4.6 m)
18 (0.5 m)	RR-3	14 (4.3 m)	RR-4	16 (4.9 m)	RR-3	12 (3.7 m)	RR-3	16 (4.9 m)
24 (0.6 m)	RR-3	16 (4.9 m)	RR-4	20 (6.1 m)	RR-3	14 (4.3 m)	RR-4	17 (5.2 m)
30 (0.8 m)	RR-3	18 (5.5 m)	RR-4	22 (6.7 m)	RR-3	16 (4.9 m)	RR-4	20 (6.1 m)
36 (0.9 m)	RR-4	20 (6.1 m)	RR-5	24 (7.3 m)	RR-3	16 (4.9 m)	RR-4	22 (6.7 m)
48 (1.2 m)	RR-4	24 (7.3 m)	RR-6	28 (8.5 m)	RR-4	20 (6.1 m)	RR-4	24 (7.3 m)
60 (1.5 m)	RR-5	32 (9.8 m)	RR-6	36 (10.9 m)	RR-4	22 (6.7 m)	RR-5	26 (7.9 m)
72 (1.8 m)	RR-6	40 (12.2 m)	RR-6	44 (13.4 m)	RR-5	24 (7.3 m)	RR-5	29 (8.8 m)
96 (2.4 m)	RR-7	50 (15.2 m)	RR-7	54 (16.5 m)	RR-5	26 (7.9 m)	RR-5	32 (9.8 m)

Notes:

1. *If tailwater depth from the pipe invert is less than half of diameter of the pipe, then minimum tailwater conditions exist. Otherwise, maximum tailwater conditions exist.*
2. *Adapted from the* Illinois Urban Manual.

MINIMUM IDOT ROCK SIZES AND APRON LENGTH FOR MAXIMUM AND MINIMUM TAILWATER CONDITIONS

IDOT Gradation	Maximum Rock Size (lb)*	Equivalent Diameter (spherical) (in)*	Minimum Bedding Thickness (in)	Minimum Thickness (in)
RR-3	50 (22.5 kg)	10 (300 mm)	—	8 (200 mm)
RR-4	150 (67.5 kg)	15 (400 mm)	6 (150 mm)	16 (400 mm)
RR-5	400 (180 kg)	21 (500 mm)	8 (200 mm)	22 (600 mm)
RR-6	600 (270 kg)	24 (600 mm)	10 (250 mm)	26 (700 mm)
RR-7	1000 (450 kg)	28 (700 mm)	12 (300 mm)	30 (800 mm)

* *Assumes a minimum specific gravity of 2.450 and minimum unit weight of 153 lb/ft^3 (2,450 kg/m^3).*

ROCK RIPRAP SIZE AND THICKNESS

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

ERM NC, Inc.
19720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28277
(704) 541-8345
SC COA # 4337

EROSION & SEDIMENTATION CONTROL DETAILS (1 OF 2)

SCALE: NTS
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2018 E&S Details.DWG

DRAWING NO. 10
REV. NO.
SHEET 10 OF 12

PERMANENT & TEMPORARY SEEDING SPECS

STABILIZATION MEASURES FOR ALL DISTURBED/COMMON AREAS:

SEEDING TO BE COMPLETED IMMEDIATELY FOLLOWING SITE RECLAMATION PRIOR TO PROJECT COMPLETION. TEMPORARY OR INTERMEDIATE SEEDING, MULCHING, MATTING OR OTHER SURFACE STABILIZATION MEASURES WILL BE PLACED ON DISTURBED AREAS FOLLOWING INITIAL SOIL DISTURBANCE. PRIOR TO SEEDING, SCARIFY SOIL TO A DEPTH OF 4-6 INCHES TO ENHANCE GERMINATION & HELP IMPEDE STORM WATER RUNOFF.
(SEE SPECS FOR DETAILED SEED BED PREP INFORMATION)
SEEDING MIXTURES WILL BE TAILORED TO SITE-SPECIFIC CONDITIONS, STEEPNESS OF SLOPES, CLIMATE, LOCATION AND ELEVATION. TYPICAL SEEDING GUIDELINES ARE AS FOLLOWS:

CLASS-TYPE	ITEM	RATE OF APPLICATION (LB/ACRE)
3A - SOUTHERN ILLINOIS SLOPE MIXTURE	PERENNIAL RYEGRASS	20
	CANADA WILD RYE (ELYMUS CANADENSIS)	20
	SWITCHGRASS (PANICUM VIRGATUM)	10
	LITTLE BLUESTEM (ANDROPOGON SCOPARIUS)	12
	SIDE-OATS GRAMA (BOUTELOUA CURTIPENDULA)	10
	WHITE PRAIRIE CLOVER (PETALOSTEMUM CANDIDUM)	5
	BLACK-EYED SUSAN (RUDBECKIA HIRTA)	5
	OATS, SPRING	50

NURSE CROPS MAY BE ADDED TO AID THE ESTABLISHMENT OF PERMANENT VEGETATION ON STEEP SLOPES OR OTHER PROBLEM AREAS. GUIDELINES FOR NURSE CROP SEEDING RATES ARE AS FOLLOWS:

MAY THROUGH MID-AUGUST		MID-AUGUST THROUGH APRIL	
GERMAN MILLET	15 lb/acre	RYE GRAIN	40 lb/acre

IN THE ABSENCE OF SOIL TESTS, FERTILIZER AND LIME WILL GENERALLY BE APPLIED AT THE FOLLOWING RATES:

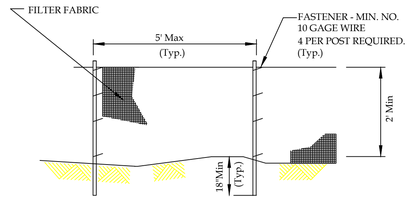
FERTILIZER:
SEED BED PREPARATION: INCORPORATE SUPERPHOSPHATE 0-26-26 @ 500lbs/acre
AT SEEDING TIME ADD 17-17-17 @600 lb/acre OR 10-10-10 @1000 lb/acre
GROUND AGRICULTURAL LIMESTONE = 4000 lb/acre*
*(Per soil test but not less than 2000 lb/acre)
VEGETATIVE MULCH, TYPICALLY WHEAT OR OAT STRAW, SHALL BE APPLIED AT THE RATE OF 2 TONS PER ACRE AND TACKED WITH APPROVED WATER BASED ASPHALT TACK AT 224 GAL/ACRE, OR AS OTHERWISE DIRECTED/APPROVED BY THE ENGINEER

LIQUID LIME OR ALTERNATIVE FERTILIZERS MAY BE SUBSTITUTED IN VARIOUS SITUATIONS. MULCH OR MATTING SHALL BE APPLIED TO ALL SEEDED AREAS TO AID IN THE ESTABLISHMENT OF VEGETATION AND HELP IMPEDE EROSION.

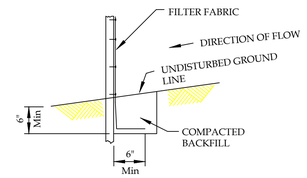
STABILIZATION TIMEFRAMES
(Effective Aug. 3, 2011)

SITE AREA DESCRIPTION	STABILIZATION	TIMEFRAME EXCEPTIONS
Perimeter dikes, swales, ditches, slopes	7 days	None
High Quality Water (HQW) Zones	7 days	None
Slopes steeper than 3:1	7 days	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed.
Slopes 3:1 or flatter	14 days	7 days for slopes greater than 50' in length.
All other areas with slopes flatter than 4:1	14 days	None, except for perimeters and HQW Zones.

STABILIZATION TABLE



ELEVATION



FABRIC ANCHOR DETAIL

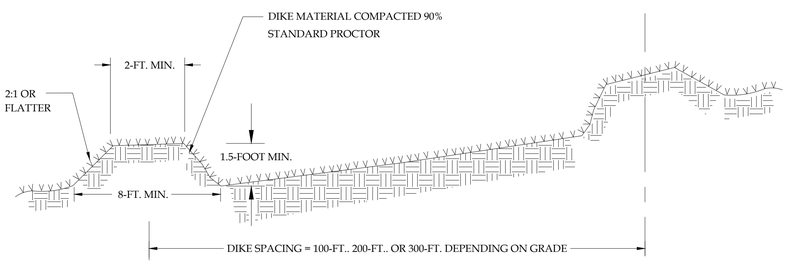
NOTES:
1. TEMPORARY SEDIMENT FENCE SHALL BE INSTALLED PRIOR TO ANY GRADING WORK IN THE AREA TO BE PROTECTED.
2. THEY SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD AND REMOVED IN CONJUNCTION WITH THE FINAL GRADING AND SITE STABILIZATION.
3. FILTER FABRIC SHALL MEET THE REQUIREMENTS OF MATERIAL SPECIFICATION 592 GEOTEXTILE TABLE 1 OR 2, CLASS WITH EQUIVALENT OPENING SIZE OF I AT LEAST 30 FOR NONWOVEN AND 40 FOR WOVEN.
4. FENCE POSTS SHALL BE EITHER STANDARD STEEL POST OR WOOD POST WITH A MINIMUM CROSS-SECTIONAL AREA OF 3.0 SQ. IN.

SILT FENCE DETAIL

INSTALLATION
1. EXCAVATE A TRENCH APPROXIMATELY 6-INCHES WIDE AND 6-INCHES DEEP WHEN PLACING FABRIC BY HAND.
2. PLACE 12-INCHES OF GEOTEXTILE FABRIC INTO THE 6-INCH DEEP TRENCH, EXTENDING THE REMAINING 6-INCHES TOWARDS THE UPSLOPE SIDE OF THE TRENCH.
3. BACKFILL THE TRENCH WITH SOIL OR GRAVEL AND COMPACT.BURY 12-INCHES OF FABRIC INTO THE GROUND WHEN PNEUMATICALLY INSTALLING SILT FENCE WITH A SLICING METHOD.
4. PURCHASE FABRIC IN CONTINUOUS ROLLS AND CUT TO THE LENGTH OF THE BARRIER TO AVOID JOINTS.
5. WHEN JOINTS ARE NECESSARY, WRAPPED THE FABRIC TOGETHER AT A SUPPORT POST WITH BOTH ENDS FASTENED TO THE POST, WITH A 6-INCH MINIMUM OVERLAP.
6. INSTALL POSTS TO A MINIMUM DEPTH OF 24-INCHES.
7. INSTALL POSTS A MINIMUM OF 1- TO 2- INCHES ABOVE THE FABRIC, WITH NO MORE THAN 3-FEET OF THE POST ABOVE THE GROUND.
8. SPACE POSTS TO MAXIMUM 6-FEET CENTERS.
9. ATTACH FABRIC TO WOOD POSTS USING STAPLES MADE OF HEAVY-DUTY WIRE AT LEAST 1½-INCH LONG, SPACED A MAXIMUM OF 6-INCHES APART.
10. STAPLE A 2-INCH WIDE LATHE OVER THE FILTER FABRIC TO SECURELY FASTEN IT TO THE UPSLOPE SIDE OF WOODEN POSTS.
11. ATTACH FABRIC TO THE STEEL POSTS USING HEAVY-DUTY PLASTIC TIES THAT ARE EVENLY SPACED AND PLACED IN A MANNER TO PREVENT SAGGING OR TEARING OF THE FABRIC.
12. IN CALL CASES, TIES SHOULD BE AFFIXED IN NO LESS THAN 4 PLACES.
13. INSTALL THE FABRIC A MINIMUM OF 24-INCHES ABOVE THE GROUND.
14. WHEN NECESSARY, THE HEIGHT OF THE FENCE ABOVE GROUND MAY BE GREATER THAN 24-INCHES.
15. IN TIDAL AREAS, EXTRA SILT FENCE HEIGHT MAY BE REQUIRED. THE POST HEIGHT WILL BE TWICE THE EXPOSED POST HEIGHT. POST SPACING WILL REMAIN THE SAME AND EXTRA HEIGHT FABRIC WILL BE 4-, 5-, OR 6-FEET TALL.
16. LOCATE SILT FENCE "J" HOOK OUTLETS EVERY 200 FEET MAXIMUM AND AT LOW POINTS.
17. INSTALL THE FENCE PERPENDICULAR TO THE DIRECTION OF FLOW AND PLACE THE FENCE THE PROPER DISTANCE FROM THE TOE OF STEEP SLOPES TO PROVIDE SEDIMENT STORAGE AND ACCESS FOR MAINTENANCE AND CLEANOUT.

INSPECTION AND MAINTENANCE
1. INSPECT EVERY SEVEN CALENDAR DAYS AND WITHIN 24-HOURS AFTER EACH RAINFALL EVENT THAT PRODUCES ½-INCHES OR MORE OF PRECIPITATION.
2. CHECK FOR SEDIMENT BUILDUP AND FENCE INTEGRITY. CHECK WHERE RUNOFF HAS ERODED A CHANNEL BENEATH THE FENCE, OR WHERE THE FENCE HAS SAGGED OR COLLAPSED BY FENCE OVERTOPPING.
3. IF THE FENCE FABRIC TEARS, BEGINS TO DECOMPOSE, OR IN ANY WAY BECOMES INEFFECTIVE, REPLACE THE SECTION OF FENCE IMMEDIATELY.
4. REMOVE SEDIMENT ACCUMULATED ALONG THE FENCE WHEN IT REACHES 1/3 THE HEIGHT OF THE FENCE, ESPECIALLY IF HEAVY RAINS ARE EXPECTED.
5. REMOVE TRAPPED SEDIMENT FROM THE SITE OR STABILIZE IT ON SITE.
6. REMOVE SILT FENCE WITHIN 30 DAYS AFTER FINAL STABILIZATION IS ACHIEVED OR AFTER TEMPORARY BEST MANAGEMENT PRACTICES (BMPS) ARE NO LONGER NEEDED.
7. PERMANENTLY STABILIZE DISTURBED AREAS RESULTING FROM FENCE REMOVAL.

SILT FENCE DETAIL 1 / 11-12



TEMPORARY DIVERSION DETAIL 2 / 11-12

DIVERSION DIKES AND BERMS

INSTALLATION
1. SLOPES SHALL BE STABILIZED IMMEDIATELY USING VEGETATION, SOD, AND EROSION CONTROL BLANKETS OR TURF REINFORCEMENT MATS TO PREVENT EROSION.
2. THE UPSLOPE SIDE OF THE DIKE SHOULD PROVIDE POSITIVE DRAINAGE SO NO EROSION OCCURS AT THE OUTLET. PROVIDE ENERGY DISSIPATION MEASURES AS NECESSARY.
3. SEDIMENT-LADEN RUNOFF MUST BE RELEASED THROUGH A SEDIMENT TRAPPING FACILITY.
4. SEDIMENT-LADEN RUNOFF SHALL BE DIRECTED TO A SEDIMENT TRAPPING FACILITY.
5. MINIMIZE CONSTRUCTION TRAFFIC OVER DIVERSION DIKES AND BERMS.

INSPECTION AND MAINTENANCE:
1. DIKES AND BERMS SHOULD BE INSPECTED, EVERY SEVEN (7) CALENDAR DAYS AND WITHIN 24-HOURS AFTER EACH RAINFALL EVENT THAT PRODUCES ½-INCHES OR MORE OF PRECIPITATION AND REPAIRS MADE AS NECESSARY.
2. DAMAGE CAUSED BY CONSTRUCTION TRAFFIC OR OTHER ACTIVITY MUST BE REPAIRED BEFORE THE END OF EACH WORKING DAY.

Table 6.62b Specifications For Sediment Fence Fabric

Temporary Silt Fence Material Property Requirements					
	Test Material	Units	Supported[1] Silt Fence	Un-Supported[1] Silt Fence	Type of Value
Grab Strength	ASTM D 4632	N (lbs)			
Machine Direction			400	550	MARV
			(90)	(90)	
X-Machine Direction			400	450	MARV
			(90)	(90)	
Permittivity[2]	ASTM D 4491	sec-1	0.05	0.05	MARV
Apparent Opening Size[2]	ASTM D 4751	mm	0.60	0.60	Max. ARV[3]
		(US Sieve #)	(30)	(30)	
Ultraviolet Stability	ASTM D 4355	% Retained Strength	70% after 500h of exposure	70% after 500h of exposure	Typical

[1] Silt Fence support shall consist of 14 gage steel wire with a mesh spacing of 150 mm (6 inches), or prefabricated poylmer mesh of equivalent strength.
[2] These default values are based on empirical evidence with a variety of sediment. For environmentally sensitive areas, a review of previous experience and/or site or regionally specific geotextile tests in accordance with Test Method D 5141 should be performed by the agency to confirm suitability of these requirements.
[3] As measured in accordance with Test Method D 4632.

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

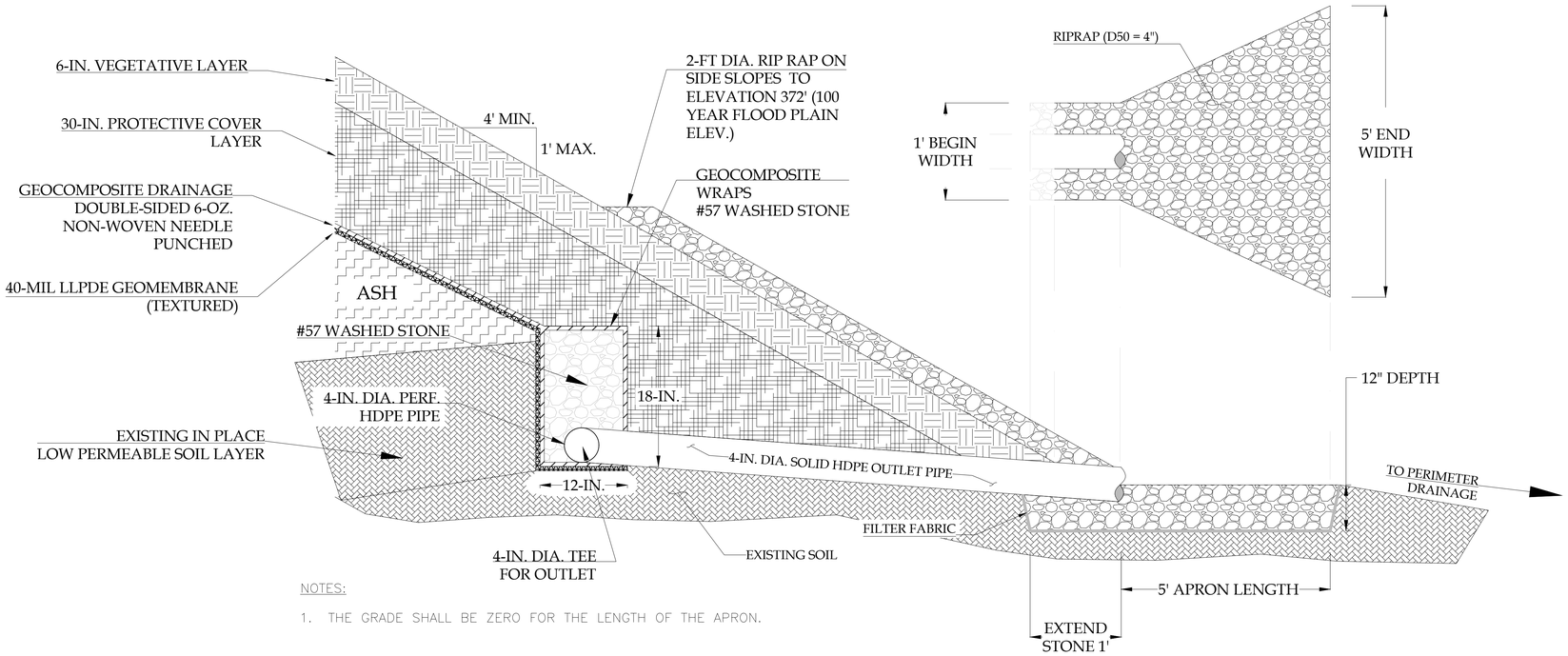
DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

ERM NC, Inc.
15720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28277
(704) 541-8345
SC COA # 4337

EROSION & SEDIMENTATION CONTROL DETAILS (2 OF 2)

SCALE: NTS
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2007: E&S Details.DWG

DRAWING NO. 11
REV. NO.
SHEET 11 OF 12

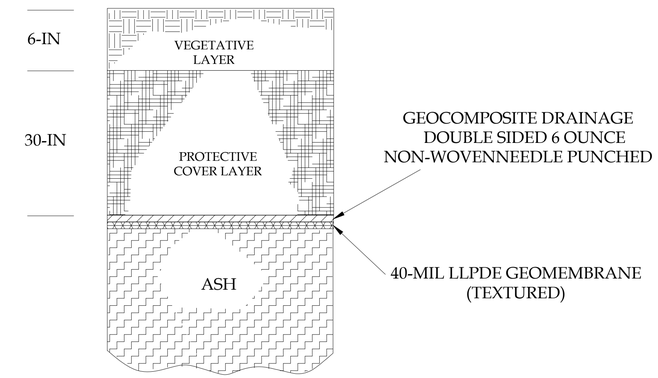


NOTES:

1. THE GRADE SHALL BE ZERO FOR THE LENGTH OF THE APRON.

ANCHOR TRENCH AND DRAIN OUTLET DETAIL

1
12-12

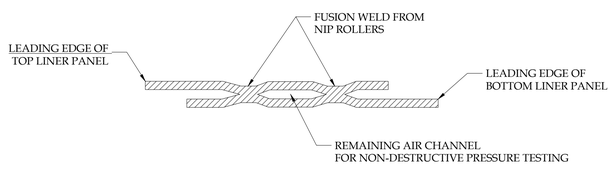


NOTES:

VEGETATIVE & PROTECTIVE SOIL LAYER ARE TAKEN FROM EXISTING EARTHEN BERM REMOVAL DURING CLOSURE CONSTRUCTION

FINAL CLOSURE SYSTEM DETAIL

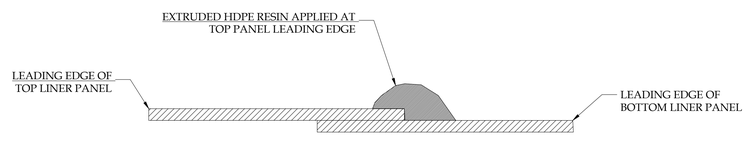
2
12-12



LLDPE DOUBLE HOT WEDGE FUSION WELD DETAIL

NOTES:

1. LEADING EDGES ARE OVERLAPPED A MINIMUM OF 6 INCHES PRIOR TO WELDING.
2. HDPE SURFACES SHALL BE CLEANED FREE OF DEBRIS AND SOIL PRIOR TO WELDING.



NOTE: LEADING EDGES ARE OVERLAPPED A MINIMUM OF 3 INCHES PRIOR TO WELDING.

LLDPE EXTRUSION WELD DETAIL

NOTES:

1. LEADING EDGES ARE OVERLAPPED A MINIMUM OF 6 INCHES PRIOR TO WELDING.
2. HDPE SURFACES SHALL BE CLEANED FREE OF DEBRIS AND SOIL PRIOR TO WELDING.
3. GRINDING OF HDPE SURFACES SHALL BE PERFORMED IN AREAS RECEIVING EXTRUDATE PRIOR TO WELDING TO SUPPLY AN ABRASIVE SURFACE. GRINDING BEYOND THE AREA RECEIVING EXTRUDATE IS NOT ALLOWED.

NO.	DATE	APPR.	REVISION	NO.	DATE	APPR.	REVISION
1	03/22		FOR PERMITTING PURPOSES				

GRAND TOWER INACTIVE CCR IMPOUNDMENT
GRAND TOWER ENERGY CENTER

GRAND TOWER ENERGY CENTER — GRAND TOWER, ILLINOIS

DRAWN BY: CWM
PROJECT ENGINEER: CWM
DESIGN ENGINEER: CWM
PROJECT MANAGER: DWW

ERM NC, Inc.
15720 BRIXHAM HILL AVENUE, SUITE 120
CHARLOTTE, NORTH CAROLINA 28277
(704) 541-8345
SC COA # 4337

CLOSURE DETAILS

SCALE: NTS
DATE: MARCH 22, 2019
PROJECT NO.
AutoCAD 2018 E&S Details.DWG

DRAWING NO. 12
REV. NO.
SHEET 12 OF 12

Appendix 4

ERM Groundwater Sampling, 2016

August 2016 Sampling

September 01, 2016

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: 0297751 **WorkOrder:** 16081714

Dear Brett Carney:

TEKLAB, INC received 3 samples on 8/26/2016 4:25:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Emily Pohlman
Project Manager
(618)344-1004 ex 44
epohlman@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Laboratory Results	5
Sample Summary	8
Dates Report	9
Quality Control Results	10
Receiving Check List	13
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 16081714

Client Project: 0297751 **Report Date:** 01-Sep-16

Abbr Definition

CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

Cooler Receipt Temp: 2.42 °C

Locations and Accreditations

	Collinsville	Springfield	Kansas City	Collinsville Air
Address	5445 Horseshoe Lake Road	3920 Pintail Dr	8421 Nieman Road	5445 Horseshoe Lake Road
	Collinsville, IL 62234-7425	Springfield, IL 62711-9415	Lenexa, KS 66214	Collinsville, IL 62234-7425
Phone	(618) 344-1004	(217) 698-1004	(913) 541-1998	(618) 344-1004
Fax	(618) 344-1005	(217) 698-1005	(913) 541-1998	(618) 344-1005
Email	jhriley@teklabinc.com	KKlostermann@teklabinc.com	dthompson@teklabinc.com	EHurley@teklabinc.com

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2017	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2017	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2017	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2017	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2017	Collinsville
Arkansas	ADEQ	88-0966		3/14/2017	Collinsville
Illinois	IDPH	17584		5/31/2017	Collinsville
Kentucky	KDEP	98006		12/31/2016	Collinsville
Kentucky	UST	0073		1/31/2017	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Missouri	MDNR	930		1/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2017	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16081714
Client Project: 0297751
Report Date: 01-Sep-16
Lab ID: 16081714-001
Client Sample ID: APW-1
Matrix: GROUNDWATER
Collection Date: 08/25/2016 11:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20	R	**192**	mg/L	1	08/30/2016 20:09	R222977
RPD for sample and sample duplicate is outside of QC limit.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**27**	mg/L	1	08/30/2016 21:30	R222962
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.47**		1	08/26/2016 20:40	R222816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**192**	µg/L	1	08/31/2016 14:31	121843
Iron	NELAP	20.0		**1430**	µg/L	1	08/31/2016 14:31	121843
Manganese	NELAP	3.0		**124**	µg/L	1	08/31/2016 14:31	121843

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16081714
Client Project: 0297751
Report Date: 01-Sep-16
Lab ID: 16081714-002
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 08/25/2016 13:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**470**	mg/L	1	08/29/2016 20:37	R222939
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**130**	mg/L	10	08/30/2016 22:13	R222962
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.27**		1	08/26/2016 20:44	R222816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**2560**	µg/L	1	08/31/2016 14:49	121843
Iron	NELAP	20.0		**1190**	µg/L	1	08/31/2016 14:49	121843
Manganese	NELAP	3.0		**61.5**	µg/L	1	08/31/2016 14:49	121843

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16081714
Client Project: 0297751
Report Date: 01-Sep-16
Lab ID: 16081714-003
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 08/25/2016 15:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**214**	mg/L	1	08/29/2016 20:37	R222939
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**26**	mg/L	1	08/30/2016 22:16	R222962
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.76**		1	08/26/2016 20:48	R222816
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**340**	µg/L	1	08/31/2016 14:55	121843
Iron	NELAP	20.0		**1190**	µg/L	1	08/31/2016 14:55	121843
Manganese	NELAP	3.0		**48.2**	µg/L	1	08/31/2016 14:55	121843

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
16081714-001	APW-1	Groundwater	2	08/25/2016 11:45
16081714-002	APW-4	Groundwater	2	08/25/2016 13:00
16081714-003	APW-3	Groundwater	2	08/25/2016 15:15

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
16081714-001A	APW-1	08/25/2016 11:45	08/26/2016 16:25		
	Standard Methods 2540 C (Total)				08/30/2016 20:09
	SW-846 9036 (Total)				08/30/2016 21:30
	SW-846 9040B, Laboratory Analyzed				08/26/2016 20:40
16081714-001B	APW-1	08/25/2016 11:45	08/26/2016 16:25		
	SW-846 3005A, 6010B, Metals by ICP (Total)			08/29/2016 9:10	08/31/2016 14:31
16081714-002A	APW-4	08/25/2016 13:00	08/26/2016 16:25		
	Standard Methods 2540 C (Total)				08/29/2016 20:37
	SW-846 9036 (Total)				08/30/2016 22:13
	SW-846 9040B, Laboratory Analyzed				08/26/2016 20:44
16081714-002B	APW-4	08/25/2016 13:00	08/26/2016 16:25		
	SW-846 3005A, 6010B, Metals by ICP (Total)			08/29/2016 9:10	08/31/2016 14:49
16081714-003A	APW-3	08/25/2016 15:15	08/26/2016 16:25		
	Standard Methods 2540 C (Total)				08/29/2016 20:37
	SW-846 9036 (Total)				08/30/2016 22:16
	SW-846 9040B, Laboratory Analyzed				08/26/2016 20:48
16081714-003B	APW-3	08/25/2016 15:15	08/26/2016 16:25		
	SW-846 3005A, 6010B, Metals by ICP (Total)			08/29/2016 9:10	08/31/2016 14:55

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: 0297751

Work Order: 16081714
Report Date: 01-Sep-16

STANDARD METHODS 2540 C (TOTAL)

Batch R222939 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						08/29/2016
Total Dissolved Solids	20		**< 20**						08/29/2016

Batch R222939 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**922**	1000	0	92.2	90	110	08/29/2016

Batch R222939 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**918**	1000	0	91.8	90	110	08/29/2016

Batch R222977 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						08/30/2016
Total Dissolved Solids	20		**< 20**						08/30/2016
Total Dissolved Solids	20		**< 20**						08/30/2016

Batch R222977 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**954**	1000	0	95.4	90	110	08/30/2016

Batch R222977 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**968**	1000	0	96.8	90	110	08/30/2016
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	08/30/2016

Batch R222977 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 16081714-001A DUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	R	**202**				192.0	5.08	08/30/2016

SW-846 9036 (TOTAL)

Batch R222962 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						08/30/2016

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: 0297751

Work Order: 16081714
Report Date: 01-Sep-16

SW-846 9036 (TOTAL)

Batch R222962 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	96.7	90	110	08/30/2016

Batch R222962 **SampType:** MS Units **mg/L**
SampID: 16081714-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**37**	10.00	27.46	91.4	85	115	08/30/2016

Batch R222962 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 16081714-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10		**37**	10.00	27.46	98.7	36.60	1.97	08/30/2016

SW-846 9040B, LABORATORY ANALYZED

Batch R222816 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**7.00**	7.000	0	100.0	99.1	100.8	08/26/2016

Batch R222816 **SampType:** LCS Units
SampID: LCS-R222816

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**7.00**	7.000	0	100.0	99.1	100.8	08/26/2016

Batch R222816 **SampType:** DUP Units RPD Limit **10**
SampID: 16081714-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.52**				6.470	0.77	08/26/2016

Batch R222816 **SampType:** DUP Units RPD Limit **10**
SampID: 16081714-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.29**				7.270	0.27	08/26/2016

Batch R222816 **SampType:** DUP Units RPD Limit **10**
SampID: 16081714-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.77**				7.760	0.13	08/26/2016

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 121843 **SampType:** MBLK Units **µg/L**

SampID: MBLK-121843

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**< 20.0**	20.00	0	0	-100	100	08/31/2016
Iron	20.0		**< 20.0**	20.00	0	0	-100	100	08/31/2016
Manganese	3.0		**< 3.0**	3.000	0	0	-100	100	08/31/2016

Batch 121843 **SampType:** LCS Units **µg/L**

SampID: LCS-121843

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**485**	500.0	0	97.1	85	115	08/31/2016
Iron	20.0		**2000**	2000	0	100.2	85	115	08/31/2016
Manganese	3.0		**508**	500.0	0	101.5	85	115	08/31/2016

Batch 121843 **SampType:** MS Units **µg/L**

SampID: 16081714-001BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**676**	500.0	192.0	96.8	75	125	08/31/2016
Iron	20.0		**3610**	2000	1427	109.0	75	125	08/31/2016
Manganese	3.0		**632**	500.0	124.5	101.5	75	125	08/31/2016

Batch 121843 **SampType:** MSD Units **µg/L** RPD Limit **20**

SampID: 16081714-001BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron	20.0		**676**	500.0	192.0	96.7	676.2	0.10	08/31/2016
Iron	20.0		**3570**	2000	1427	107.4	3608	0.95	08/31/2016
Manganese	3.0		**632**	500.0	124.5	101.4	632.2	0.11	08/31/2016

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: 0297751

Work Order: 16081714

Report Date: 01-Sep-16

Carrier: Nick Reed

Received By: KF

Completed by: Kalyn Foecke
On: 26-Aug-16

Reviewed by: Elizabeth A. Hurley
On: 26-Aug-16

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **2.42**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 1 Work order # 16081714

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE 2.43 °C
Preserved in: ☒ LAB ☒ FIELD
Lab Notes KF 8/26/16

FOR LAB USE ONLY

Client Comments:

Courier

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Project Name/Number 0297751

Sample Collector's Name M. Halley

Results Requested ☐ Standard ☐ 1-2 Day (100% Surcharge) ☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	B Fe Mn 6010	pH	Sulfate	TDS
16081714-001	APW-1	8/25/16 1145	1	1												X	X	X	X	X
002	APW-4	1300	1	1																
003	APW-3	1515	1	1																

Relinquished By	Date/Time	Received By	Date/Time
[signature]	8/26/16 0930	[signature]	8/26/16
[signature]	8/26/16 1420	[signature]	8/26/16 1420
[signature]	8/26/16 1625	[signature]	8/26/16 1625

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client.

BottleOrder: 32928

KF 8/26/16

December 2016 Sampling

December 09, 2016

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower 0297751 **WorkOrder:** 16120102

Dear Brett Carney:

TEKLAB, INC received 3 samples on 12/2/2016 9:30:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

This reporting package includes the following:

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Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 16120102

Client Project: Grand Tower 0297751 **Report Date:** 09-Dec-16

Abbr	Definition
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

Cooler Receipt Temp: 0.62 °C

Locations and Accreditations

	Collinsville	Springfield	Kansas City	Collinsville Air
Address	5445 Horseshoe Lake Road	3920 Pintail Dr	8421 Nieman Road	5445 Horseshoe Lake Road
	Collinsville, IL 62234-7425	Springfield, IL 62711-9415	Lenexa, KS 66214	Collinsville, IL 62234-7425
Phone	(618) 344-1004	(217) 698-1004	(913) 541-1998	(618) 344-1004
Fax	(618) 344-1005	(217) 698-1005	(913) 541-1998	(618) 344-1005
Email	jhriley@teklabinc.com	KKlostermann@teklabinc.com	Ryoungstrom@teklabinc.com	EHurley@teklabinc.com

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2017	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2017	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2017	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2017	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2017	Collinsville
Arkansas	ADEQ	88-0966		3/14/2017	Collinsville
Illinois	IDPH	17584		5/31/2017	Collinsville
Kentucky	KDEP	98006		12/31/2016	Collinsville
Kentucky	UST	0073		1/31/2017	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Missouri	MDNR	930		1/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2017	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16120102
Client Project: Grand Tower 0297751
Report Date: 09-Dec-16
Lab ID: 16120102-001
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 12/01/2016 9:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**548**	mg/L	1	12/06/2016 20:29	R226618
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**552**	mg/L	1	12/04/2016 17:11	R226497
SW-846 9036 (DISSOLVED)								
Sulfate	NELAP	200	S	**204**	mg/L	20	12/07/2016 12:32	R226692
MS and/or MSD did not recover within control limits. Result is verified by re-analysis at another dilution.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**210**	mg/L	20	12/07/2016 13:04	R226692
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.55**		1	12/02/2016 16:31	R226404
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Boron	NELAP	20.0		**2710**	µg/L	1	12/07/2016 18:39	125029
Iron	NELAP	20.0		**1240**	µg/L	1	12/07/2016 18:39	125029
Manganese	NELAP	3.0		**532**	µg/L	1	12/07/2016 18:39	125029
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**2800**	µg/L	1	12/06/2016 12:04	124503
Iron	NELAP	20.0		**4850**	µg/L	1	12/06/2016 12:04	124503
Manganese	NELAP	3.0		**640**	µg/L	1	12/06/2016 12:04	124503

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16120102
Client Project: Grand Tower 0297751
Report Date: 09-Dec-16
Lab ID: 16120102-002
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 12/01/2016 10:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**610**	mg/L	1	12/04/2016 18:04	R226497
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**670**	mg/L	1	12/04/2016 17:12	R226497
SW-846 9036 (DISSOLVED)								
Sulfate	NELAP	100		**341**	mg/L	10	12/05/2016 23:15	R226550
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**330**	mg/L	10	12/05/2016 23:31	R226550
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.20**		1	12/02/2016 16:34	R226404
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Boron	NELAP	20.0		**6380**	µg/L	1	12/07/2016 19:01	125029
Iron	NELAP	20.0		**3680**	µg/L	1	12/07/2016 19:01	125029
Manganese	NELAP	3.0		**390**	µg/L	1	12/07/2016 19:01	125029
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**6270**	µg/L	1	12/06/2016 12:26	124503
Iron	NELAP	20.0		**17800**	µg/L	1	12/06/2016 12:26	124503
Manganese	NELAP	3.0		**710**	µg/L	1	12/06/2016 12:26	124503

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 16120102
Client Project: Grand Tower 0297751
Report Date: 09-Dec-16
Lab ID: 16120102-003
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 12/01/2016 15:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (DISSOLVED)								
Total Dissolved Solids	NELAP	20		**492**	mg/L	1	12/04/2016 18:04	R226497
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**502**	mg/L	1	12/04/2016 18:00	R226497
SW-846 9036 (DISSOLVED)								
Sulfate	NELAP	50		**130**	mg/L	5	12/05/2016 23:18	R226550
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**130**	mg/L	5	12/05/2016 23:34	R226550
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.33**		1	12/02/2016 16:36	R226404
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Boron	NELAP	20.0		**2280**	µg/L	1	12/08/2016 15:04	125029
Iron	NELAP	20.0		**< 20.0**	µg/L	1	12/07/2016 19:05	125029
Manganese	NELAP	3.0		**46.1**	µg/L	1	12/07/2016 19:05	125029
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Boron	NELAP	20.0		**2350**	µg/L	1	12/06/2016 13:54	124503
Iron	NELAP	20.0		**450**	µg/L	1	12/06/2016 12:30	124503
Manganese	NELAP	3.0		**66.6**	µg/L	1	12/06/2016 12:30	124503

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
16120102-001	APW-3	Groundwater	4	12/01/2016 9:50
16120102-002	APW-2	Groundwater	4	12/01/2016 10:45
16120102-003	APW-4	Groundwater	4	12/01/2016 15:05

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
16120102-001A	APW-3	12/01/2016 9:50	12/02/2016 9:30		
	Standard Methods 2540 C (Total)				12/04/2016 17:11
	SW-846 9036 (Total)				12/07/2016 13:04
	SW-846 9040B, Laboratory Analyzed				12/02/2016 16:31
16120102-001B	APW-3	12/01/2016 9:50	12/02/2016 9:30		
	Standard Methods 2540 C (Dissolved)				12/06/2016 20:29
	SW-846 9036 (Dissolved)				12/07/2016 12:32
16120102-001C	APW-3	12/01/2016 9:50	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Total)			12/02/2016 12:31	12/06/2016 12:04
16120102-001D	APW-3	12/01/2016 9:50	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Dissolved)			12/07/2016 9:42	12/07/2016 18:39
16120102-002A	APW-2	12/01/2016 10:45	12/02/2016 9:30		
	Standard Methods 2540 C (Total)				12/04/2016 17:12
	SW-846 9036 (Total)				12/05/2016 23:31
	SW-846 9040B, Laboratory Analyzed				12/02/2016 16:34
16120102-002B	APW-2	12/01/2016 10:45	12/02/2016 9:30		
	Standard Methods 2540 C (Dissolved)				12/04/2016 18:04
	SW-846 9036 (Dissolved)				12/05/2016 23:15
16120102-002C	APW-2	12/01/2016 10:45	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Total)			12/02/2016 12:31	12/06/2016 12:26
16120102-002D	APW-2	12/01/2016 10:45	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Dissolved)			12/07/2016 9:42	12/07/2016 19:01
16120102-003A	APW-4	12/01/2016 15:05	12/02/2016 9:30		
	Standard Methods 2540 C (Total)				12/04/2016 18:00
	SW-846 9036 (Total)				12/05/2016 23:34
	SW-846 9040B, Laboratory Analyzed				12/02/2016 16:36
16120102-003B	APW-4	12/01/2016 15:05	12/02/2016 9:30		
	Standard Methods 2540 C (Dissolved)				12/04/2016 18:04
	SW-846 9036 (Dissolved)				12/05/2016 23:18
16120102-003C	APW-4	12/01/2016 15:05	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Total)			12/02/2016 12:31	12/06/2016 12:30
	SW-846 3005A, 6010B, Metals by ICP (Total)			12/02/2016 12:31	12/06/2016 13:54
16120102-003D	APW-4	12/01/2016 15:05	12/02/2016 9:30		
	SW-846 3005A, 6010B, Metals by ICP (Dissolved)			12/07/2016 9:42	12/07/2016 19:05
	SW-846 3005A, 6010B, Metals by ICP (Dissolved)			12/07/2016 9:42	12/08/2016 15:04

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Work Order: 16120102

Client Project: Grand Tower 0297751

Report Date: 09-Dec-16

STANDARD METHODS 2540 C (DISSOLVED)

Batch **R226618** **SampType:** **DUP** Units **mg/L** RPD Limit **5**

SampID: 16120102-001B DUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**538**				548.0	1.84	12/06/2016

STANDARD METHODS 2540 C (TOTAL)

Batch **R226497** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						12/04/2016
Total Dissolved Solids	20		**< 20**						12/04/2016
Total Dissolved Solids	20		**< 20**						12/04/2016
Total Dissolved Solids	20		**< 20**						12/04/2016

Batch **R226497** **SampType:** **LCS** Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**924**	1000	0	92.4	90	110	12/04/2016

Batch **R226497** **SampType:** **LCSQC** Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**976**	1000	0	97.6	90	110	12/04/2016
Total Dissolved Solids	20		**924**	1000	0	92.4	90	110	12/04/2016
Total Dissolved Solids	20		**958**	1000	0	95.8	90	110	12/04/2016

Batch **R226497** **SampType:** **MS** Units **mg/L**

SampID: 16120102-001A MS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1080**	500.0	552.0	106.0	85	115	12/04/2016

Batch **R226497** **SampType:** **MSD** Units **mg/L** RPD Limit **5**

SampID: 16120102-001A MSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1070**	500.0	552.0	104.0	1082	0.93	12/04/2016

Batch **R226618** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						12/06/2016
Total Dissolved Solids	20		**< 20**						12/06/2016

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower 0297751

Work Order: 16120102
Report Date: 09-Dec-16

STANDARD METHODS 2540 C (TOTAL)

Batch R226618 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**936**	1000	0	93.6	90	110	12/06/2016

Batch R226618 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	12/06/2016

SW-846 9036 (DISSOLVED)

Batch R226692 **SampType:** MS Units **mg/L**
SampID: 16120102-001BMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	200	S	**365**	200.0	203.5	80.7	85	115	12/07/2016

Batch R226692 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 16120102-001BMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	200		**381**	200.0	203.5	88.5	364.8	4.23	12/07/2016

SW-846 9036 (TOTAL)

Batch R226550 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						12/05/2016

Batch R226550 **SampType:** MBLK Units **mg/L**
SampID: MBLK 161204

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						12/05/2016

Batch R226550 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	98.0	90	110	12/05/2016

Batch R226692 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						12/07/2016

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

SW-846 9036 (TOTAL)

Batch R226692 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.8	90	110	12/07/2016

SW-846 9040B, LABORATORY ANALYZED

Batch R226404 **SampType:** LCS Units

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.98**	7.000	0	99.7	99.1	100.8	12/01/2016

Batch R226404 **SampType:** DUP Units RPD Limit **10**

SampID: 16120102-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.57**				7.550	0.26	12/02/2016

Batch R226404 **SampType:** DUP Units RPD Limit **10**

SampID: 16120102-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.19**				7.200	0.14	12/02/2016

Batch R226404 **SampType:** DUP Units RPD Limit **10**

SampID: 16120102-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.36**				7.330	0.41	12/02/2016

SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)

Batch 125029 **SampType:** MBLK Units **µg/L**

SampID: MBLK-125029

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**< 20.0**	20.00	0	0	-100	100	12/07/2016
Iron	20.0		**< 20.0**	20.00	0	0	-100	100	12/07/2016
Manganese	3.0		**< 3.0**	3.000	0	0	-100	100	12/07/2016

Batch 125029 **SampType:** LCS Units **µg/L**

SampID: LCS-125029

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**449**	500.0	0	89.7	85	115	12/07/2016
Iron	20.0		**1810**	2000	0	90.5	85	115	12/07/2016
Manganese	3.0		**450**	500.0	0	90.1	85	115	12/07/2016

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)

Batch 125029 **SampType:** MS Units **µg/L**

SampID: 16120102-001DMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**3150**	500.0	2708	87.8	75	125	12/07/2016
Iron	20.0		**3180**	2000	1238	97.2	75	125	12/07/2016
Manganese	3.0		**984**	500.0	531.6	90.5	75	125	12/07/2016

Batch 125029 **SampType:** MSD Units **µg/L** RPD Limit **20**

SampID: 16120102-001DMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron	20.0		**3190**	500.0	2708	95.8	3147	1.26	12/07/2016
Iron	20.0		**3200**	2000	1238	98.0	3183	0.44	12/07/2016
Manganese	3.0		**995**	500.0	531.6	92.7	984.0	1.13	12/07/2016

SW-846 3005A, 6010B, METALS BY ICP (TOTAL)

Batch 124503 **SampType:** MBLK Units **µg/L**

SampID: MBLK-124503

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**< 20.0**	20.00	0	0	-100	100	12/06/2016
Iron	20.0		**< 20.0**	20.00	0	0	-100	100	12/06/2016
Manganese	3.0		**< 3.0**	3.000	0	0	-100	100	12/06/2016

Batch 124503 **SampType:** LCS Units **µg/L**

SampID: LCS-124503

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**476**	500.0	0	95.1	85	115	12/06/2016
Iron	20.0		**1920**	2000	0	96.0	85	115	12/06/2016
Manganese	3.0		**480**	500.0	0	96.0	85	115	12/06/2016

Batch 124503 **SampType:** MS Units **µg/L**

SampID: 16120102-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Boron	20.0		**3410**	500.0	2803	122.0	75	125	12/06/2016
Iron	20.0		**7350**	2000	4848	124.9	75	125	12/06/2016
Manganese	3.0		**1160**	500.0	640.4	103.5	75	125	12/06/2016

Batch 124503 **SampType:** MSD Units **µg/L** RPD Limit **20**

SampID: 16120102-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Boron	20.0		**3370**	500.0	2803	112.8	3413	1.36	12/06/2016
Iron	20.0		**7210**	2000	4848	118.0	7346	1.88	12/06/2016
Manganese	3.0		**1140**	500.0	640.4	100.9	1158	1.13	12/06/2016

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower 0297751

Work Order: 16120102

Report Date: 09-Dec-16

Carrier: Employee

Received By: EEP

Completed by: Laurie Langdon
On: 02-Dec-16

Reviewed by: Michael L. Austin
On: 02-Dec-16

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **0.62**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 1 Work order # 16120102

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 0.62 °C
Preserved in: [ ] LAB [X] FIELD
FOR LAB USE ONLY
Lab Notes 12/2/16

Client Comments:

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [ ] No
Are these samples known to be hazardous? [ ] Yes [ ] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [ ] No

Project Name/Number
Grand Tower 0297751

Sample Collector's Name
M. Halley

Results Requested
[ ] Standard [ ] 1-2 Day (100% Surcharge)
[ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	B Fe Mn Dissolved	B Fe Mn Total	pH	Sulfate Dissolved	Sulfate Total	TDS Dissolved	TDS Total
	APW-3	12/1/16 0950	2	2												X	X	X	X	X	X	X	X
	APW-2	1045															X	X	X	X	X	X	X
	APW-4	1505															X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	12/2/16 0930	[signature]	12/2/16 930 AM

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client.

BottleOrder: 34626

Appendix 5

Annual Groundwater Monitoring Report, August 2018

Annual Groundwater Monitoring Report

Grand Tower Energy Center, LLC

Grand Tower, Jackson County, Illinois

09 Aug 2018

Project No.: 0297751

The business of sustainability

ERM

Draft	Draft
Name	Name
Role	Role
Date	Date

Document details

Reference	0297751
Date	09 Aug 2018
Version	DRAFT 2.0
Author	ERM
Client Name	Rockland Capital

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Document history

				ERM approval to issue		
Version	**Revision**	**Author**	**Reviewed by**	**Name**	**Date**	**Comments**
Draft	1.0	BC	ERM	DW	09 Aug 2018	Text
Draft	2.0		Rockland Cap	RR	13 Aug 2018	Text

Executive Summary

This report evaluates possible impacts related to historical operations of the coal combustion waste (CCW) ash basin located on the Grand Tower Energy Center (GTEC) facility property (Site) in Jackson County, Illinois. GTEC has reportedly produced electricity since 1951 utilizing both coal and oil fired boilers prior to converting to natural gas in 2001. While operating coal fired boilers, GTEC developed a CCW impoundment for both fly ash and bottom ash residuals. Based on plans dated 1985, the basin was expanded from an original 10-acre footprint to the current 21.7-acre footprint.

The CCW impoundment has not received CCW materials since converting to natural gas in 2001. The impoundment continues to receive low volume facility waste water, which discharges to an unnamed tributary of the Mississippi River under an active NPDES permit (NPDES Permit No. IL0000124). Subsequent to closure, the low volume waste will be diverted from the CCW basin to a treatment system within the power plant to eliminate influent sources from the basin.

The GTEC meets the definition of an inactive ash basin, and as a result, has a modified schedule regarding monitoring and reporting. In accordance with CFR 257:

1. No later than April 17, 2019, comply with groundwater monitoring requirements set forth in §§ 257.90(b) and 257.94(b); and
2. No later than August 1, 2019, prepare the initial groundwater monitoring and corrective action report as set forth in § 257.90(e).

Four monitoring wells have previously been monitored at the Site to assess groundwater quality. Eight additional monitoring wells were installed by ERM to define the hydrogeologic features of the Site and to determine if impacts from former operation of the CCW impoundment may be present in the subsurface. Collectively, these 12 monitoring wells comprise the network used to assess the potential presence of CCW constituents in the groundwater.

Eight episodes of groundwater sampling were conducted from September 2017 through February 2018 to establish background concentrations on the Site and to conduct a preliminary evaluation to determine if the CCW impoundment is impacting groundwater quality.

In accordance with 40 CFR §257.93(f), statistical methods for evaluating groundwater monitoring data for each specified constituent were utilized at the Site to establish background concentrations for parameters with no state or federal standard, to assess the statistical validity of the data, and to help establish whether exceedances to standards are related to the impoundment. Based on the statistical analyses, up to six Appendix III or IV parameters exceed background or regulatory standards. These exceedances do not impact the existing closure plans for the GTEC ash impoundment.

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Appendix Listing

Appendix A. Soil Boring Logs and Well Construction Diagrams
Appendix B. Laboratory Analytical Reports
Appendix C. Documentation of Statistical Analyses

1 Introduction

This report was produced by Environmental Resource Management, Inc. (ERM), on behalf of Grand Tower Energy Center, LLC (GTEC). This report evaluates possible impacts related to historical operations of the coal combustion waste (CCW) ash basin located on the GTEC facility property (Site) in Jackson County, Illinois. Consistent with the notification requirements of the Coal Combustion Residual Rule (40 CFR §257.94), this annual groundwater monitoring report will be posted to the Plant's operating record and notification will be made to the State of Illinois, and the report will be placed on the publicly accessible internet site within thirty days thereafter (40 CFR §257.105(h), §257.106(h), §257.107(h)).

1.1 Site History

GTEC has reportedly produced electricity since 1951 utilizing both coal and oil fired boilers prior to converting to natural gas in 2001. While operating coal fired boilers, GTEC developed a CCW impoundment for both fly ash and bottom ash residuals. Reportedly, original construction of the impoundment contained an internal divider soil berm to segregate bottom ash and fly ash residuals. The earliest plans reviewed for the basin were prepared by Sargent & Lundy dated 1969. Based on plans dated 1985, the impoundment was expanded from an original 10-acre footprint to the current 21.7-acre footprint.

The CCW impoundment has not received CCW materials since converting to natural gas in 2001. The impoundment is permitted to receive low volume facility waste water, which discharges to an unnamed tributary of the Mississippi River under an active NPDES permit (NPDES Permit No. IL0000124). The new NPDES permit allows for continued waste water discharge to the ash pond, however, since commissioning of the onsite waste water treatment (WWT) plant in Q2 2017, the low volume facility waste water has been discharged through the new outfall (BO1).

In 2009, the GTEC owner at the time, Ameren Energy Generating Company (Ameren), was requested to provide a hydrogeologic assessment report for the CCW surface impoundment in order to evaluate groundwater quality data and determine if operation of the impoundment had adversely affected groundwater. Ameren commissioned Natural Resource Technology, Inc. (NRT) to perform the assessment and report findings. The assessment began in 2010 and was completed in March 2013. A complete copy of the Phase 1 Hydrogeologic Assessment for the GTEC CCW surface impoundment was included in Appendix 1 of the January 2017 submittal prepared by ERM entitled "Application to Establish a Groundwater Management Zone."

While the assessment was ongoing, GTEC received a Violation Notice from the Illinois Environmental Protection Agency (IEPA) (Violation Notice W-2012-00062 dated June 27, 2012). This violation notice was issued due to reported exceedances of Class I groundwater standards for groundwater samples from four (4) monitoring wells installed during the hydrogeologic assessment. A copy of the Violation Notice was included in Appendix 2 of the January 2017 submittal prepared by ERM entitled "Application to Establish a Groundwater Management Zone" for reference.

Currently, GTEC is a 478 Megawatt (MW) natural gas combined cycle facility that is located in Grand Tower, Illinois adjacent to the east bank of the Mississippi River. GTEC is located on 300 acres of land and is a merchant facility, which sells energy and capacity into the Midcontinent Independent System Operator (MISO) system. The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of of Rockland Power Partners II, LP, and was purchased from Ameren in February 2014.

1.2 Regulatory Framework

The GTEC meets the definition of an inactive ash basin, and as a result, has a modified schedule regarding monitoring and reporting. In accordance with CFR 257:

3. No later than April 17, 2019, comply with groundwater monitoring requirements set forth in §§ 257.90(b) and 257.94(b); and
4. No later than August 1, 2019, prepare the initial groundwater monitoring and corrective action report as set forth in § 257.90(e).

The Federal Coal Combustion Residual (CCR) program requires the implementation of statistical analyses to provide an accurate representation of groundwater quality at the background and downgradient wells (40 CFR §257.93(a) and IEPA Title 35, Subtitle G, Chapter I, Subchapter (f) Part 742 Subparts D and E). In cases where one regulatory program provides more specific guidelines than the other, the more stringent requirements will be implemented in the approach.

United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act (RCRA) groundwater Unified Guidance (USEPA 2009) provides detailed recommendations on statistical approaches to groundwater evaluation. Whenever possible, this guidance was used to select appropriate statistical methods.

1.2.1 Federal CCR Rule

In accordance with the requirements of the CCR Rule, facility owners must develop a PE certified statistical analysis plan (StAP) that confirms that the statistical methods selected to evaluate the groundwater monitoring data are appropriate (40 CFR §257.93(f)(6)). The Rule provides a menu of options for the statistical test methods and performance criteria (40 CFR §257.93(f)-(g)); this document specifies the statistical procedures chosen and the performance standards under those sections that will be used for all groundwater monitoring reporting.

An overview of the regulatory requirements satisfied in this document are provided below.

Regulatory Citation in 40 CFR §257	Requirement (paraphrased)	Section of this Report
§257.90(e)	Status of the groundwater monitoring program.	2
§257.90(e)	Summarize key actions completed.	2.1
§257.90(e)	Describe any problems encountered.	2.3.3
§257.90(e)	Key activities for upcoming year.	5

Regulatory Citation in 40 CFR §257	Requirement (paraphrased)	Section of this Report
§257.90(e)(1)	Map, aerial image or diagram of CCR Unit and monitoring wells	Figure 1
§257.90(e)(2)	Identification of new monitoring wells installed or abandoned during the preceding year.	2.2.3
§257.90(e)(3)	Summary of groundwater data, wells sampled, date sampled, and whether sample was required under detection or assessment monitoring.	Appendix B
§257.90(e)(4)	Narrative Discussion of any transition between monitoring programs.	5

1.2.2 State Rule

Illinois currently does not have a state-lead program for the management and closure of CCW impoundment. Consequently, this report references the federal rule as the controlling regulations. However, this analysis also considers the State of Illinois Administrative Code Title 35 Environmental Protection, Subtitle G Waste Disposal, Chapter I Pollution Control Board, Subchapter F Risk Based Cleanup Objectives, Part 742 Tiered Approach to Corrective Action Objectives, Subparts D Determining Area Background and E Tier I Evaluation Regulatory guidelines of IEPA dated July 15, 2016. Groundwater protection standards are listed in Illinois Administrative Code Title 35 Environmental Protection, Subtitle F Public Water Supplies, Chapter I Pollution Control Board, Part 620 Groundwater Quality.

1.3 Objectives

The assessment monitoring program is designed to determine if the concentrations of constituents in groundwater are compliant with acceptable levels. Concentrations are considered acceptable if levels are at or below background concentrations or groundwater protection standards (GWPS), whichever is highest (40 CFR §257.95).

1.4 Document Organization

This document is organized into the following sections:

- Program Overview
- Statistical Approach
- Findings
- Next Steps

2 Program Status

The GTEC meets the definition of an inactive ash basin, and as a result, has modified schedule regarding monitoring and reporting. In accordance with CFR 257:

5. No later than April 17, 2019, comply with groundwater monitoring requirements set forth in §§ 257.90(b) and 257.94(b); and
6. No later than August 1, 2019, prepare the initial groundwater monitoring and corrective action report as set forth in § 257.90(e).

To comply with these regulations, samples were collected from the PE certified monitoring-well network from September 2017 through February 2018. The groundwater samples were collected as part of assessment monitoring under 40 CFR §257.95, based on the exceedance of some groundwater quality standards in previous monitoring events.

2.1 Summary of Key Actions Completed

Eight additional monitoring wells were installed to define the hydrogeologic features of the Site and to determine if impacts from former operation of the CCW impoundment may be present in the subsurface. These new wells supplement the four existing wells that were subject of the NRT 2013 hydrogeologic assessment. Collectively, these 12 monitoring wells comprise the network used to assess the potential presence of CCW constituents in the groundwater. It should be noted that Monitoring Well APW-1 was damaged prior to the start of these monitoring activities, and consequently replaced with a similarly-constructed well (APW-1r). The locations of these new and existing wells are shown on Figure 1.

The groundwater monitoring wells installed by ERM were subjected to aquifer testing. Based on this testing, the average hydraulic conductivity of the wells screened in the Henry Formation is about 5.4 x 10^{-3} cm/sec.

Eight episodes of groundwater sampling were conducted from September 2017 through February 2018 to establish background concentrations on the Site and to conduct a preliminary evaluation to determine if the CCW impoundment is impacting groundwater quality. Wells were sampled using low flow conditions and a submersible pump with dedicated tubing. No issues were noted during development, purging, or sampling from any of the wells. Except for one well, recharge was sufficient so that none off the wells went dry during the sampling efforts.

ERM has conducted preliminary modelling of the CCW impoundment and impacts related to closure. The groundwater quality data obtained during the field work described above will be used to update the model for final closure of the CCW impoundment.

2.2 Summary of the Well Network

The well locations and network are shown in Figure 1. ERM installed eight additional monitoring wells to help define the horizontal and vertical limits of impacts in the aquifer under the Site. Shallow and deep well clusters were placed directly downgradient of the impoundment (APW-6S and APW-6D) and on the downgradient property boundary in the direction of the Grand Tower Community Supply Well (CWS)(APW-10S and APW-10D). Additional wells (APW-5, APW-6, APW-7, and APW-8) were installed to delineate potential

impacts in the upper Henry Formation. Monitoring Well APW-9 was installed to provide a second background (generally upgradient) location relative to the impoundment. The boring and well logs for these wells are presented in Appendix A.

2.2.1 Regional Geology

The GTEC facility is located in the Mississippi Valley where Quaternary coarse-grained outwash deposits of the Henry Formation are overlain by channel and floodplain deposits of the Cahokia Formation (Berg and Kempton; 1987; Linebeck, 1979). The outwash of the Henry Formation generally consists of sands and gravels, and is a significant aquifer under the Site. Historic well logs suggest the Henry Formation ranges in thickness from 150 to 200 feet in the GTEC area. The Cahokia Formation consists primarily of overbank and modern river and stream deposits and is comprised more commonly of finer-grained silt and clay with occasional sand seams. This unit is the uppermost saturated unit under the Site. Wells on the Site are screened within the Henry Formation, which appears to be hydraulically connected to the Cahokia Formation.

2.2.2 Groundwater Flow Rate and Direction

Based on groundwater monitoring conducted previously, Wells APW-1r and APW-9 are located upgradient of the CCW surface impoundment and serve as the background groundwater quality wells for the Site. The remaining wells are located east, south and west of the CCW surface impoundment, and act as sentinel wells.

Piezometers installed by ERM into the uppermost saturated unit beneath the CCW impoundment (Cahokia Formation) were subjected to field permeability testing to determine the hydraulic conductivity of the Cahokia saturated soils under the Site. Results of this testing indicate that the mean hydraulic conductivity of the piezometers averages 5.73 ft/day or 2.0×10^{-3} cm/sec. Similar testing was conducted on the eight monitoring wells installed in the Henry Formation in 2017. The average hydraulic conductivity of the Henry Formation wells is about 5.4×10^{-3} cm/sec.

Depth to groundwater measurements were made at each monitoring well prior to each sampling event. Groundwater elevations, calculated by subtracting the depth to groundwater from the surveyed reference elevation for each well, were reviewed for each sampling event. Based on measured elevations in the wells, groundwater flow is dependent on the stage of the Mississippi River. When the river is lower, then groundwater flow is generally toward the west-southwest. When the river stage is elevated, there is an inward groundwater flow direction, generally from west to east. Maps of the potentiometric surface can be found in Figure 2.

2.2.3 Changes to the Well Network

NRT initially investigated the CCW surface impoundment between 2010 and 2013. Groundwater samples were collected on a quarterly basis for a period of two years from four monitoring wells (APW-1, APW -2, APW-3, and APW-4) surrounding the CCW surface impoundment. Well APW-1 is located upgradient of the CCW surface impoundment and serves as the background groundwater quality well for the Site. The remaining three wells are located east, south and west of the CCW surface impoundment to act as sentinel wells for detection monitoring. Locations of these wells are shown on Figure 1.

ERM performed additional groundwater sampling of onsite monitoring wells in August and December 2016. Monitoring APW-1 was replaced in April 2017 due to damage received

during mowing of grass in the area. The replacement well (APW-1r) was constructed identical to the original well, adjacent to where the original well was located.

Based on IEPA comments in June 2017, ERM installed eight additional monitoring wells, as described above. These monitoring wells and the existing four wells were sampled on eight occasions from September 2017 through February 2018 to establish background concentrations on the Site and to conduct a preliminary evaluation to determine if the CCW impoundment is impacting groundwater quality. A total of 12 wells are now present on the site.

2.3 Sampling Summary

2.3.1 Sampling Schedule

Sampling occurred approximately every three weeks starting in September 2017, as defined below and summarized in Table 1.

Sample Event No.	Dates
1	September 5-7, 2017
2	September 27-29, 2017
3	October 18-20, 2017
4	November 8-10, 2017
5	November 27-29, 2017
6	December 27-28, 2017
7	January 17-19, 2018
8	February 7-9, 2018

2.3.2 Analytes Sampled

The wells were sampled for the 40 CFR §257 Appendix III and Appendix IV analytes which include:

Appendix III	Appendix IV	
Boron	Antimony	Radium 226+228
Calcium	Arsenic	Selenium
Chloride	Barium	Thallium
Fluoride	Beryllium	
pH	Cadmium	
Sulfate	Chromium	
Total Dissolved Solids (TDS)	Cobalt	
	Lead	
	Lithium	
	Mercury	
	Molybdenum	

The samples were not field filtered, so the results for metals represent total recoverable metals.

2.3.3 Data Quality and Problems with Sampling

Sampling was conducted using a submersible pump and low flow sampling procedures. No issues were reported during sampling, with exception to APW-2. In all wells except APW-2, turbidity was minimal. At APW-2, turbidity was slightly elevated due to the dewatering of the well and subsequent recovery prior to sampling. It should be noted that a hydrogen sulphide odor was observed in a number of wells, indicating aerobic conditions in the subsurface.

Analytical results were provided by TekLab Inc. (TekLab) located in Collinsville, Illinois. Teklab is accredited through the National Environmental Laboratory Program. Procedures and analysis of samples follow USEPA requirements specified in Test Methods for Evaluating Solid Waste-SW-846 (SW-846 [USEPA, 1994]). Analytical data from each event, summarized in graphic and tabular form, is included with the laboratory reports presented in Appendix B.

ERM's data quality review found the laboratory analytical results to be valid, reliable, and useable for decision-making purposes with the listed qualifiers. No analytical results were rejected. Data quality information reviewed for these results included field sampling forms, chain-of-custody documentation, holding times, laboratory methods, cooler temperatures, laboratory method blanks, laboratory control sample recoveries, field duplicate samples, matrix spikes/matrix spike duplicates, quantitation limits, and equipment blanks. Data qualifiers were appended to results in the project database as appropriate based on laboratory quality measurements (e.g., control sample recoveries) and field quality measurements (e.g., agreement between normal and field duplicate samples).

3 Overview of Statistical Approach

40 CFR §257.93(f) specifies the acceptable statistical methods for evaluating groundwater monitoring data for each specified constituent. These include:

- A tolerance or prediction interval (TI or PI) procedure in which an interval for each constituent is established from the distribution of the background data and the level of each constituent in each compliance well is compared to the upper tolerance limit (UTL) or upper prediction limit (UPL);
- A control chart[i];
- Parametric and nonparametric analysis of variance (ANOVA) followed by multiple comparisons[ii]; or
- Another statistical method that meets the performance standards specified in 40 CFR §257.93(g).

Furthermore, the Rule states that for assessment monitoring, a GWPS must be established for all constituents (§257.95(d)(2)). In accordance with the CCR Rule and IEPA regulations (Title 35(G)(Chapter I)(f)(§742.410)(b.1.C), a UTL approach was used to establish background levels and was used as GWPS when it exceeds the regulatory standard or the regulatory standard is absent (§257.95(d)). For assessment monitoring, the USEPA Unified Guidance (2009) specifically recommends using a confidence interval or ANOVA-based approach to compare compliance wells to an established GWPS (USEPA 2009, Chapter 7 and 21).

The following sections describe the methods involved in the statistical evaluation of groundwater data, including:

1. Data handling;
2. Establishing background concentrations;
3. Selection of GWPS; and
4. Comparisons of downgradient wells to the GWPS.

An overview of the decision framework for this approach is presented in Figure 3.

3.1 Data Handling

Consistent with lab conventions, J-flagged values are estimated quantities that are observed between the method detection limit[iii] (MDL) and RL. USEPA (2014) guidance allows for J-flagged values to be used as reported concentrations. Any exceedances caused by J-flagged values will be indicated. R-flagged data fail to meet the minimum data quality control standards. The lab identifies R-flagged data as insufficiently reliable to be used in the dataset (USEPA 2014).

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[i] Control charts are an alternative to PLs in detection monitoring. They are similar to PLs in that future observations in a control chart limit are estimated from background and then compared to a sequence of compliance point measurements.

[ii] An interwell technique, designed to simultaneously compare datasets from different well locations.

[iii] The MDL may have been historically reported as the sample quantitation limit (SQL). Such values may have represented a sample-specific detection limit, rather than a quantitation limit. Nomenclature for various reported analytical limits have changed over time and must be considered in proper context.

During the data usability review, data may also be assigned a J-flag and R-flag to indicate estimated data and rejected data, respectively. Data flagged by the data reviewer as estimated will be used for statistical analysis. Data flagged by the data reviewer as unusable and rejected will be excluded from statistical analysis and decision making.

Non-detect (ND) measurements are concentrations below the MDL. In other words, data are below a certain value but it is unknown by how much. NDs are assumed to fall between zero and the MDL (USEPA 2009).

The Unified Guidance and the ProUCL Technical Guide (USEPA 2009, 2015) make numerous suggestions for ND handling for different applications that include substitution with estimated[iv] or surrogate value, or implementation of nonparametric methods when analyzing the data. Over the course of a sampling program, MDLs and RLs may vary as analytical methods improve. In this program, the minimum RL will be substituted for all RLs in the dataset for UTL calculations. This is a conservative approach to handling NDs because it:

- Avoids retention of historically high RLs in UTL calculations;
- Allows detected values above the RL to drive UTLs instead of RLs; and
- Provides a conservative (i.e., lower) UTL for wells with a higher proportion of NDs. Lower UTL are most likely to result in higher false positive errors rather than false negatives.

Consistent with Title 35(G)(Chapter I)(f)(§742.410)(b.1.A), a concentration equal to one half the detection limit was used for ND values in calculations.

3.2 Establishment of Background Concentrations

Concentrations measured in background wells are used as a basis for comparison to support decisions related to whether the regulated unit is impacting groundwater. Hence, having appropriate and representative background measurements is an essential factor in effective groundwater monitoring programs. Background levels were established for all constituents using a 95 percent confidence limit on the 95th percentile[v] (i.e., a 95/95 UTL; Title 35(G)(Chapter I)(f)(§742.410)(b.1.C).

It is presumed that background data have been obtained from wells that have undergone review, are representative of pre-waste placement conditions, have been accepted as background, and are not affected by the facility (40 CFR §257.91(c)(2).

A background dataset will be established after reviewing the statistical assumptions for UTL calculation including (USEPA 2009, chapter 17):

- Statistically independent measurements (Section Statistical Independence of 3.2.1, USEPA 2009);
- Verification of detection rates and data distributions for each dataset (Section 3.2.2, 40 CFR §257.93(g)(1);
- Accounting for possible outliers (Section 3.2.3, USEPA 2009); and

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iv USEPA ProUCL software offers several methods to estimate NDs, including (but not limited to) Kaplan-Meier estimators and Regression on Order Statistics.

v For pH, a 95 percent confidence limit on the 5th percentile (i.e., a 95/5 lower tolerance limit or LTL) will also be established.

- Temporal stationarity or check for data trends (Section 3.2.4, USEPA 2009, 40 CFR §257.93(g)(6)).

3.2.1 Statistical Independence of Measurements

A central assumption of most statistical tests is that the samples are randomly selected from a population and are statistically independent of each other. This means that the selection of one value from the population does not influence the probability of observing any other measurement in the population. The assumption of statistical independence may not be met with groundwater sampling since measurements taken close together in time may be more correlated with each other than samples taken at longer time intervals. One way to ensure statistical independence of samples is to verify that groundwater flow velocity is fast enough so that the water in a well is 'refreshed' between sampling events (USEPA 2009, Chapter 3). Based on aquifer lithology and measurements of hydraulic conductivity, ERM believes that groundwater velocities are sufficient to represent native conditions at the time of sampling.

3.2.2 Verification of Detection Rates and Data Distributions

Descriptive statistics are calculated to characterize the detection rates and data distribution for each analyte and upgradient dataset combination. Understanding the detection rate and data distribution is important for selecting the appropriate UTL calculation (40 CFR §257.93(g)(1). Additionally, for completeness, the following descriptive statistics will also be calculated:

- Number of results
- Number of detected results
- Minimum detected and ND RL[vi]
- Maximum detected and non-detected value
- Mean
- Median
- Standard deviation
- Coefficient of variation[vii]
- Data distribution[viii]

3.2.3 Check for Possible Outliers

The Unified Guidance (USEPA 2009 page 18-5 and chapter 12) specifies that UTL calculations assume that the background dataset should be screened for outliers. Statistical outliers are extreme (large or small) values within a dataset that numerically deviate a significant amount from the rest of the values, and are not representative of the population from which they are drawn (USEPA 2009). The presence of outliers may distort statistics if used in calculations. When analyzing groundwater concentrations, USEPA guidance (2009) recommends performing a careful quality check of the data to identify any anomalous values. Once found, it can be determined whether outliers represent actual extreme values or are errors as a result of (i) inconsistent or erroneous sampling and analytical methods, or (ii) transcription errors (USEPA 2009). Consistent with USEPA (2015) guidance, for the

[vi] As provided in the lab reports. As such, the minimum and maximum detection reporting limit refers to the minimum and maximum non-detected reporting limit for non-detect results

[vii] Coefficient of variation is a normalized measure of the variance of the data and is calculated by dividing the standard deviation by the mean.

[viii] Shapiro-Wilk's test is used to determine the distribution of the data. If $p > 0.05$, the data is considered normally distributed. If $p > 0.05$ on the log-transformed data, the data is considered lognormally distributed. All other cases are considered to have no discernable distribution (NDD) (USEPA 2009). The Shapiro-Wilk's test is specifically prescribed in Title 35(G)(Chapter I)(f)(§742.410)(b.1.B). For NDD wells, Anderson-Darling test was used to determine if the data is gamma distributed.

purpose of the identification of high outliers, outlier evaluations will be performed on detected data only using both statistical and visual techniques.

Statistical Outlier Testing

Statistical outiler tests were performed using Dixon's test for datasets with fewer than 25 values and Rosner's test for datasets with 25 or more values (USEPA 2015). When the data distribution is normal, statistical outlier testing is performed on untransformed data. When data are lognormally distributed, data is log-transformed before the outlier test is conducted to meet the assumption of normality of the test (USEPA 2009, 2015). Data with no discernible distribution (NDD) had outlier tests conducted on both untransformed and log-transformed data. A data point is considered a statistical outlier if it is found in the upper tail of the distribution and is significant at a significance level (α) of 0.05.

Visual Outlier Assessment

A useful visual assessment is to graph the data as a quantile-quantile probability plot (QQ plot[ix]). Probability plots can also indicate the presence of possible outlier values that do not follow the basic pattern of the data and can show the presence of significant positive or negative skewness (USEPA 2009). When viewing QQ plots, data points in the upper tail that fall above of the 95 percent confidence limits are considered potential visual outliers. As with the statistical outlier testing, data will be transformed as needed before visual outliers are identified.

Decision Framework for the Inclusion/Exclusion of Outlier Value

Consistent with guidance (USEPA 2009) and standard practices, statistical methods alone (e.g., Dixon's Test or Rosner's test) should not determine the exclusion of a statistical outlier. In consultation with the project's hydrogeologist, data points will be considered for exclusion if they meet the following visual and statistical criteria:

- For normally distributed data, a data point was identified as a visual *and* statistical outlier using raw, untransformed data;
- For lognormally distributed data, a data point was identified as a visual *and* statistical outlier using log-transformed data; and
- For NDD data, a data point identified as a visual *and* statistical outlier using *either* untransformed *or* log-transformed data.

An outlier will not be excluded if it is ND or if the dataset has fewer than five detected values. Though statistical outlier testing is not considered reliable with fewer than eight values, the datasets collected at this time are too small to consistently meet this data quality criteria.

3.2.4 Check for Temporal Stationarity

To properly calculate UTLs for background datasets, the data must meet the assumption of temporal stationarity, namely that the mean and variance in the data are constant over the time (USEPA 2009). The CCR Rule (40 CFR §257.93(g)(6)) requires trends in the background data to be examined and, when present, accounted for (adjusted) with a correction factor or truncation of unrepresentative historical values before a UTL is calculated.

[ix] QQ plots will be generated using the `qqPlot()` function in R (found in the `car` library (https://cran.r-project.org/web/packages/car/car.pdf))

Background datasets were plotted on time series plots[x] to visually assess changes in concentrations over time. If detection rates exceeded 50 percent, a Mann Kendall test was used to test for significant trends. The Mann Kendall Test is a non-parametric method that tests the following null hypothesis (USEPA 2009):

- Null Hypothesis (H_0): No monotonic trend exists.
- Alternative Hypothesis (H_A): A monotonic trend exists.

Significantly increasing or decreasing trends (τ) are identified at a significance level (α) of less than or equal to 0.05. If a significant increasing or decreasing trend is detected[xi], a UTL was calculated around a trend line (see Section 3.2.5). In cases where historical data is unrepresentative of current conditions, truncation of the dataset was considered on a case-by-case basis as long as the dataset continued to meet minimum data requirements.

3.2.5 Calculating UTLs

A tolerance interval is a concentration range designed to contain a pre-specified proportion of the underlying population from which the statistical sample is drawn (e.g., 95 percent of all possible population measurements). Background observations should rarely exceed the upper tolerance limit. Similarly, if compliance point measurements are unimpacted and are representative of background conditions, they should also rarely exceed the UTL. The UTL thus gauges whether concentration measurements sampled from compliance point wells are extreme relative to background (USEPA 2009, Chapter 17).

For normally distributed data without temporal trends, the tolerance limit can be calculated as follows (USEPA 2009 and Title 35(G)(Chapter I)(f)(§742.410)(b.1.C)):

$$TL = \bar{x} * \kappa(n, \gamma, 1 - \alpha) * s$$

Where:

$\bar{x}$ = Population mean

s = Population standard deviation

$\kappa(n, \gamma, 1 - \alpha)$ = One sided normal tolerance factor associated with a sample size (*n*), coverage coefficient of γ and a confidence level of 1-α[xii].

Consistent with conventional statistical practice, UTLs were constructed with 95 percent confidence and 95 percent coverage. The following sections describe the various approaches for developing UTLs for wells with different data characteristics. UTLs were all constructed using R statistical programming software (URL http://www.R-project.org/ and the `tolerance`[xiii] package) using protocols that follow USEPA guidance (USEPA 2015, 2009).

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x Scatterplots will be generated using the RL for easy identification of wells and analytes with varying RLs throughout the lifetime of the monitoring.

xi In cases where more than 50 percent of the data is ND, the trend will be visually assessed.

xii The coverage coefficient will be set to 0.95 and a confidence level set to 95 percent.

xiii https://www.jstatsoft.org/article/view/v036i05/v36i05.pdf

Developing UTLs when Background Datasets do not Meet Minimum Test Requirements

When datasets are small (i.e., eight or fewer detects) and/or have low detection rates (< 50 percent detected), accurately estimating population parameters becomes difficult to do with a reasonable level of confidence (USEPA 2015). IEPA administrative code specifies that when datasets are small, the maximum value should be used *in lieu* of a UTL (Title 35(G)(Chapter I)(f)(§742.410)(b.1.D))[xiv]. This is consistent with a non-parametric UTL calculation recommended elsewhere in guidance (USEPA 2015). UTLs based on maximum values, however, fail to have the specified performance criteria or population coverage (USEPA 2015).

Methods for Calculating UTLs for Static Data

One of the basic requirements for UTL calculation is that the background data exhibit stationary concentrations over time (USEPA 2009, Chapter 17). UTLs for wells without significant temporal trends (i.e., static data, see section 3.3.3 for testing for trends) were calculated with methods that account for the data distribution and are consistent with USEPA (2009) guidance.

UTLs were calculated using the recommended untransformed or log-transformed data and ND handling. When data follow a normal or transformed-normal distribution and detection rates were at least 85 percent, parametric prediction limits were constructed. Nonparametric prediction limits were constructed on data sets with greater than 15 percent NDs, datasets with fewer than eight detected values, or when data do not follow a transformed normal distribution[xv].

Methods for Calculating UTLS for Dynamic Data

When the background dataset exhibits concentrations that change temporally, a static UTL calculation can lead to a substantial overestimation or underestimation of background conditions (USEPA 2009). Therefore, a tolerance limit on the trend line was calculated for wells that had significant trends using the `tolerance` package in R and an adaptation of a protocol specified in Appendix C of the Unified Guidance (USEPA 2009).

3.3 Selecting a Groundwater Protection Standard (GWPS)

Groundwater protection standards (GWPS) are values against which compliance wells are compared to determine if downgradient wells exceed allowable limits. GWPS can be values established by state or federal agencies as maximum contaminant levels (MCLs) or background threshold values (BTV) such as a UTL. The preamble to the CCR Rule states (40 CFR Preamble Section IV(K)(5)):

"For each …constituent that is detected, a groundwater protection standard must be set. The groundwater protection standards must be the MCL or the background concentration level for the detected constituent, whichever is higher. If there is no MCL promulgated for a detected constituent, then the groundwater protection standard must be set at background"

For this assessment monitoring program, the IEPA[xvi] provides the following MCLs which are wholly consistent with USEPA MCLs:

[xiv] IEPA regulations specify that the maximum value should be used when sample sizes are below 10; however, CCR datasets are only required to have eight samples during the first round of reporting. Since Federal CCR regulations and USEPA recommend the implementation of UTLs relaxed sample size criteria have been used for UTL calculations. UTLs were calculated as long as there were at least 5 detected values. This minimum requirement may be increased as additional data are collected.

[xvi] Title 35: Environmental Protection Subtitle F Chapter I Part 620 Groundwater Quality

Analyte	Concentration (mg/L)
Antimony	0.006
Arsenic	0.05
Barium	2
Beryllium	0.004
Boron	2
Cadmium	0.005
Chloride	200
Chromium	0.1
Cobalt	1
Fluoride	4
Lead	0.0075
Lithium	0.04[xvii]
Mercury	0.002
Molybdenum	0.1[xvii]
pH	>6.5, <9.5
Radium 226	20 pCi/L
Radium 228	20 pCi/L
Selenium	0.05
Sulfate	400
Thallium	0.002
Total Dissolved Solids	1,200

Calcium has no agency standard for groundwater and the UTL from background concentrations will be used as a BTV.

The GWPS selected for each constituent will be the maximum of either the BTV or the MCLs listed above (§257.95(h)).

3.4 Comparisons to Downgradient Wells

Compliance testing during assessment monitoring requires that each well and analyte is tested against a GWPS to determine if it is in exceedance. Groundwater concentrations are

[xvii] The Illinois EPA does not specify a groundwater standard for this analyte, so the USEPA MCL will be used

presumed not to exceed the fixed standard unless the sampling data from one or more well constituents indicates otherwise. Once a positive determination has been made for at least one compliance well constituent, the facility is subject to corrective action requirements under §257.95-6 (USEPA 2009).

USEPA Guidance (USEPA 2009) describes a confidence interval (CI) as a flexible and statistically accurate method for comparing concentrations from a single well to a fixed GWPS. A CI around the mean is designed to estimate the true average of the underlying population, while at the same time, accounting for variability in the sampling data (USEPA 2009).The hypotheses to be tested can thus be constructed as follows:

H_o: The average or median concentration in the compliance well is not above the GWPS

H_A: The average or median concentration in the compliance well exceeds the GWPS

Guidance recommends using the lower confidence limit (LCL) of the mean to evaluate the above hypotheses so that the compliance standard has only been violated when the LCL is above the GWPS.

While it is possible to construct a CI for each analyte in each compliance well, the decision framework around selecting the appropriate method for performing this calculation is complex and time consuming to implement (see USEPA 2015 and ProUCL software for details). Additionally, confidence interval comparisons are not among the methods explicitly listed in §257.93(f) (see Section 3).

A comparable method that is included in §257.93(f) is a parametric or non-parametric analysis of variance (ANOVA) approach. A one-sided Wilcoxon Rank Sum (WRS) test[xviii, xix] was used to compare the median of each compliance well-analyte pair to the GWPS. The confidence level of the test was set to 95 percent so that a well-analyte pair is determined to be in violation (i.e., the H_A is accepted) if we are 95 percent confident that the LCL of the median is above the GWPS.

[xviii] WRS is a simplified non-parametric ANOVA and is equivalent to a non-parametric ANOVA when only two groups are compared

[xix] Implementation of WRS is fast and easy compared to parametric calculations of confidence intervals since it can be executed on any data distribution and performs well with non-detected values. WRS is thus applicable to most analyte-well combinations. The power of non-parametric tests is generally comparable to that of parametric tests (Helsel 2002)

4 Results of Statistical Analysis

4.1 Establishing Background Concentrations

When evaluating the concentrations of analytes in groundwater, USEPA guidance (2009) recommends performing a careful quality check of the data to identify any anomalies. In addition to the data validation that was performed (discussed above in Section 2.3.3), descriptive statistics, outlier testing, and checking for temporal stationarity were completed to finalize the background dataset (the supporting documentation is found in Appendix C and discussed below).

4.1.1 Statistical Independence of Measurements

The groundwater velocity at GTEC was estimated at about 5.0 x 10^{-3} cm/sec in both the Cahokia and Henry Formation wells. A sampling interval of three weeks would allow sufficient groundwater movement for samples to be statistically independent of each other.

4.1.2 Verification of Detection Rates and Data Distributions

Descriptive statistics were calculated for the background wells for all analytes (Table 2). The descriptive statistics highlight a number of relevant characteristics about the background well including:

- There are a total of 21 analytes in the each of the two background wells: APW-1R and APW-9.
- 26 well-analyte pairs have detection rates greater than or equal to 50 percent.
- 23 well-analyte pairs have 100 percent detects.
- 19 well-analyte pairs follow a normal distribution (using Shapiro-Wilks Normality Test) and two well-analyte pairs follow a log-normal distribution. Three well-analyte pairs follow a gamma distribution, with the remaining 18 well-analyte pairs having no discernible distribution (not enough detected values to use the Anderson-Darling Test).

Although the eight detected values is commonly used as the minimum data requirements, this report uses five detected values as the cutoff for all of the statistical tests. The sample size requirements have been relaxed to allow for the analysis of most datasets at this stage of the monitoring program, while the sample sizes are still small. As additional samples are collected and the datasets updated, the minimum requirement will be increased.

4.1.3 Checking for Potential Outliers

As discussed in Section 3.2.3, both statistical and visual outlier tests were performed on the background dataset. Three data points were identified as both statistical and visual outliers (Table 3 and and QQ Plots of Upgradient Wells in Appendix C):

- Arsenic in sample APW-9-20170905, 0.0031 mg/L;
- Chloride in sample APW-9-20180208, 768 mg/L; and
- TDS in sample APW-9-20180208, 3380 mg/L.

While these values were all flagged as outliers, upper tolerance limit (UTL) calculations that include them did not result in values larger than groundwater protection standards. Thus, these values were not removed from subsequent calculations.

4.1.4 Checking for Temporal Stability

A trend test was calculated for all detected values in the background dataset as long as they had at least five detected data points and at least 50 percent detection rate. A summary of the Mann Kendall trend test results and time series plots can be found in Table 4 and the Timeseries of Upgradient Wells in Appendix C). The following summarizes the results of the trend analysis:

- 25 out of 42 well-analyte pairs met the data requirements of the trend test.
- No well-analyte pairs had significantly increasing trends (i.e., all concentrations were either decreasing or stable over time).

4.2 Selecting a Groundwater Protection Standard (GWPS)

UTLs were calculated for the 42 well-analyte following the procedures specified in Section 3.2.5 and are provided in Table 5.

The maximum of either the calculated UTL or the agency standard was chosen for each analyte to be used as a screen value for downgradient wells (Table 6).

- The IEPA MCL was used as the GWPS for all analytes that had a standard including antimony, arsenic, barium, beryllium, boron, cadmium, chloride, chromium, cobalt, fluoride, lead, mercury, pH, selenium, sulfate, thallium, and TDS.
- The USEPA MCL was used as the GWPS for lithium and molybdenum.
- The lower limit for pH used the BTV as the GWPS, as it was lower than the IEPA MCL (6.222 and 6.5 standard units (SU), respectively).
- Calcium used the BTV as the GWPS, as they did not have any agency standard.

4.3 Comparison to Downgradient Wells

A one-sided WRS was run to compare each downgradient well to the selected GWPS. A full output and display can be found in Table 7 and the Boxplots of Downgradient Wells in Appendix C. The following analytes and wells were above the GWPS:

- Arsenic in well APW-10S;
- Boron in well APW-2, APW-3, APW-5, APW-6D, and APW-6S;
- Calcium in well APW-10D, APW-10S, APW-2, APW-5, and APW-7;
- Lithium in well APW-2 and APW-4;
- Molybdenum in well APW-2, APW-5, and APW-6S; and
- Sulfate in well APW-2.

The presence of arsenic at APW-10S is not believed to be related to the impoundment on the Site due to its location and the lack of exceedances at wells located between the impoundment and the APW-10S well.

5 Key Future Activities

The results of the statistical analyses confirm what was indicated by the NRT hydrogeologic assessment in 2013, which is that groundwater quality is impacted by the existing inactive coal ash basin. Based on these detections, the inactive ash basin is subject to closure. As described previously, GTEC has initiated closure of this inactive ash basin. This data will be used to update the groundwater flow and mass transport model for the site, with specific regard to the impact of the planned consolidation and cap alternative. ERM will submit a revised GMZ application to address these statistical findings and to address IEPA comments from their June 6, 2017 letter to Rockland Capital.

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Appendix B. Laboratory Analytical Reports
Appendix C. Documentation of Statistical Analyses
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Timeseries of Upgradient Wells
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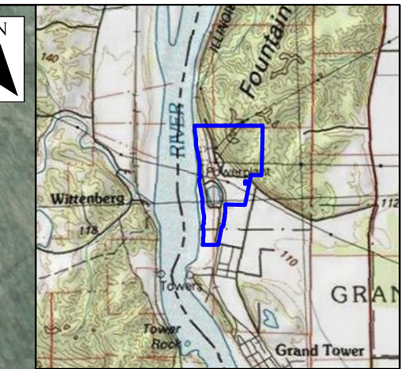

Legend

- Parcels
- Site
- Right of Way
- Inactive Ash Basin
- Boring
- Piezometer
- Shallow Well
- Deep Well

Figure 1
Aerial Map of the Site with Monitoring Well Locations
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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FILE: P:\Projects\0297751 Rockland Capital Fly Ash Impoundment Closure.DW\2016 Model\GIS\MXD\StatsReport\F1_SM.mxd, REVISED: 08/08/2018 , SCALE: 1:6,000 when printed at 11x17

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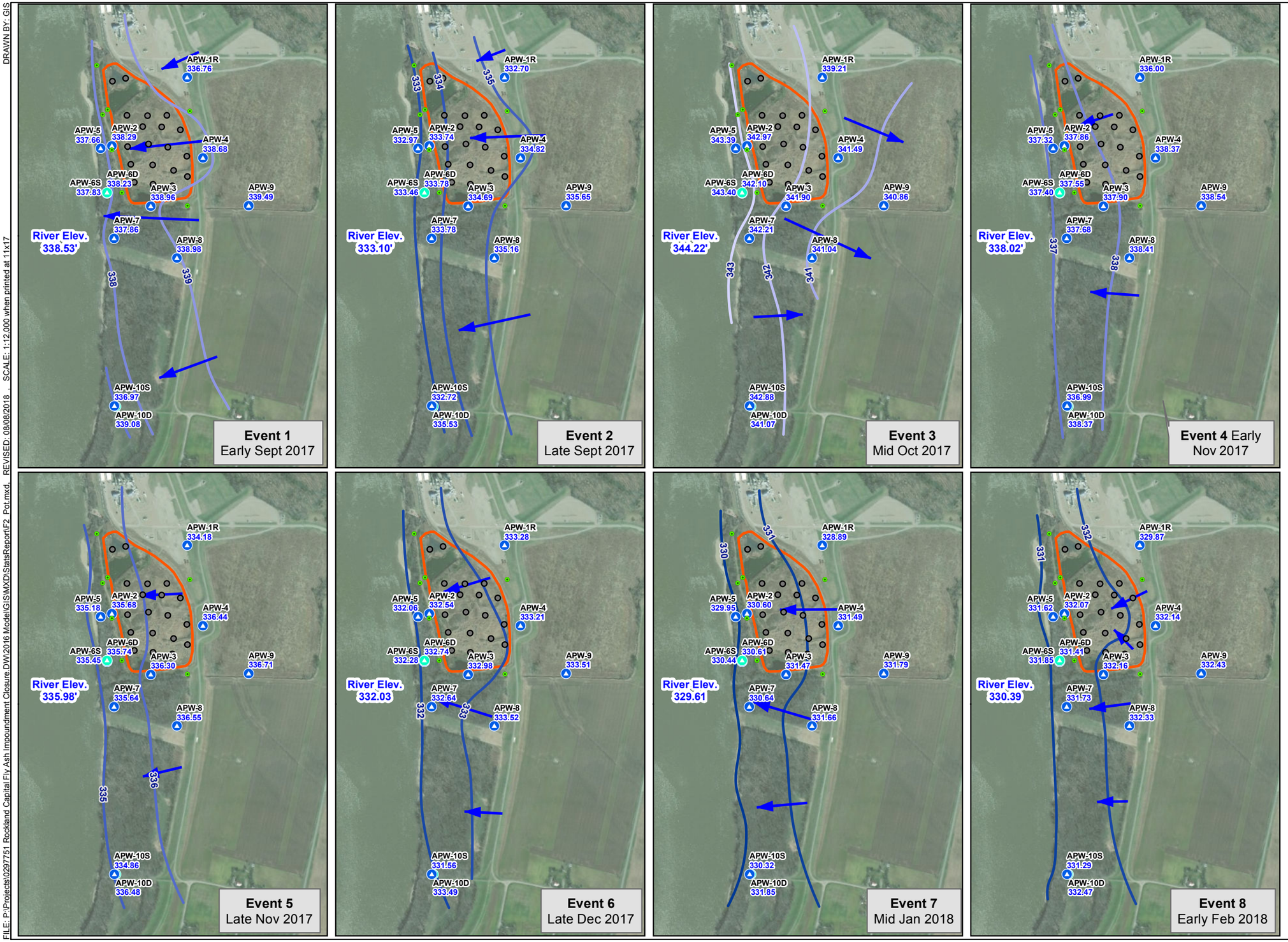

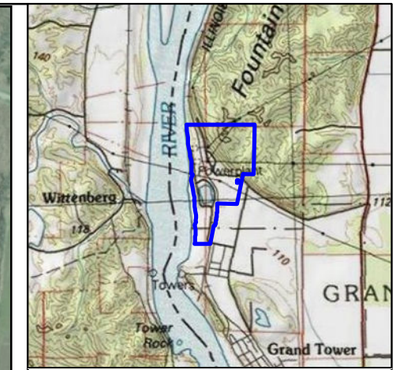

Legend

- Inactive Ash Basin
- Boring
- Piezometer
- Shallow Well
- Deep Well

Potentiometric Surface Elevation

- 343
- 342
- 341
- 339
- 338
- 337
- 336
- 335
- 334
- 333
- 332
- 331
- 330

Groundwater Flow Direction

(Approximate)

N

0 500 1,000 Feet

Figure 2
Map with Potentiometric Surface Contours

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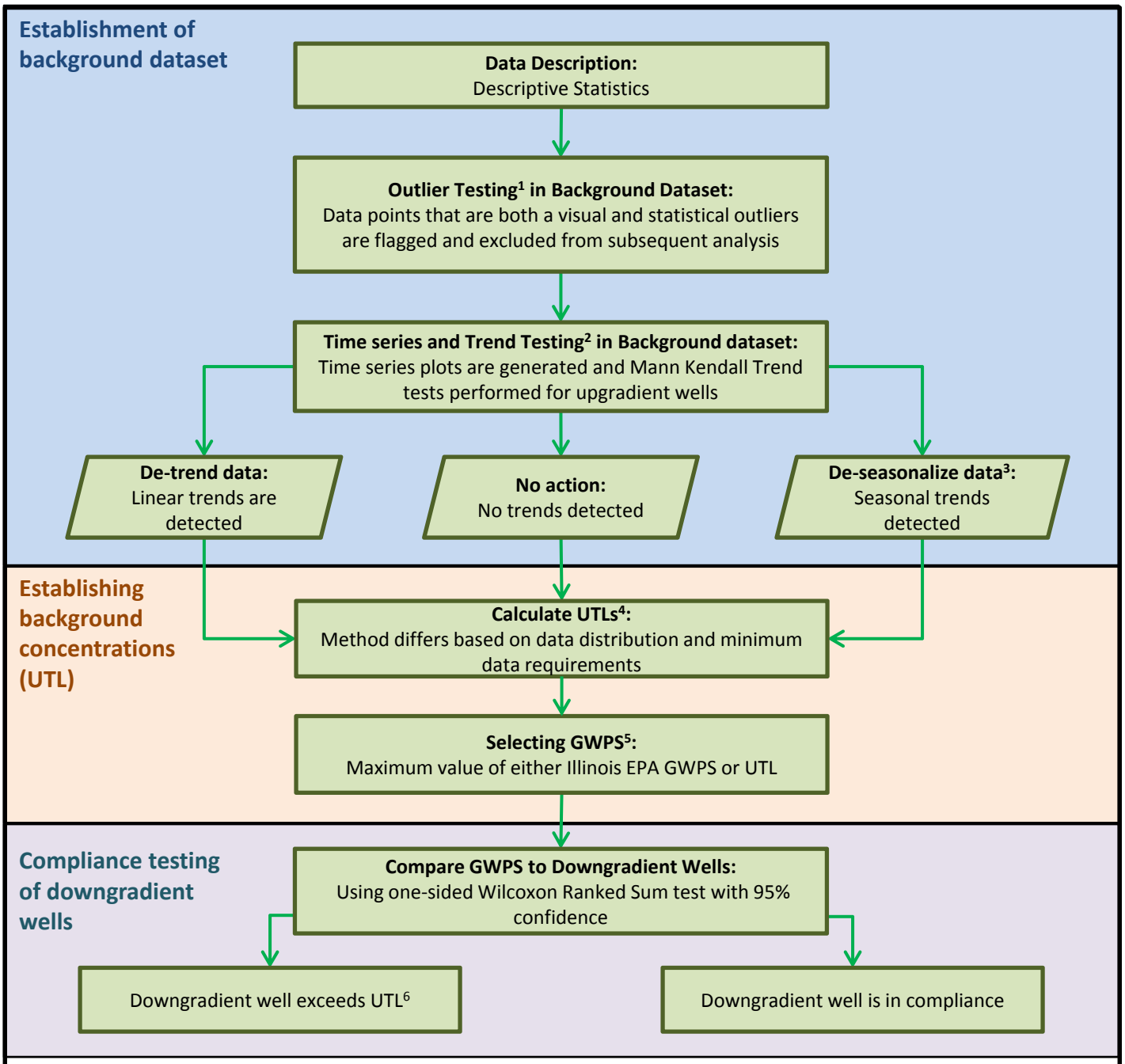


[1]Test each upgradient dataset for outliers using Dixon's test if number of data points (N) is < 25 and Rosner's test if N ≥ 25. Data points with outlier test results with $p < 0.05$, as well as visual outliers (using QQ plots) are excluded from subsequent analysis.

[2]For linear trend testing using Mann Kendall test, $p<0.05$ indicates a significant trend while $p \geq 0.05$ indicates no trend. Testing for seasonality requires at least three years of data and a seasonal Mann Kendall test.

[3]A minimum of five years of data are needed to perform season al trend tests

[4]UTLs are calculated with 95% confidence and 95% coverage. Calculation method differs per upgradient well and analyte, and is determined by the data distribution and whether the minimum data requirements are met.

[5]The GWPS can be values established by state or federal agencies as maximum contaminant levels (MCL) or background threshold values (BTV) such as a UTL. CCR Rule §257.95(h) indicates that the GWPS selected for each constituent will be the maximum of either the BTV or the MCL.

[6]Exceedances will result in continued monitoring throughout the closure process

ERM	Decision Framework Grand Tower Energy Center Jackson County, Illinois	Figure **3**

Table 1
Sample Dates and Wells
Grand Tower

Well	APW-1R	APW-9	APW-10D	APW-10S	APW-2	APW-3	APW-4	APW-5	APW-6D	APW-6S	APW-7	APW-8
Gradient	Up	Up	Down	Down	Down	Down	Down	Down	Down	Down	Down	Down
Date												
9/5/2017	X	X										
9/6/2017					X	X		X	X	X		
9/7/2017			X	X							X	X
9/8/2017							X					
9/27/2017	X	X	X	X								
9/28/2017					X			X	X	X	X	X
9/29/2017						X	X					
10/18/2017	X	X										X
10/19/2017			X	X			X	X	X	X	X	
10/20/2017					X	X						
11/8/2017	X	X					X					X
11/9/2017			X	X	X	X		X	X	X	X	
11/10/2017						X						
11/27/2017	X	X										X
11/28/2017			X	X			X		X	X	X	
11/29/2017					X	X		X				
12/27/2017					X			X	X	X	X	X
12/28/2017	X	X	X	X		X	X					
1/17/2018	X	X										X
1/18/2018			X	X				X	X	X	X	
1/19/2018					X	X	X					
2/7/2018	X				X			X				
2/8/2018		X				X	X		X	X	X	X
2/9/2018			X	X								
Total	8	8	8	8	8	9	8	8	8	8	8	8

Table 2
Descriptive Statistics for Background Wells
Grand Tower

Analyte	Well	Units	N	Num Detects	Percent Detects	Min ND	Max ND	Min Detect	Median	Mean	Max Detect	SD	CV	Distribution
Antimony	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Antimony	APW-9	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Arsenic	APW-1R	mg/L	8	6	75%	0.001	0.001	0.0011	0.0011	0.000988	0.0012	0.000304	31%	NDD
Arsenic	APW-9	mg/L	8	8	100%			0.0018	0.0022	0.00224	0.0031	0.000393	18%	Normal
Barium	APW-1R	mg/L	8	8	100%			0.165	0.177	0.177	0.193	0.00888	5%	Normal
Barium	APW-9	mg/L	8	8	100%			0.118	0.131	0.145	0.227	0.0371	26%	GammaHW
Beryllium	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Beryllium	APW-9	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Boron	APW-1R	mg/L	8	8	100%			0.211	0.244	0.268	0.357	0.0564	21%	Normal
Boron	APW-9	mg/L	8	8	100%			0.255	0.538	0.544	0.877	0.225	41%	Normal
Cadmium	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Cadmium	APW-9	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Calcium	APW-1R	mg/L	8	8	100%			84.3	89.6	89.6	97.1	4.28	5%	Normal
Calcium	APW-9	mg/L	8	8	100%			76.5	83.6	83.6	92	4.65	6%	Normal
Chloride	APW-1R	mg/L	8	3	38%	5	5	9	2.5	5.31	11	3.92	74%	NDD
Chloride	APW-9	mg/L	8	8	100%			13	13	107	768	267	249%	GammaHW
Chromium	APW-1R	mg/L	8	6	75%	0.001	0.001	0.0015	0.00165	0.00169	0.0033	0.00093	55%	Normal
Chromium	APW-9	mg/L	8	4	50%	0.001	0.001	0.0011	0.0008	0.0027	0.0148	0.00493	182%	NDD
Cobalt	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Cobalt	APW-9	mg/L	8	2	25%	0.001	0.001	0.0014	0.0005	0.000938	0.0031	0.000929	99%	NDD
Fluoride	APW-1R	mg/L	8	8	100%			0.12	0.155	0.154	0.18	0.0185	12%	Normal
Fluoride	APW-9	mg/L	8	8	100%			0.19	0.2	0.204	0.22	0.0119	6%	Normal
Lead	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Lead	APW-9	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Lithium	APW-1R	mg/L	8	8	100%			0.0155	0.0174	0.0171	0.018	0.000996	6%	Normal
Lithium	APW-9	mg/L	8	8	100%			0.0148	0.0173	0.0168	0.018	0.00111	7%	Normal
Mercury	APW-1R	mg/L	8	0	0%	0.0002	0.0002		0.0001	0.0001		0	0%	NDD
Mercury	APW-9	mg/L	8	0	0%	0.0002	0.0002		0.0001	0.0001		0	0%	NDD
Molybdenum	APW-1R	mg/L	8	0	0%	0.001	0.001		0.0005	0.0005		0	0%	NDD
Molybdenum	APW-9	mg/L	8	8	100%			0.0223	0.0246	0.0256	0.0327	0.0039	15%	Lognormal
pH	APW-1R	SU	8	8	100%			6.41	6.52	6.54	6.69	0.101	2%	Normal
pH	APW-9	SU	8	8	100%			7.11	7.23	7.24	7.35	0.0761	1%	Normal
Radium 226+228	APW-1R	pCi/L	8	8	100%			0.22	0.58	0.791	2.54	0.752	95%	Lognormal
Radium 226+228	APW-9	pCi/L	8	8	100%			0.275	0.665	0.728	1.2	0.351	48%	Normal
Selenium	APW-1R	mg/L	8	8	100%			0.0034	0.004	0.00392	0.0044	0.000296	8%	Normal
Selenium	APW-9	mg/L	8	8	100%			0.0126	0.0141	0.0148	0.0186	0.00201	14%	Normal
Sulfate	APW-1R	mg/L	8	8	100%			41	65	66	88	15.3	23%	Normal
Sulfate	APW-9	mg/L	8	8	100%			25	48.5	46.9	65	14.9	32%	Normal
TDS	APW-1R	mg/L	8	8	100%			358	406	409	474	36.4	9%	Normal
TDS	APW-9	mg/L	8	8	100%			278	365	728	3380	1070	147%	GammaHW
Thallium	APW-1R	mg/L	8	1	13%	0.001	0.001	0.0014	0.0005	0.000612	0.0014	0.000318	52%	NDD
Thallium	APW-9	mg/L	8	1	13%	0.001	0.001	0.001	0.0005	0.000563	0.001	0.000177	31%	NDD

Notes
mg/L: milligrams per liter
SU: Standard units
TDS: Total dissolved solids
N: number of data points
Min ND: The minimum non-detected value
Max ND: The maximum non-detected value
SD: Standard Deviation
CV: Coefficient of Variation (standard deviation divided by the mean)
Normal: the data fit a normal distribution
Lognormal: the data fit a lognormal distribution
NDD: No discernible distribution
GammaHW or GammaWH: the data fit one of the particular gamma distributions

Table 3
Potential Outliers in Background Wells
Grand Tower

Well	Sample	Date	Analyte	Units	Concentration	Distribution	Statistical Outlier	Visual Outlier	Normal Outlier	Log Statistical Outlier	Log Visual Outlier	Lognormal Outlier	Statistical and Visual Outlier	Notes	Final Outlier Determination
APW-1R	APW-1R-20170927	9/27/2017	Arsenic	mg/L	0.0012	NDD	X			X					
APW-1R	APW-1R_20171108	11/8/2017	Arsenic	mg/L	0.0012	NDD	X			X					
APW-9	APW-9-20170905	9/5/2017	Arsenic	mg/L	0.0031	Normal	X	X	X		X		0	Retained as it did not result in UTL exceed IEPA Class I GWPS	Retain
APW-9	APW-9-20170905	9/5/2017	Barium	mg/L	0.227	GammaHW		X			X				
APW-9	APW-9-20170927	9/27/2017	Barium	mg/L	0.171	GammaHW		X			X				
APW-9	APW-9-20180208	2/8/2018	Chloride	mg/L	768	GammaHW	X	X	X	X	X	X	0	Retained as it did not result in UTL exceed IEPA Class I GWPS	Retain
APW-1R	APW-1R_20171018	10/18/2017	Chromium	mg/L	0.0033	Normal		X							
APW-9	APW-9-20180117	1/17/2018	Fluoride	mg/L	0.22	Normal	X			X					
APW-9	APW-9_20171018	10/18/2017	Molybdenum	mg/L	0.0327	Lognormal		X							
APW-9	APW-9_20171108	11/8/2017	Molybdenum	mg/L	0.0303	Lognormal		X							
APW-1R	APW-1R-20170905	9/5/2017	Radium 226+228	pCi/L	2.54	Lognormal	X	X	X		X				
APW-9	APW-9_20171018	10/18/2017	Selenium	mg/L	0.017	Normal		X			X				
APW-9	APW-9_20171108	11/8/2017	Selenium	mg/L	0.0186	Normal		X			X				
APW-9	APW-9-20180208	2/8/2018	TDS	mg/L	3380	GammaHW	X	X	X	X	X	X	0	Retained as it did not result in UTL exceed IEPA Class I GWPS	Retain

Notes
NDD: No Discernible Distribution
SU: Standard units
mg/L: milligrams per liter
Outlier tests were performed on detected data only.
Statistical outliers were determined using a Dixon's test for N < 25 and with Rosner's test for N > 25.
Visual outliers were identified if they fall above the confidence envelope on the QQ plot.
Data points were considered potential outliers if they were both statistical and visual outliers.
NDD wells had data points considered as potential outliers if they were either a normal or lognormal outlier.
[Blank] data distribution indicates that the well data did not have enough detected data points for outlier analysis.
Lognormally distributed data was first log-transformed before visual and statistical outlier tests were performed.
Normal data distribution indicates that the well data was directly used for statistical and visual outlier tests.
NDD indicates that the both untransformed and transformed data were examined with statistical and visual outlier tests.
0 indicates that the data point was a statistical and visual outlier but was retained after review by the hydrogeologist

Table 4
Mann Kendall Test for Trends in Background Wells
Grand Tower

Analyte	Well	N	Num Detects	Percent Detects	p-value	tau	Conclusion
Antimony	APW-1R	8	0	0%			Insufficient Data
Antimony	APW-9	8	0	0%			Insufficient Data
Arsenic	APW-1R	8	6	75%	0.233	-0.371	Stable, No Trend
Arsenic	APW-9	8	8	100%	0.441	-0.231	Stable, No Trend
Barium	APW-1R	8	8	100%	0.399	0.286	Stable, No Trend
Barium	APW-9	8	8	100%	0.262	-0.327	Stable, No Trend
Beryllium	APW-1R	8	0	0%			Insufficient Data
Beryllium	APW-9	8	0	0%			Insufficient Data
Boron	APW-1R	8	8	100%	0.179	0.429	Stable, No Trend
Boron	APW-9	8	8	100%	0.00551	-0.786	Decreasing Trend
Cadmium	APW-1R	8	0	0%			Insufficient Data
Cadmium	APW-9	8	0	0%			Insufficient Data
Calcium	APW-1R	8	8	100%	0.548	0.214	Stable, No Trend
Calcium	APW-9	8	8	100%	0.905	-0.0714	Stable, No Trend
Chloride	APW-1R	8	3	38%			Insufficient Data
Chloride	APW-9	8	8	100%	0.127	0.5	Stable, No Trend
Chromium	APW-1R	8	6	75%	0.209	-0.371	Stable, No Trend
Chromium	APW-9	8	4	50%			Insufficient Data
Cobalt	APW-1R	8	0	0%			Insufficient Data
Cobalt	APW-9	8	2	25%			Insufficient Data
Fluoride	APW-1R	8	8	100%	0.615	0.148	Stable, No Trend
Fluoride	APW-9	8	8	100%	0.698	-0.118	Stable, No Trend
Lead	APW-1R	8	0	0%			Insufficient Data
Lead	APW-9	8	0	0%			Insufficient Data
Lithium	APW-1R	8	8	100%	0.708	-0.109	Stable, No Trend
Lithium	APW-9	8	8	100%	0.034	-0.618	Decreasing Trend
Mercury	APW-1R	8	0	0%			Insufficient Data
Mercury	APW-9	8	0	0%			Insufficient Data
Molybdenum	APW-1R	8	0	0%			Insufficient Data
Molybdenum	APW-9	8	8	100%	0.262	-0.327	Stable, No Trend
pH	APW-1R	8	8	100%	0.179	0.429	Stable, No Trend
pH	APW-9	8	8	100%	0.262	0.327	Stable, No Trend
Radium 226+228	APW-1R	8	8	100%	0.179	-0.429	Stable, No Trend
Radium 226+228	APW-9	8	8	100%	0.548	-0.214	Stable, No Trend
Selenium	APW-1R	8	8	100%	0.899	-0.0378	Stable, No Trend
Selenium	APW-9	8	8	100%	0.905	0.0714	Stable, No Trend
Sulfate	APW-1R	8	8	100%	0.0615	0.546	Stable, No Trend
Sulfate	APW-9	8	8	100%	0.0178	-0.691	Decreasing Trend
TDS	APW-1R	8	8	100%	0.72	0.143	Stable, No Trend
TDS	APW-9	8	8	100%	0.72	0.143	Stable, No Trend
Thallium	APW-1R	8	1	13%			Insufficient Data
Thallium	APW-9	8	1	13%			Insufficient Data

Notes
TDS: Total dissolved solids
N: number of data points
tau: Kendall's tau statistic
p-value: A two-sided p-value describing the probability of the H0 being true (a=0.05)
Trend tests were performed only if the upgradient dataset met the minium data quality criteria (>=5 detected values an

Table 5
Calculated UTLs for Background Datasets
Grand Tower

Analyte	Well	Unit	N	Percent Detect	LTL	LTL Notes	UTL	UTL Notes
Antimony	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Antimony	APW-9	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Arsenic	APW-1R	mg/L	8	75%			0.0012	95/0 NP Binomial UTL
Arsenic	APW-9	mg/L	8	100%			0.003489	Normal 95% UTL
Barium	APW-1R	mg/L	8	100%			0.2049	Normal 95% UTL
Barium	APW-9	mg/L	8	100%			0.133	95/0 NP Binomial UTL
Beryllium	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Beryllium	APW-9	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Boron	APW-1R	mg/L	8	100%			0.4473	Normal 95% UTL
Boron	APW-9	mg/L	8	100%			0.682	Detrended 95/95 UTL
Cadmium	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Cadmium	APW-9	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Calcium	APW-1R	mg/L	8	100%			103.2	Normal 95% UTL
Calcium	APW-9	mg/L	8	100%			98.44	Normal 95% UTL
Chloride	APW-1R	mg/L	8	38%			11	<5 Detects, Max Detect used
Chloride	APW-9	mg/L	8	100%			13	95/0 NP Binomial UTL
Chromium	APW-1R	mg/L	8	75%			0.001	95/5 Normal UTL
Chromium	APW-9	mg/L	8	50%			0.0148	<5 Detects, Max Detect used
Cobalt	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Cobalt	APW-9	mg/L	8	25%			0.0031	<5 Detects, Max Detect used
Fluoride	APW-1R	mg/L	8	100%			0.2126	Normal 95% UTL
Fluoride	APW-9	mg/L	8	100%			0.2416	Normal 95% UTL
Lead	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Lead	APW-9	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Lithium	APW-1R	mg/L	8	100%			0.02024	Normal 95% UTL
Lithium	APW-9	mg/L	8	100%			0.01832	Detrended 95/95 UTL
Mercury	APW-1R	mg/L	8	0%			0.0001	<5 Detects, Max DL used
Mercury	APW-9	mg/L	8	0%			0.0001	<5 Detects, Max DL used
Molybdenum	APW-1R	mg/L	8	0%			0.0005	<5 Detects, Max DL used
Molybdenum	APW-9	mg/L	8	100%			0.04015	Lognormal 95% UTL
pH	APW-1R	SU	8	100%	6.222	Normal 95% LTL	6.865	Normal 95% UTL
pH	APW-9	SU	8	100%	6.995	Normal 95% LTL	7.48	Normal 95% UTL
Radium 226+228	APW-1R	pCi/L	8	100%			7.002	Lognormal 95% UTL
Radium 226+228	APW-9	pCi/L	8	100%			1.847	Normal 95% UTL
Selenium	APW-1R	mg/L	8	100%			0.00487	Normal 95% UTL
Selenium	APW-9	mg/L	8	100%			0.02118	Normal 95% UTL
Sulfate	APW-1R	mg/L	8	100%			114.7	Normal 95% UTL
Sulfate	APW-9	mg/L	8	100%			62.31	Detrended 95/95 UTL
TDS	APW-1R	mg/L	8	100%			525.3	Normal 95% UTL
TDS	APW-9	mg/L	8	100%			372	95/0 NP Binomial UTL
Thallium	APW-1R	mg/L	8	13%			0.0014	<5 Detects, Max Detect used
Thallium	APW-9	mg/L	8	13%			0.001	<5 Detects, Max Detect used

Notes
N: number of data points
UTL: upper tolerance limit
LTL: Lower tolerance limit. These were only calculated for pH
mg/L: milligrams per liter
SU: Standard units

Table 6
Final Standards for Each Analyte
Grand Tower

Analyte	Unit	LTL	LTL Notes	UTL	UTL Notes	Regulatory Standard	Final Standard	Type
Antimony	mg/L			0.0005	<5 Detects, Max DL used	0.006	0.006	MCL
Arsenic	mg/L			0.003489	Normal 95% UTL	0.05	0.05	MCL
Barium	mg/L			0.2049	Normal 95% UTL	2	2	MCL
Beryllium	mg/L			0.0005	<5 Detects, Max DL used	0.004	0.004	MCL
Boron	mg/L			0.682	Detrended 95/95 UTL	2	2	MCL
Cadmium	mg/L			0.0005	<5 Detects, Max DL used	0.005	0.005	MCL
Calcium	mg/L			103.2	Normal 95% UTL		103.2	UTL
Chloride	mg/L			13	95/0 NP Binomial UTL	200	200	MCL
Chromium	mg/L			0.0148	<5 Detects, Max Detect used	0.1	0.1	MCL
Cobalt	mg/L			0.0031	<5 Detects, Max Detect used	1	1	MCL
Fluoride	mg/L			0.2416	Normal 95% UTL	4	4	MCL
Lead	mg/L			0.0005	<5 Detects, Max DL used	0.0075	0.0075	MCL
Lithium	mg/L			0.02024	Normal 95% UTL	0.04	0.04	MCL
Mercury	mg/L			0.0001	<5 Detects, Max DL used	0.002	0.002	MCL
Molybdenum	mg/L			0.04015	Lognormal 95% UTL	0.1	0.1	MCL
pH	SU	6.222	Normal 95% LTL	7.48	Normal 95% UTL	6.5 - 9.5	6.222 - 9.5	LTL, MCL
Radium 226+228	pCi/L			7.002	Lognormal 95% UTL	20	20	MCL
Selenium	mg/L			0.02118	Normal 95% UTL	0.05	0.05	MCL
Sulfate	mg/L			114.7	Normal 95% UTL	400	400	MCL
TDS	mg/L			525.3	Normal 95% UTL	1200	1200	MCL
Thallium	mg/L			0.0014	<5 Detects, Max Detect used	0.002	0.002	MCL

Notes
N: number of data points
UTL: upper tolerance limit
LTL: Lower tolerance limit. These were only calculated for pH
mg/L: milligrams per liter
SU: Standard units

Table 7
Comparison of Downgradient Wells to Standards
Grand Tower

Analyte	Well	Median	Lower Limit	Upper Limit	Unit	Standard Description	p-value	Exceed
Antimony	APW-10D	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-10S	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-2	0.0005		0.006	mg/L	IEPA Class I GWPS	0.997	
Antimony	APW-3	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-4	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-5	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-6D	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-6S	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-7	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Antimony	APW-8	0.0005		0.006	mg/L	IEPA Class I GWPS	0.998	
Arsenic	APW-10D	0.0005		0.05	mg/L	IEPA Class I GWPS	0.997	
Arsenic	APW-10S	0.191		0.05	mg/L	IEPA Class I GWPS	0.00391	X
Arsenic	APW-2	0.01695		0.05	mg/L	IEPA Class I GWPS	1	
Arsenic	APW-3	0.00225		0.05	mg/L	IEPA Class I GWPS	0.995	
Arsenic	APW-4	0.0016		0.05	mg/L	IEPA Class I GWPS	0.995	
Arsenic	APW-5	0.0019		0.05	mg/L	IEPA Class I GWPS	0.995	
Arsenic	APW-6D	0.00925		0.05	mg/L	IEPA Class I GWPS	1	
Arsenic	APW-6S	0.00145		0.05	mg/L	IEPA Class I GWPS	0.995	
Arsenic	APW-7	0.0005		0.05	mg/L	IEPA Class I GWPS	0.997	
Arsenic	APW-8	0.0005		0.05	mg/L	IEPA Class I GWPS	0.997	
Barium	APW-10D	0.341		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-10S	0.6055		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-2	0.4335		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-3	0.1075		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-4	0.14		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-5	0.214		2	mg/L	IEPA Class I GWPS	0.995	
Barium	APW-6D	0.159		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-6S	0.218		2	mg/L	IEPA Class I GWPS	0.995	
Barium	APW-7	0.387		2	mg/L	IEPA Class I GWPS	1	
Barium	APW-8	0.221		2	mg/L	IEPA Class I GWPS	1	
Beryllium	APW-10D	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-10S	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-2	0.0005		0.004	mg/L	IEPA Class I GWPS	0.997	
Beryllium	APW-3	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-4	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-5	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-6D	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-6S	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-7	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Beryllium	APW-8	0.0005		0.004	mg/L	IEPA Class I GWPS	0.998	
Boron	APW-10D	0.0914		2	mg/L	IEPA Class I GWPS	1	
Boron	APW-10S	0.559		2	mg/L	IEPA Class I GWPS	1	
Boron	APW-2	8.56		2	mg/L	IEPA Class I GWPS	0.00391	X
Boron	APW-3	4.48		2	mg/L	IEPA Class I GWPS	0.00391	X
Boron	APW-4	2.075		2	mg/L	IEPA Class I GWPS	0.629	
Boron	APW-5	9.275		2	mg/L	IEPA Class I GWPS	0.00391	X
Boron	APW-6D	3.65		2	mg/L	IEPA Class I GWPS	0.00391	X
Boron	APW-6S	5.88		2	mg/L	IEPA Class I GWPS	0.00391	X
Boron	APW-7	0.301		2	mg/L	IEPA Class I GWPS	1	
Boron	APW-8	0.1395		2	mg/L	IEPA Class I GWPS	0.995	
Cadmium	APW-10D	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-10S	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-2	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-3	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-4	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-5	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-6D	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-6S	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-7	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	
Cadmium	APW-8	0.0005		0.005	mg/L	IEPA Class I GWPS	0.998	

Table 7
Comparison of Downgradient Wells to Standards
Grand Tower

Analyte	Well	Median	Lower Limit	Upper Limit	Unit	Standard Description	p-value	Exceed
Calcium	APW-10D	123.5		103.2	mg/L	UTL: Normal 95%	0.00391	X
Calcium	APW-10S	142		103.2	mg/L	UTL: Normal 95%	0.00707	X
Calcium	APW-2	152.5		103.2	mg/L	UTL: Normal 95%	0.00391	X
Calcium	APW-3	91.55		103.2	mg/L	UTL: Normal 95%	0.973	
Calcium	APW-4	106		103.2	mg/L	UTL: Normal 95%	0.363	
Calcium	APW-5	124.5		103.2	mg/L	UTL: Normal 95%	0.00391	X
Calcium	APW-6D	105		103.2	mg/L	UTL: Normal 95%	0.264	
Calcium	APW-6S	97.75		103.2	mg/L	UTL: Normal 95%	1	
Calcium	APW-7	191.5		103.2	mg/L	UTL: Normal 95%	0.00391	X
Calcium	APW-8	98.2		103.2	mg/L	UTL: Normal 95%	0.992	
Chloride	APW-10D	16.5		200	mg/L	IEPA Class I GWPS	0.995	
Chloride	APW-10S	6		200	mg/L	IEPA Class I GWPS	0.997	
Chloride	APW-2	12		200	mg/L	IEPA Class I GWPS	0.996	
Chloride	APW-3	21		200	mg/L	IEPA Class I GWPS	0.995	
Chloride	APW-4	11		200	mg/L	IEPA Class I GWPS	0.997	
Chloride	APW-5	15.5		200	mg/L	IEPA Class I GWPS	0.996	
Chloride	APW-6D	16.5		200	mg/L	IEPA Class I GWPS	0.996	
Chloride	APW-6S	27		200	mg/L	IEPA Class I GWPS	0.995	
Chloride	APW-7	15		200	mg/L	IEPA Class I GWPS	0.997	
Chloride	APW-8	10		200	mg/L	IEPA Class I GWPS	0.996	
Chromium	APW-10D	0.00165		0.1	mg/L	IEPA Class I GWPS	0.995	
Chromium	APW-10S	0.0016		0.1	mg/L	IEPA Class I GWPS	0.995	
Chromium	APW-2	0.0479		0.1	mg/L	IEPA Class I GWPS	0.988	
Chromium	APW-3	0.00255		0.1	mg/L	IEPA Class I GWPS	0.995	
Chromium	APW-4	0.0021		0.1	mg/L	IEPA Class I GWPS	0.995	
Chromium	APW-5	0.0019		0.1	mg/L	IEPA Class I GWPS	0.996	
Chromium	APW-6D	0.0009		0.1	mg/L	IEPA Class I GWPS	0.996	
Chromium	APW-6S	0.00195		0.1	mg/L	IEPA Class I GWPS	0.995	
Chromium	APW-7	0.0011		0.1	mg/L	IEPA Class I GWPS	0.996	
Chromium	APW-8	0.00115		0.1	mg/L	IEPA Class I GWPS	0.996	
Cobalt	APW-10D	0.00255		1	mg/L	IEPA Class I GWPS	0.995	
Cobalt	APW-10S	0.0005		1	mg/L	IEPA Class I GWPS	0.998	
Cobalt	APW-2	0.00395		1	mg/L	IEPA Class I GWPS	1	
Cobalt	APW-3	0.0005		1	mg/L	IEPA Class I GWPS	0.997	
Cobalt	APW-4	0.0005		1	mg/L	IEPA Class I GWPS	0.997	
Cobalt	APW-5	0.0005		1	mg/L	IEPA Class I GWPS	0.998	
Cobalt	APW-6D	0.0005		1	mg/L	IEPA Class I GWPS	0.997	
Cobalt	APW-6S	0.0005		1	mg/L	IEPA Class I GWPS	0.998	
Cobalt	APW-7	0.0005		1	mg/L	IEPA Class I GWPS	0.998	
Cobalt	APW-8	0.00075		1	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-10D	0.1		4	mg/L	IEPA Class I GWPS	0.995	
Fluoride	APW-10S	0.165		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-2	0.245		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-3	0.29		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-4	0.175		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-5	0.325		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-6D	0.22		4	mg/L	IEPA Class I GWPS	0.996	
Fluoride	APW-6S	0.255		4	mg/L	IEPA Class I GWPS	0.995	
Fluoride	APW-7	0.2		4	mg/L	IEPA Class I GWPS	0.995	
Fluoride	APW-8	0.29		4	mg/L	IEPA Class I GWPS	0.996	
Lead	APW-10D	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-10S	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-2	0.00855		0.0075	mg/L	IEPA Class I GWPS	0.249	
Lead	APW-3	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.997	
Lead	APW-4	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-5	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-6D	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-6S	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-7	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	
Lead	APW-8	0.0005		0.0075	mg/L	IEPA Class I GWPS	0.998	

Table 7
Comparison of Downgradient Wells to Standards
Grand Tower

Analyte	Well	Median	Lower Limit	Upper Limit	Unit	Standard Description	p-value	Exceed
Lithium	APW-10D	0.01465		0.04	mg/L	USEPA GWPS MCL	0.995	
Lithium	APW-10S	0.0291		0.04	mg/L	USEPA GWPS MCL	1	
Lithium	APW-2	0.05105		0.04	mg/L	USEPA GWPS MCL	0.00391	X
Lithium	APW-3	0.02605		0.04	mg/L	USEPA GWPS MCL	1	
Lithium	APW-4	0.04085		0.04	mg/L	USEPA GWPS MCL	0.0124	X
Lithium	APW-5	0.04045		0.04	mg/L	USEPA GWPS MCL	0.23	
Lithium	APW-6D	0.0164		0.04	mg/L	USEPA GWPS MCL	1	
Lithium	APW-6S	0.0416		0.04	mg/L	USEPA GWPS MCL	0.136	
Lithium	APW-7	0.01795		0.04	mg/L	USEPA GWPS MCL	0.995	
Lithium	APW-8	0.02065		0.04	mg/L	USEPA GWPS MCL	0.995	
Mercury	APW-10D	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-10S	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-2	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-3	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-4	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-5	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-6D	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-6S	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-7	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Mercury	APW-8	0.0001		0.002	mg/L	IEPA Class I GWPS	0.998	
Molybdenum	APW-10D	0.0005		0.1	mg/L	USEPA GWPS MCL	0.997	
Molybdenum	APW-10S	0.0005		0.1	mg/L	USEPA GWPS MCL	0.997	
Molybdenum	APW-2	0.156		0.1	mg/L	USEPA GWPS MCL	0.00781	X
Molybdenum	APW-3	0.07575		0.1	mg/L	USEPA GWPS MCL	1	
Molybdenum	APW-4	0.07705		0.1	mg/L	USEPA GWPS MCL	1	
Molybdenum	APW-5	0.198		0.1	mg/L	USEPA GWPS MCL	0.00391	X
Molybdenum	APW-6D	0.05865		0.1	mg/L	USEPA GWPS MCL	1	
Molybdenum	APW-6S	0.2805		0.1	mg/L	USEPA GWPS MCL	0.00391	X
Molybdenum	APW-7	0.0036		0.1	mg/L	USEPA GWPS MCL	0.995	
Molybdenum	APW-8	0.0005		0.1	mg/L	USEPA GWPS MCL	0.997	
pH	APW-10D	6.99	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	0.995	
pH	APW-10S	6.94	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	0.995	
pH	APW-2	7.17	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
pH	APW-3	7.62	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
pH	APW-4	7.255	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	0.995	
pH	APW-5	7.42	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
pH	APW-6D	7.215	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
pH	APW-6S	7.135	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
pH	APW-7	6.81	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	0.995	
pH	APW-8	6.935	6.222	9.5	SU	LTL: Normal 95%, IEPA Class I GWPS	1	
Radium 226+228	APW-10D	0.907		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-10S	1.02		20	pCi/L	IEPA Class I GWPS	0.995	
Radium 226+228	APW-2	1.55		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-3	0.9005		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-4	0.78		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-5	1.08		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-6D	1.165		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-6S	0.98		20	pCi/L	IEPA Class I GWPS	1	
Radium 226+228	APW-7	0.77		20	pCi/L	IEPA Class I GWPS	0.995	
Radium 226+228	APW-8	1.06		20	pCi/L	IEPA Class I GWPS	1	
Selenium	APW-10D	0.00125		0.05	mg/L	IEPA Class I GWPS	0.995	
Selenium	APW-10S	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-2	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-3	0.0005		0.05	mg/L	IEPA Class I GWPS	0.997	
Selenium	APW-4	0.01445		0.05	mg/L	IEPA Class I GWPS	1	
Selenium	APW-5	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-6D	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-6S	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-7	0.0005		0.05	mg/L	IEPA Class I GWPS	0.998	
Selenium	APW-8	0.0138		0.05	mg/L	IEPA Class I GWPS	0.995	

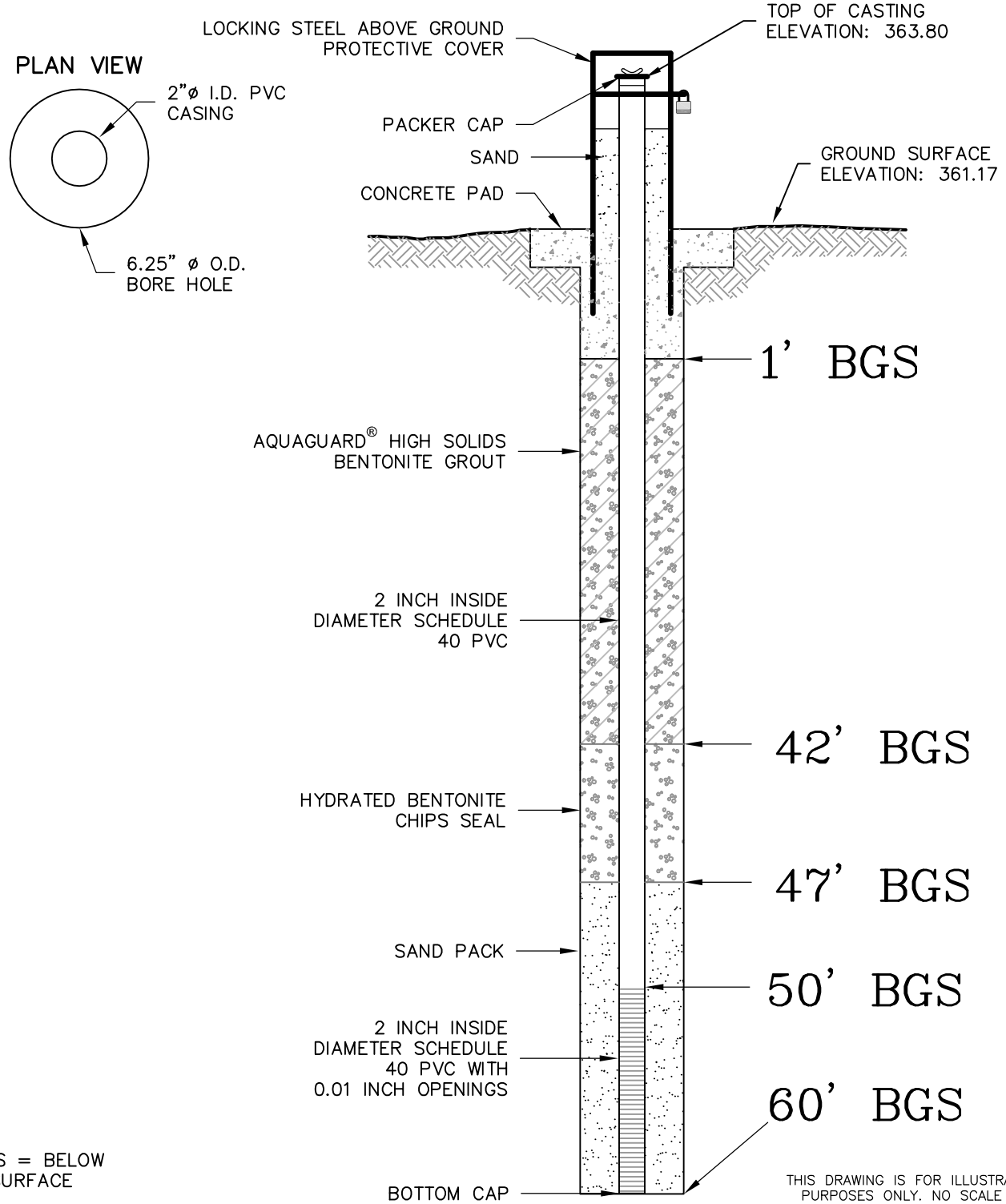
Table 7
Comparison of Downgradient Wells to Standards
Grand Tower

Analyte	Well	Median	Lower Limit	Upper Limit	Unit	Standard Description	p-value	Exceed
Sulfate	APW-10D	43.5		400	mg/L	IEPA Class I GWPS	0.996	
Sulfate	APW-10S	5		400	mg/L	IEPA Class I GWPS	0.997	
Sulfate	APW-2	461		400	mg/L	IEPA Class I GWPS	0.00707	X
Sulfate	APW-3	197.5		400	mg/L	IEPA Class I GWPS	1	
Sulfate	APW-4	108		400	mg/L	IEPA Class I GWPS	1	
Sulfate	APW-5	403		400	mg/L	IEPA Class I GWPS	0.32	
Sulfate	APW-6D	218.5		400	mg/L	IEPA Class I GWPS	1	
Sulfate	APW-6S	183		400	mg/L	IEPA Class I GWPS	1	
Sulfate	APW-7	62		400	mg/L	IEPA Class I GWPS	1	
Sulfate	APW-8	39		400	mg/L	IEPA Class I GWPS	0.995	
TDS	APW-10D	467		1200	mg/L	IEPA Class I GWPS	0.995	
TDS	APW-10S	714		1200	mg/L	IEPA Class I GWPS	0.995	
TDS	APW-2	875		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-3	492		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-4	478		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-5	804		1200	mg/L	IEPA Class I GWPS	0.995	
TDS	APW-6D	561		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-6S	570		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-7	738		1200	mg/L	IEPA Class I GWPS	1	
TDS	APW-8	440		1200	mg/L	IEPA Class I GWPS	1	
Thallium	APW-10D	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-10S	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-2	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-3	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-4	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-5	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-6D	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-6S	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-7	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	
Thallium	APW-8	0.0005		0.002	mg/L	IEPA Class I GWPS	0.998	

Notes
mg/L: milligrams per liter
p-value: one-sided Wilcoxon Ranked Sum Test p-value describing the probability that the median of the well-analyte pair is greater than the standard
Exceed 'X' indicates that the well-analyte pair is significantly greater than the standard (or less than for pH)

Appendix A
Soil Boring Logs and Well Construction Diagrams

WELL CONSTRUCTION DETAIL
APW–5



NOTE: BGS = BELOW GROUND SURFACE

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		0297751
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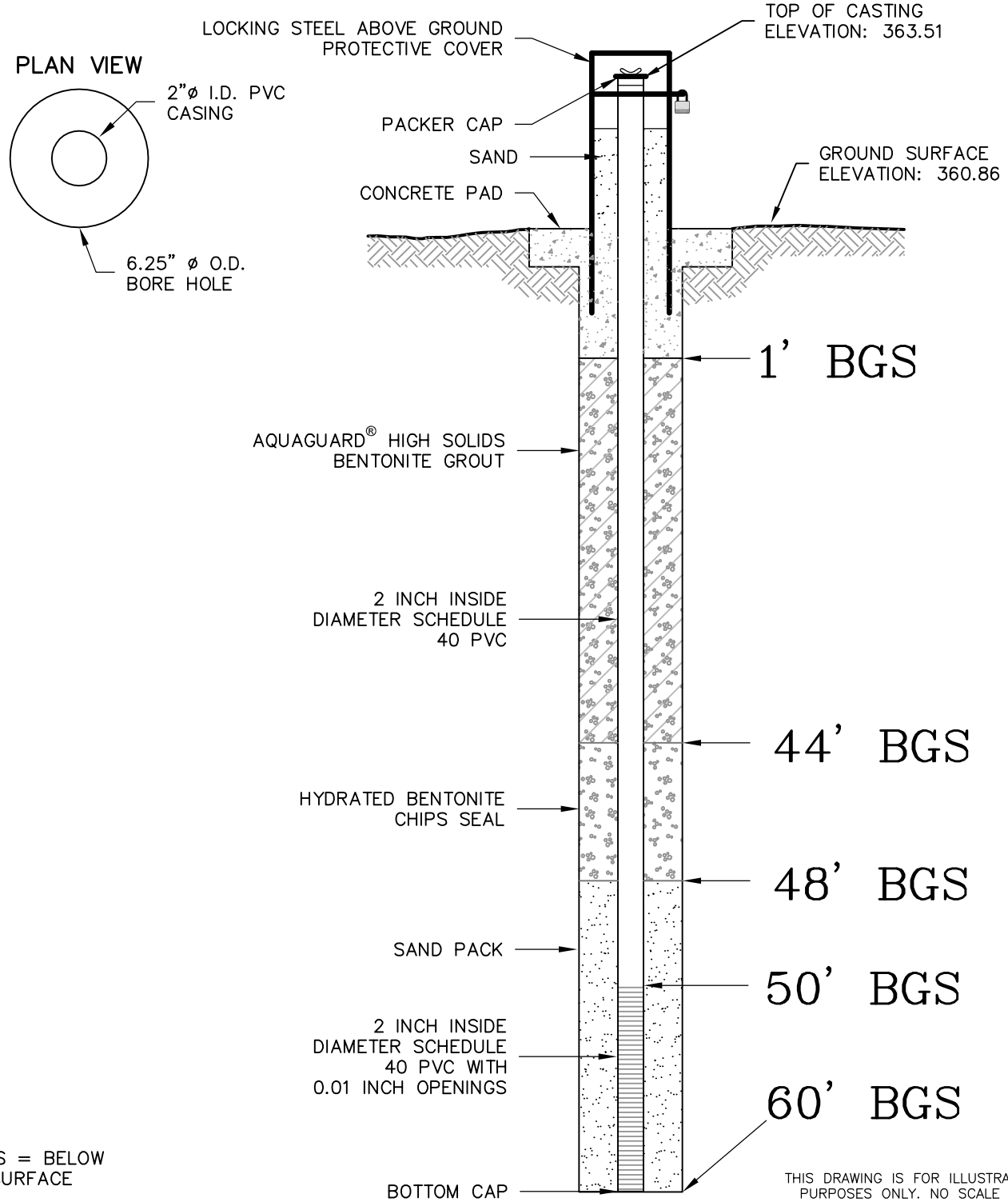
APW–6S



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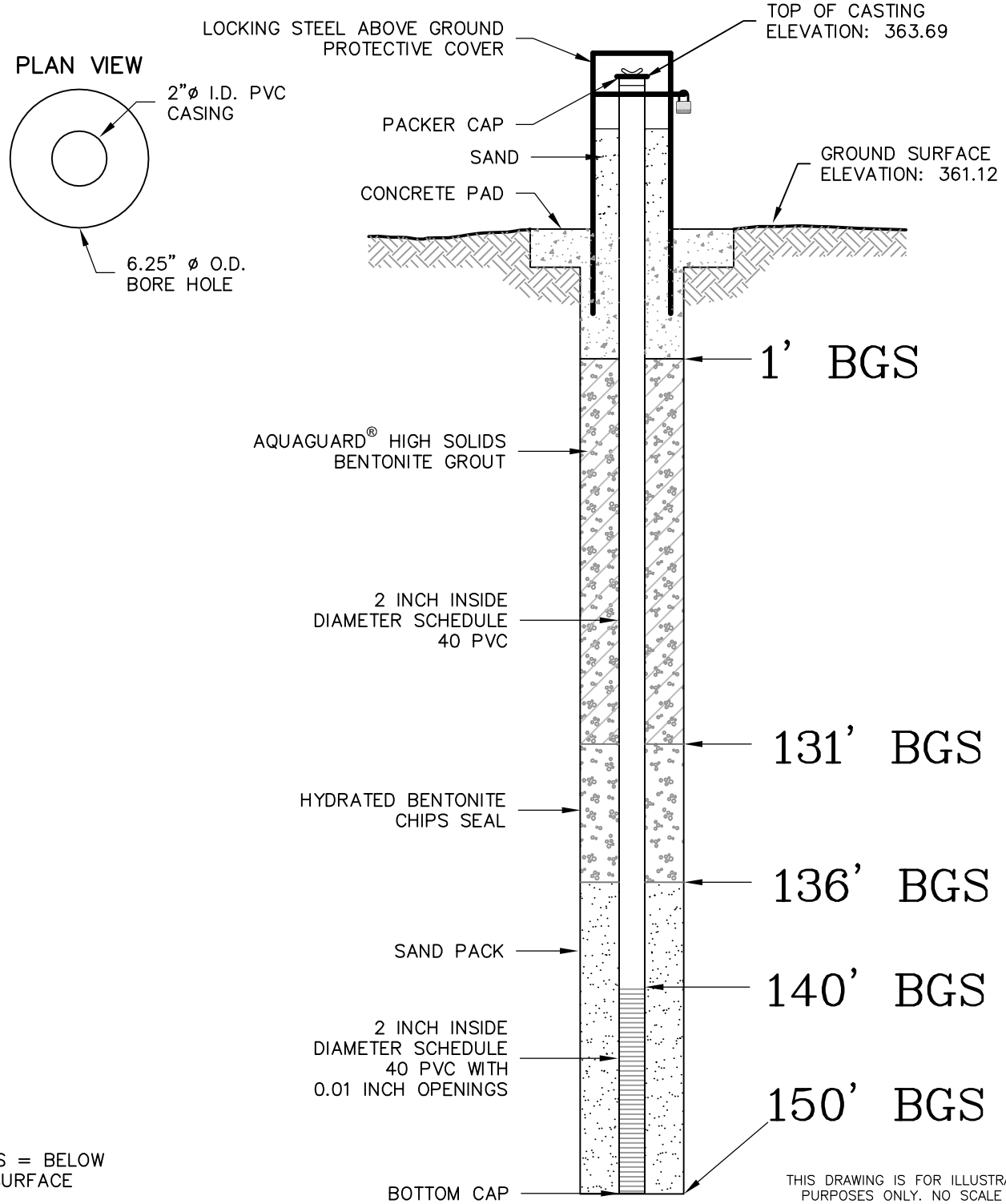
APW–6D



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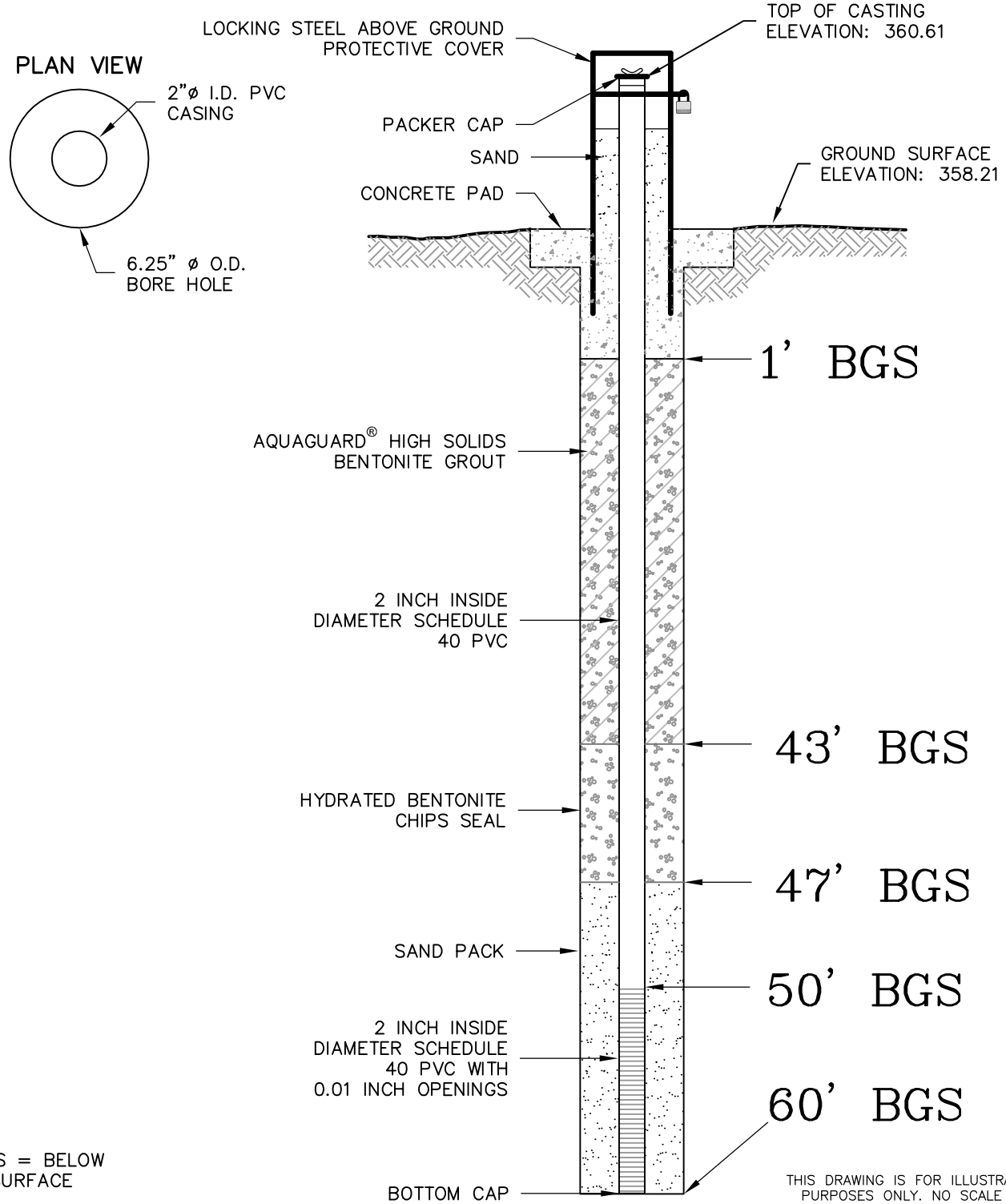
WELL CONSTRUCTION DETAIL
APW–7



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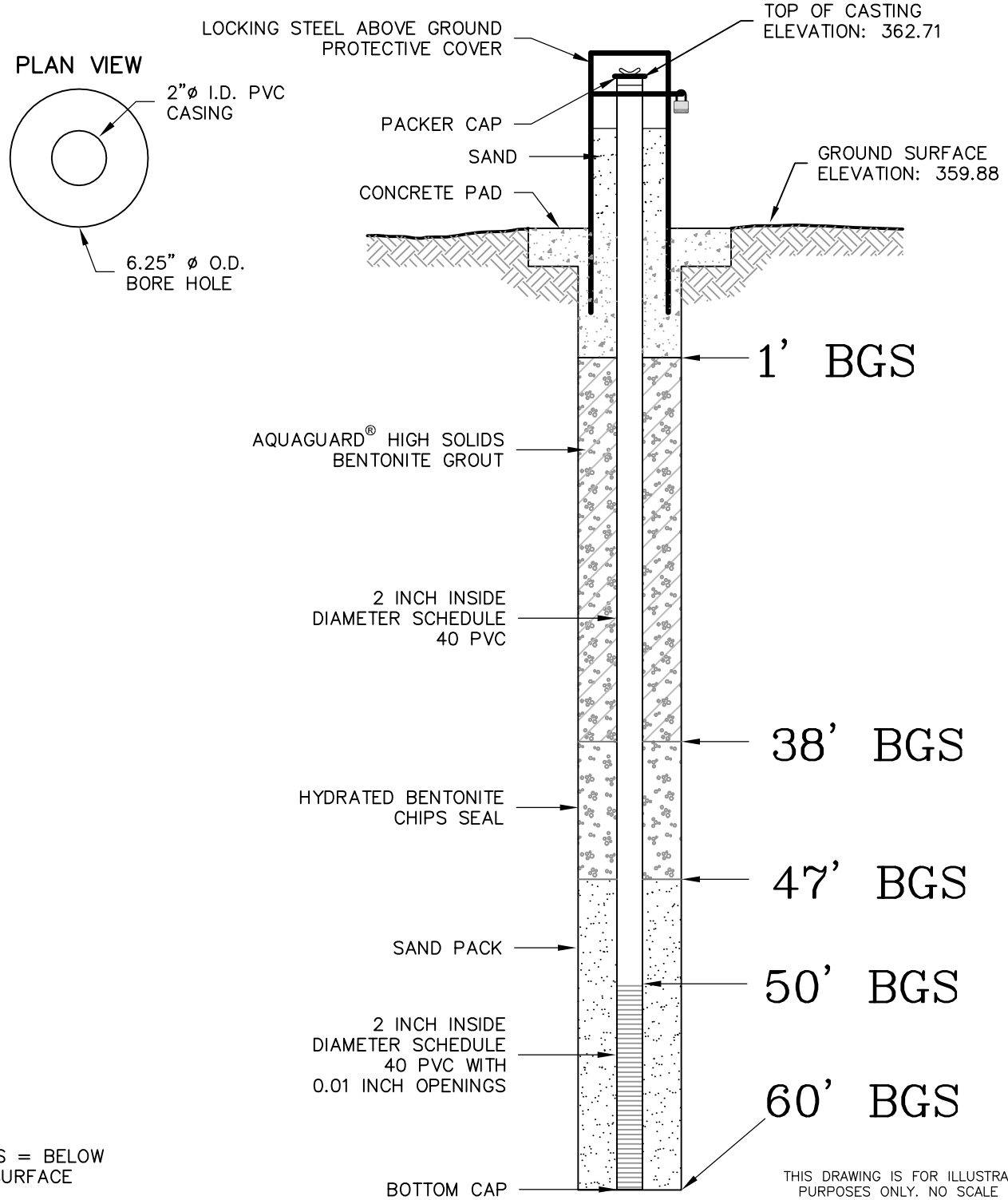
WELL CONSTRUCTION DETAIL
APW-8



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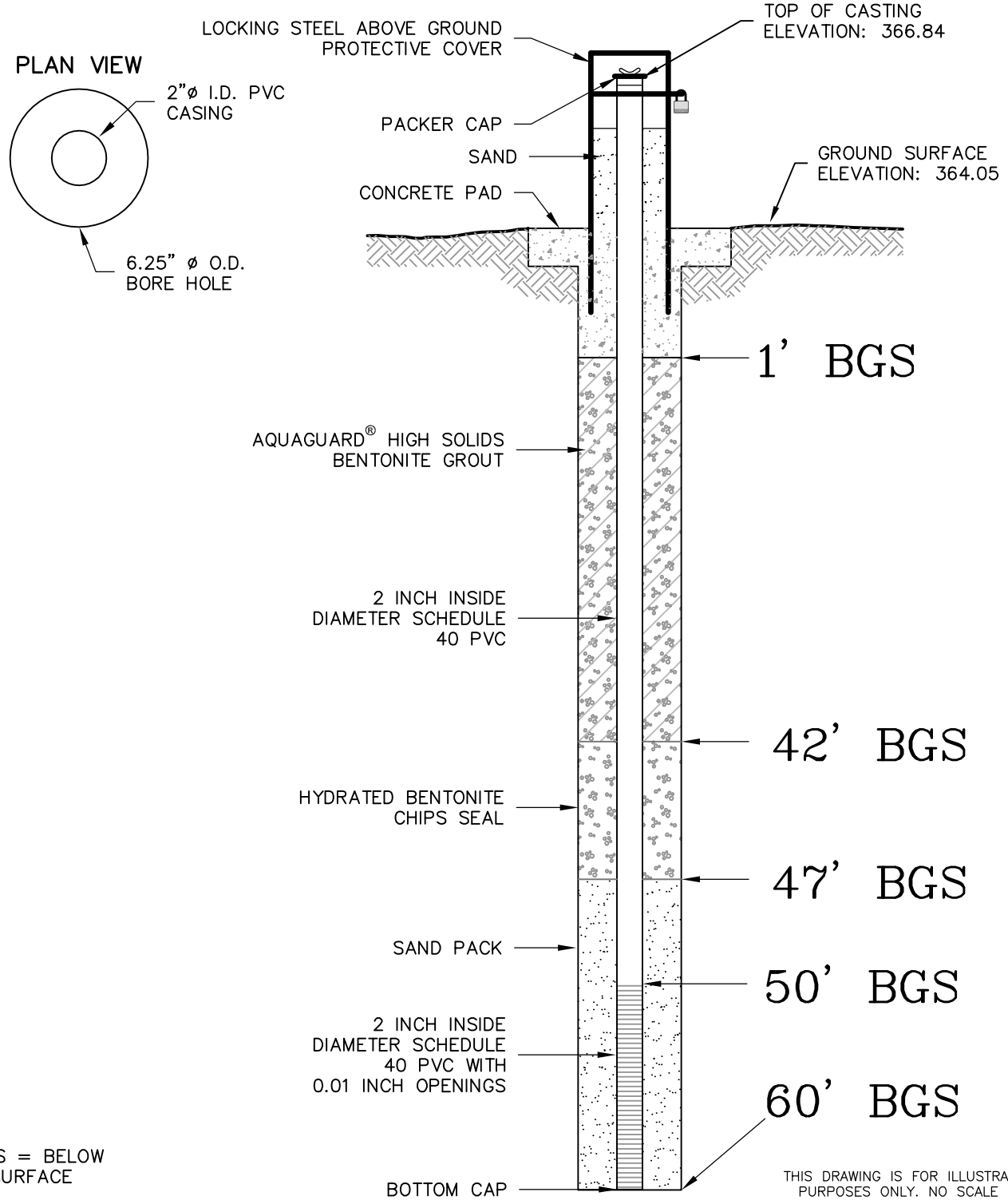
WELL CONSTRUCTION DETAIL
APW–9



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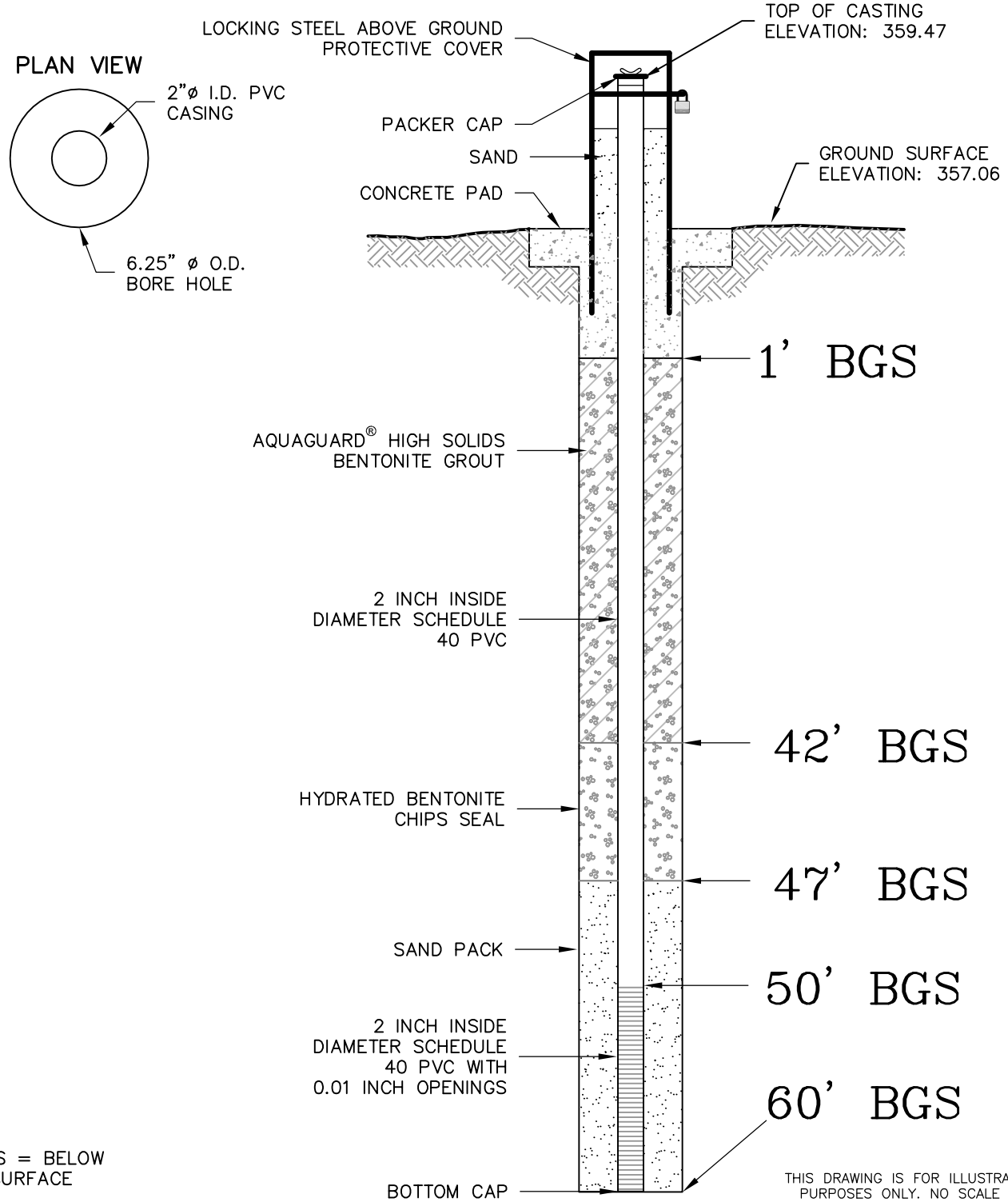
WELL CONSTRUCTION DETAIL
APW–10S



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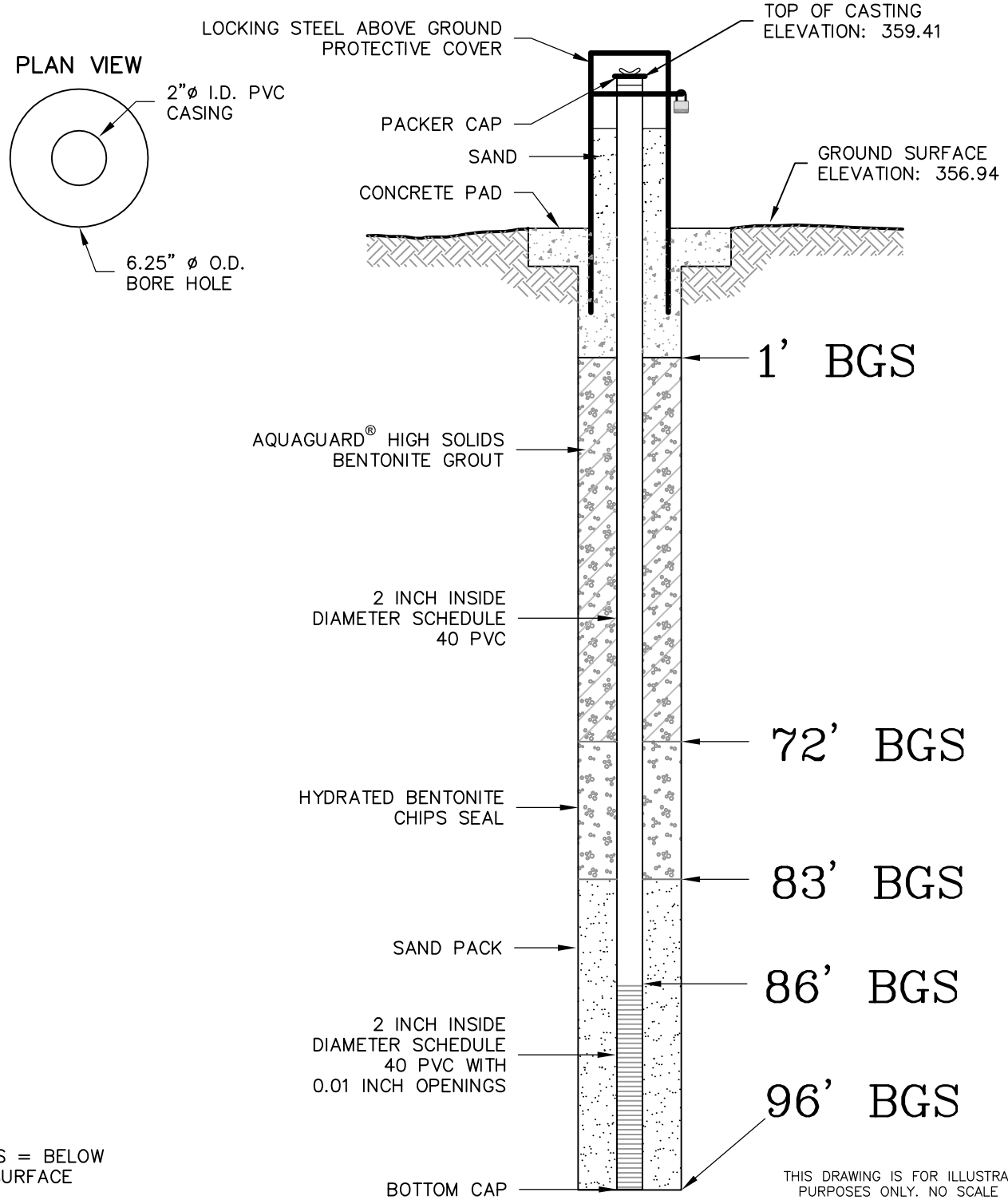
WELL CONSTRUCTION DETAIL
APW–10D



NOTE: BGS = BELOW GROUND SURFACE

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	21.44 ft
Surface Elevation:	361.17
Casing Depth/Diameter:	62.88 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-5
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1145 / Time 1350
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/24/17 / Date 08/24/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
3 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0–5			0-5' Hand Auger for Utility Clearance	- - - - -		0–5		0'-3': SAND, with trace to little silt and trace round large gravel non-uniform, loose, moist, color when wet moderate yellowish brown (10YR 5/4), color dry light olive gray (5Y 6/1).
								3'-31': Clayey SILT with trace to little sand without rounded gravel color moderate yellowish brow (10YR 5/4).
5			RUN 1 5-6' REC:	-		5		As above;
6–16			RUN 2 6-16' REC: 3.7/10.0	-		6–16		As above;
16–20			RUN 3 16-26' REC: 3.8/10.0			16–20		As above;

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	21.44 ft
Surface Elevation:	361.17
Casing Depth/Diameter:	62.88 ft / 2 in.
Contractor:	Cascade Drilling Inc.
	Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-5

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1145 / Time 1350
☐ Mud Rotary	2" x 18"	☐ Other:	Date 08/24/17 / Date 08/24/17
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
3 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		
21						21		
22						22		
23						23		
24						24		
25						25		
26				-		26		As above;
27						27		
28						28		
29						29		
30						30		
31			RUN 4 26-36' REC: 7.4/10.0	<0.25		31		Inferred contact; abrupt change to 31-40.5': CLAYEY SILT with very fine sand, medium plasticity, color olive gray (5Y 4/1), faint organic odor, dilatant water present
32				<0.25		32		
33						33		
34						34		
35						35		
36				-		36		As above;
37						37		
38			RUN 5 36-46' REC: 7.2/10.0			38		
39						39		
40						40		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	21.44 ft
Surface Elevation:	361.17
Casing Depth/Diameter:	62.88 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-5
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1145 / Time 1350
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/24/17 / Date 08/24/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
3 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		Grading change to; 40.5-52.2': Alternating interbedded uniform very fine sand to non-uniform fine to medium SAND with trace to some gravel throughout RUN 5 color olive gray (5Y 4/1);
41						41		
42						42		
43						43		
44						44		
45						45		
46						46		non-uniform fine to medium SAND with trace rounded gravel, color olive gray.
47						47		
48						48		
49						49		
50			RUN 6 46-56' REC: 6.4/10.0			50		
51						51		
52						52		Abrupt change to; 52.2 - Very fine SAND with trace fines to end of RUN 6, color as above olive gray.
53						53		
54						54		
55						55		
56						56		As above; very fine SAND with trace fines to end of RUN 7
57						57		
58			RUN 7 46-60' REC: 4.3/4.0			58		
59						59		
60						60		End of boring at 60' bgs

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	21.22 ft
Surface Elevation:	360.86
Casing Depth/Diameter:	63.88 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6S
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 1
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1320 / Time 1440
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/25/17 / Date 08/25/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
3 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	
50 to 60	2" PVC Screen	1 to 44	High solids grout	
to	Schedule 40	44 to 48	Med bentonite chip	STICKUP
to		48 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0						0		Blind drilled to depth (SEE BORING LOG APW-6D for geologic discription)
1						1		NOTE: APW-6S located south of APW-6D
2						2		
3						3		
4						4		
5						5		
6						6		
7						7		
8						8		
9						9		
10						10		
11						11		
12						12		
13						13		
14						14		
15						15		
16						16		
17						17		
18						18		
19						19		
20						20		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0			0-5' Hand Auger for Utility Clearance			0		0'-6': SAND, with trace to some silt, color pale yellowish brown (10YR 6/2)
1						1		
2						2		
3						3		
4						4		
5			RUN 1 5-6' REC:			5		
6			RUN 2 6-16' REC: 9.8/10.0			6		abrupt change to; 6'-15.3': Clayey SILT, moist and stiff, sub angular internal structure with root hairs present throughout, faint organic odor present, color dark yellowish brown (10 YR 4/2).
7				1.75		7		
8				1.75		8		
9				2		9		
10				2.25		10		
11				2		11		
12				2.25		12		
13				1.75		13		
14				<0.25		14		
15				<0.25		15		abrupt change to; 15.3'-16.0': SAND non-uniform fine to medium grain size, color moderate yellowish brown (10YR 5/4) to end of RUN 2.
16			RUN 3 16-26' REC: 6.8/10.0			16		abrupt change to; 16.0'-21.0': Clayey SILT, moist and stiff as above, color dark yellowish brown (10 YR 4/2).
17				1.25		17		
18				2		18		
19				1.25		19		
20				1.75		20		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"	☐ Other:	Date 8/24/2017 / Date 8/25/2017
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		inferred contact, abrupt change to;
21				0.75		21		21.0'-29.3': SAND, well sorted fine to medium grain size , color modeate yellowish brown (10YR 5/4).
22						22		
23						23		
24						24		
25						25		
26						26		SAND as above;
27						27		
28						28		
29						29		Inferred contact, grading change to: 29.3'-31.5': Interbedded SAND as above with CLAYEY SILT with trace to some very fine sand slight plasticity, color olive gray (5Y 4/1).
30						30		
31			RUN 4 26-36' REC: 6.5/10.0			31		Inferred contact, abrupt change to: 31.5'-36.0': SAND very fine grain size uniform and well graded with trace to some silt, color olive gray (5Y 4/1)
32						32		
33						33		
34						34		
35						35		
36						36		Inferred contact, grading change to: 36.0'-40.6': SAND fine to medium grain size with trace small rounded gravel, color olive gray (5Y 4/1)
37			RUN 5 36-46' REC: 4.6/10.0			37		
38						38		
39						39		
40						40		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"	☐ Other:	Date 8/24/2017 / Date 8/25/2017
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		Abrupt change to; 40.6'-76': SAND, very fine and uniform, trace to little silt and clay, color olive gray (5Y 4/1).
41						41		
42						42		
43						43		
44						44		
45						45		
46			RUN 6 46-56' REC: 6.6/10.0			46		As above; oragnic varving noted throughout RUN 6, varving color ranging from olive black (5Y 2/1) to graysih black (N2)
47						47		
48						48		
49						49		
50						50		
51						51		
52						52		
53						53		
54						54		
55						55		
56			RUN 7 56-66' REC: 4.3/4.0			56		very fine SAND, uniform with little silt, color medium gray (N4)
57						57		
58						58		
59						59		
60						60		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 4 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
60						60		
61						61		
62						62		
63						63		
64						64		
65						65		
66						66		As above; very fine sand
67						67		
68						68		
69						69		
70			RUN 8 66-76' REC: 2.4/10.0			70		
71						71		
72						72		
73						73		
74						74		
75						75		
76						76		Abrupt change to; 76.0'-150.0': SAND, medium to course grain size, with little to few rounded small to large gravel throughout, moderately graded, matrix color is dark yellowish brown (10YR 4/2), gravel and course sands are highly varigated
77						77		
78			RUN 9 76-86' REC: 8.4/10			78		
79						79		
80						80		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 5 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	STICKUP
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
80						80		
81						81		
82						82		
83						83		
84						84		
85						85		
86						86		As above;
87						87		
88						88		
89						89		
90			RUN 10 86-96' REC: 6.6/10.0			90		
91						91		
92						92		
93						93		
94						94		
95						95		
96						96		As above; sand matrix color moderate yellowish brown (10YR 5/4)
97						97		
98			RUN 11 96-106' REC: 8.2/10.0			98		
99						99		
100						100		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.
Contractor:	Cascade Drilling Inc.
	Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 6 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
100						100		
101						101		
102						102		
103						103		
104						104		
105						105		
106			RUN 12 106-116' REC: 8.2/10.0			106		As above;
107						107		
108						108		
109						109		
110						110		
111						111		
112						112		
113						113		
114						114		
115						115		
116			RUN 13 116-126' REC: 8.0/10			116		As above;
117						117		
118						118		
119						119		
120						120		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.
Contractor:	Cascade Drilling Inc.
	Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 7 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
120						120		
121						121		
122						122		
123						123		
124						124		
125						125		
126						126		Stop drill work at 1800 8/24/2017; resumed drilling on 8/25/2107 As above;
127						127		
128						128		
129						129		
130			RUN 14 126-136' REC: 4.2/10.0			130		
131						131		
132						132		
133						133		
134						134		
135						135		
136						136		As above;
137						137		
138			RUN 15 136-146' REC: 6.6/10.0			138		
139						139		
140						140		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	150 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	21.6 ft
Depth G. W. Encountered (After Drilling):	21.53 ft
Surface Elevation:	361.12
Casing Depth/Diameter:	155.10 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 8 of 8
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1500 / Time 1140
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 8/24/2017 / Date 8/25/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 140	Solid 2" PVC pipe	0 to 1	Concrete well pad	
140 to 150	2" PVC screen	1 to 131	High solids grout	
to	Schedule 80	131 to 136	Med bentonite chip	STICKUP
to		136 to 150	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
140						140		
141						141		
142						142		
143						143		
144						144		
145						145		
146						146		As above;
147			RUN 16 146-150' REC: 6.2/4.0			147		
148						148		
149						149		
150						150		End of boring at 150' bgs
151						151		
152						152		
153						153		
154						154		
155						155		
156						156		
157						157		
158						158		
159						159		
160						160		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	358.21
Casing Depth/Diameter:	62.39 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-7
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1010 / Time 1120
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/26/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 43	High solids grout	
to	Schedule 40	43 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0			0-5' Hand Auger for Utility Clearance	-		0		0.0'-4.0': Sandy SILT, loos ena friable root hairs present with faint organic odor, moist, color light olive gray (5Y 5/1)
1				-		1		
2				-		2		
3				-		3		
4				-		4		4.0'-16.0': Clayey SILT with very fine sand, stiff to very stiff, moist, structured with semi-blocky pedon surfaces, non-plastic, color dark yellowish brown (10YR 4/2)
5				-		5		As above;
6			RUN 1 5-8' REC:	2.25		6		As above; iron staining noted on soil structured surfaces; staining color moderated brown (5YR 3/4)
7			RUN 2 6-16' REC: 7.3/10.0	1.75		7		
8				1.75		8		
9				1		9		
10				1		10		
11				1.25		11		
12				1.25		12		
13				1.25		13		
14						14		
15						15		
16						16		Inferred contact, abrupt change to; 16.0'-24.0': Clayey SILT, increased clay content compared to above, sub-angular blocky structure, moist sticky, low plasticity, color olive black (5Y 2/1)
17			RUN 3 16-26' REC: 7.9/10.0	1		17		
18				1.25		18		
19				1		19		
20				1.25		20		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	358.21
Casing Depth/Diameter:	62.39 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-7
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1010 / Time 1120
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/26/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 43	High solids grout	
to	Schedule 40	43 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		
21						21		
22						22		
23						23		
24						24		Inferred contact; abrupt change to 24.0'-36.5': SAND, fine to medium grain size with fines, saturated, color grayish black (N2).
25						25		
26						26		As above; with few course sand and little gravel, color grading to dark yellowish brown (10YR 4/2) with depth
27						27		
28						28		
29						29		
30			RUN 4 26-36' REC: 3.0/10.0			30		
31						31		
32						32		
33						33		
34						34		
35						35		
36						36		As above; Inferred contact, abrupt change to; 36.5'-38.5': Interbedded thinly bedded Clayey SILT and SAND medium to course grain size color olive gray (5Y 4/1)
37						37		
38			RUN 5 36-46' REC: 3.7/10.0			38		abrupt change to; 38.5'-60.0': SAND very fine with trace fines, massive and uniform saturated color medium dark gray (N4).
39						39		
40						40		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	358.21
Casing Depth/Diameter:	62.39 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-7
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	Start / Finish
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Time 1010 / Time 1120
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Date 08/26/17 / Date 08/26/17
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 43	High solids grout	
to	Schedule 40	43 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		
41						41		
42						42		
43						43		
44						44		
45						45		
46						46		As above; very fine SAND
47						47		
48						48		
49						49		
50			RUN 6 46-56' REC: 5.9/10.0			50		
51						51		
52						52		
53						53		
54						54		
55						55		
56						56		As above; very fine SAND
57						57		
58			RUN 7 46-60' REC: 4.7/4.0			58		
59						59		
60						60		End of boring at 60' bgs

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	359.88
Casing Depth/Diameter:	62.36 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-8
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1250 / Time 1415
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/26/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 38	High solids grout	
to	Schedule 40	38 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0			0-5' Hand Auger for Utility Clearance	-		0		0.0'-2.5': Clayey SILT, with trace sand, desication cracks present at surface, dry, color pale yellowish brown (10 YR 6/2).
1				-		1		
2				-		2		color grading to dark yellowish brown (10 YR 4/2)
3				-		3		2.5'-5.5': Silty SAND, color as above
4				-		4		
5				-		5		
			RUN 1 5-6' REC:					
6			RUN 2 6-16' REC: 2.8/10.0			6		5.5-16': SAND, fine to medium grain sizes, with little rounded gravel, color pale yellowish brown (10YR 6/2) As above SAND;
7						7		
8						8		
9						9		
10						10		
11						11		
12						12		
13						13		
14						14		
15						15		
16						16		Abrupt change to; 16.0'-18.4': Clayey SILT, stiff to very stiff, moist low plasticity, varigated color pale yellowish brown (10YR 6/2) to moderate yellowish brown (10YR 5/2) animal burrows filled with sand noted to 18' bgs
17			RUN 3 16-26' REC: 9.2/10.0	3		17		
18				2.5		18		Abrupt change to; 18.4'-23.75': SILT with fines, soft, saturated, color dark yellowish brown (10YR 4/2)
19				>0.25		19		
20				>0.25		20		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	359.88
Casing Depth/Diameter:	62.36 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-8

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1250 / Time 1415
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/26/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 38	High solids grout	
to	Schedule 40	38 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		
21				>0.25		21		
22				>0.25		22		
23				>0.25		23		
24				>0.25		24		23.75'-30.6': SAND, with trace to little silt uniform, color dark yellowish brown (10YR 4/2)
25				-		25		
26				-		26		moderate yellowish brown (10YR 5/4)
27				-		27		
28				-		28		
29				-		29		
30			RUN 4 26-36' REC: 7.6/10.0	-		30		
31				>0.25		31		30.6'-30.8'=Clayey SILT, very soft, moist, color light olive gray (5Y 6/1) Abrupt change to;
32				>0.25		32		30.8'-32.5': Sandy SILT, very soft, loose, color moderate yellowish brown (10YR 5/4) grading to;
33				-		33		32.5-47.0': SAND, fine to medium grain size, with trace fines, moderately well sorted, color moderate yellowish brown (10YR 5/4)
34						34		
35						35		
36						36		As above; SAND with little medium to large rounded gravel through out RUN 5, color as above
37						37		
38			RUN 5 36-46' REC: 3.3/10.0			38		
39						39		
40						40		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	359.88
Casing Depth/Diameter:	62.36 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-8

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1250 / Time 1415
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/26/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 38	High solids grout	
to	Schedule 40	38 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		
41						41		
42						42		
43						43		
44						44		
45						45		
46						46		As above;
47						47		Granding change to;
48						48		47.0-60.0': SAND medium to course grain size, with trace to some rounded gravel,
49						49		moderately well sorted, color moderate yellowish brown (10YR 5/4).
50						50		
51			RUN 6 46-56' REC: 7.6/10.0			51		
52						52		
53						53		
54						54		
55						55		
56						56		As above;
57						57		
58			RUN 7 46-60' REC: 2.3/4.0			58		
59						59		
60						60		End of boring at 60' bgs

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	364.05
Casing Depth/Diameter:	63.18 / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-9
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1600 / Time 0850
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/25/17 / Date 08/26/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0			0-5' Hand Auger for Utility Clearance			0		0.0'-12.0': Clayey SILT, with trace to some very fine sand, root hairs present, dry and stiff color dary yellowish brown (10YR 4/2).
1				3		1		
2				1.75		2		below 2.0' bgs color grading to moderate yellowish brown (10 YR 5/4)
3				2		3		
4				2.25		4		
5				-		5		
			RUN 1 5-6' REC:	1				As above;
6						6		
7			RUN 2 6-16' REC: 8.2/10.0	1		7		
8				1		8		
9				1		9		
10				1		10		
11				0.75		11		
12				0.75		12		12.0'-22.5': Clayey SILT, moist, medium density, low plasticity, color dark yellowish brown (10YR 4/2)
13				1.25		13		
14						14		
15						15		
16						16		As above;
17			RUN 3 16-26' REC: 7.7/10.0	1		17		
18				1.25		18		
19				1.25		19		Increasing clay content below 19' bgs
20				1.5		20		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	364.05
Casing Depth/Diameter:	63.18 / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-9
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	Start / Finish
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Time 1600 / Time 0850
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Date 08/25/17 / Date 08/26/17
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		
21				1.5		21		
22				1.75		22		
23				>.25		23		22.5'-26.0': SILT with trace clay, color dark yellowish brown (10YR 4/2) to end of RUN 3
24						24		
25						25		
26						26		Inferred contact, Aburpt change to; 26.0'-28.0': Silty SAND, sand is very fine grain size, color dark yellowish brown (10YR 4/2)
27				>.25		27		
28				0.5		28		grading change to; 28.0'-29.0': SAND, very fine sand with trace fines, uniform, color dark yellowish brown (10 YR 4/2)
29				1		29		29.0'-31.0': Silty SAND, sand is very fine grain size, color dark yellowish brown (10YR 4/2)
30						30		
31			RUN 4 26-36' REC: 6.9/10.0			31		31.0'-39.0': SAND, very fine sand with trace fines, uniform, color dark yellowish brown (10 YR 4/2)
32						32		
33						33		
34						34		
35						35		
36						36		As above; very fine SAND
37						37		
38			RUN 5 36-46' REC: 5.1/10.0			38		
39						39		39.0-56.0': SAND medium to course grain size, with trace to some rounded gravel, moderately well sorted, matrix color moderate yellowish brown (10YR 5/4).
40						40		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	364.05
Casing Depth/Diameter:	63.18 / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-9

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 3
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1600 / Time 0850
☐ Mud Rotary	2" x 18"	☐ Other:	Date 08/25/17 / Date 08/26/17
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		
41						41		
42						42		
43						43		
44						44		
45						45		
46						46		As above;
47						47		
48						48		
49						49		
50			RUN 6 46-56' REC: 2.1/10.0			50		
51						51		
52						52		
53						53		
54						54		
55						55		
56						56		Very course sands and gravel noted in sample catcher - no other recovery from RUN 7 on two re-attempts
57						57		
58			RUN 7 46-60' REC: 0.0/4.0			58		
59						59		
60						60		End of boring at 60' bgs

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	60 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	18.76 ft
Surface Elevation:	357.06
Casing Depth/Diameter:	62.55 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-10S
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 1
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1355 / Time 1505
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 08/27/17 / Date 08/27/17
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 50	Solid 2" PVC Pipe	0 to 1	Concrete well pad	STICKUP
50 to 60	2" PVC Screen	1 to 42	High solids grout	
to	Schedule 40	42 to 47	Med bentonite chip	
to		47 to 60	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0						0		Blind drilled to depth (SEE BORING LOG APW-10D for geologic discription)
1						1		NOTE: APW-10S located west of APW-10D
2						2		
3						3		
4						4		
5						5		
6						6		
7						7		
8						8		
9						9		
10						10		
11						11		
12						12		
13						13		
14						14		
15						15		
16						16		
17						17		
18						18		
19						19		
20						20		

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BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 1 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1520 / Time 1300
☐ Mud Rotary	2" x 18"	☐ Other:	Date 8/26/2017 / Date 8/27/2017
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 87	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
86 to 96	2" PVC screen	1 to 72	High solids grout	
to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
0			0-5' Hand Auger for Utility Clearance			0		0'-7.2': Clayey SILT, dry and hard, color light olive gray (5Y 6/1)
1						1		Color grading to olive black (5Y 2/1)
2						2		
3						3		
4						4		
5			RUN 1 5-6' REC:			5		As above;
6						6		
7			RUN 2 6-16' REC: 4.3/10.0			7		Inferred contact, grading change to; 7.2'- ': Silty SAND grading to;
8						8		8.0'-26.0': SAND, fine to medium grain size, with small rounded gravel, color moderate yellowish brown (10YR 5/4).
9						9		
10						10		
11						11		
12						12		
13						13		
14						14		
15						15		
16			RUN 3 16-26' REC: 2.7/10.0			16		As above;
17						17		
18						18		
19						19		
20						20		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 2 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1520 / Time 1300
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 8/26/2017 / Date 8/27/2017
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 87	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
86 to 96	2" PVC screen	1 to 72	High solids grout	
to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
20						20		
21						21		
22						22		
23						23		
24						24		
25						25		
26						26		Abrupt change to; 26.0'-40.0': Clayely SILT, massive, soft and sicky, low plasticity, color olive gray (5Y 4/1)
27			RUN 4 26-36' REC: 9.7/10.0	0.25		27		
28				0.25		28		
29				0.25		29		
30				0.25		30		
31				0.25		31		
32				0.5		32		
33				0.5		33		
34				0.5		34		
35				0.5		35		
36				0.5		36		As above; color grading to medium dark gray (N4) below 36' bgs
37			RUN 5 36-46' REC: 10.0/10.0	1		37		
38				1		38		
39				0.75		39		
40				0.75		40		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.
Contractor:	Cascade Drilling Inc.
	Chris Barden

PN:	Client:	Boring No.
0297751	Grand Tower Energy Center	APW-6D

Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 3 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1520 / Time 1300
☐ Mud Rotary	2" x 18"	☐ Other:	Date 8/26/2017 / Date 8/27/2017
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 87	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
86 to 96	2" PVC screen	1 to 72	High solids grout	
to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
40						40		Grading change;
41					<0.25	41		40.0'-43.0': Clayey SILT, enriched with clay compared to as above, massive, medium plasticity, soft and sticky, color medium dark gray (N4)
42					<0.25	42		
43					<0.25	43		Grading change;
44					0.5	44		43.0'-48.0': Clayely SILT, massive, soft and sicky, low plasticity, color medium dark gray (N4)
45					0.5	45		
46					0.5	46		
47					0.5	47		
48					0.5	48		Inferred contact, grading change; 48.0'-51.7': Sandy SILT, low plasticity, color medium dark gray (N4)
49					0.5	49		
50			RUN 6 46-56' REC: 8.3/10.0		0.5	50		
51					0.5	51		Inferred contact, abrupt change to;
52					-	52		51.7'-58.1': SAND, very fine grain size, uniform; color medium dark gray (N4) to end of RUN6
53					-	53		
54					-	54		
55						55		
56						56		As above;
57						57		
58			RUN 7 56-66' REC: 9.9/10.0			58		Abrupt change to; 58.1'-75.0': Clayey Silt, massive, firm, color olive gray (5Y 4/1)
59					0.75	59		
60					0.75	60		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 4 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	Start / Finish
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Time 1520 / Time 1300
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Date 8/26/2017 / Date 8/27/2017
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
	☐ Other:	Logged by: Michael Bates	

Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
0 to 87	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
86 to 96	2" PVC screen	1 to 72	High solids grout	
to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
60						60		
61				0.75		61		
62				0.75		62		
63				0.75		63		
64				0.75		64		
65				0.75		65		
66				0.75		66		As above;
67				0.75		67		
68				0.75		68		
69				0.75		69		
70			RUN 8 66-76' REC: 9.8/10.0	0.75		70		
71				0.75		71		
72				0.75		72		
73				0.75		73		
74				0.75		74		
75				0.75		75		Grading change to; 75.0'-86.0': Silty SAND; fine to medium grain size, with trace fines, color olive gray (5Y 4/1)
76				0.75		76		As above;
77						77		
78			RUN 9 76-86' REC: 1.8/10			78		
79				0.75		79		
80				0.75		80		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 5 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	Start / Finish
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Time 1520 / Time 1300
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Date 8/26/2017 / Date 8/27/2017
☐ Mud Rotary	2" x 18"	☐ Other:	
■ Sonic	3" x 12"		
☐ Other: Air Knife	☐ 2" x 48"		
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Well Construction Summary

Depth (ft)	Casing/Screen	Depth (ft)	Annulus	Surface Completion
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to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
80						80		
81						81		
82						82		
83						83		
84						84		
85						85		
86						86		Abrupt change to;
87						87		86.0'-97.0': SAND, medium to course grain size, with little to few rounded small to large gravel throughout, moderately graded, matrix color is dark yellowish brown (10YR 4/2),
88						88		gravel and course sands are highly varigated one large limestone cobble at base of RUN 10
89						89		
90			RUN 10 86-96' REC: 3.8/10.0			90		
91						91		
92						92		
93						93		
94						94		
95						95		
96						96		
97						97		97.0'-102.0': Limestone Bedrock, Silty micro-fossiliferous, porous and vuggy,
98			RUN 11 96-102' REC: 1.9/6.0			98		vertical fractorus filled with calcite mineralization color dark yellowish orange (10YR 6/6)
99						99		
100						100		

ERM

BORING/WELL CONSTRUCTION LOG

Boring Depth/Diameter:	96 ft / 6.25 in.
Depth G. W. Encountered (During Drilling):	UNK
Depth G. W. Encountered (After Drilling):	17.65 ft
Surface Elevation:	356.94
Casing Depth/Diameter:	98.09 ft / 2 in.

Contractor: Cascade Drilling Inc.
Chris Barden

PN: 0297751	Client: Grand Tower Energy Center		Boring No. APW-6D
Drilling Method	Sampling Method	Sampling Interval	Site: Grand Tower, IL
■ Hand Auger	☐ Glass Jar	☐ 2.5 ft	Sheet 6 of 6
☐ Hollow-Stem	☐ 2x6" Sampler	☐ 5 ft	
☐ Direct Push	☐ Split Spoon	☐ 10 ft	Start / Finish
☐ Air Rotary	1.5" x 18"	☐ Continuous Core	Time 1520 / Time 1300
☐ Mud Rotary	2" x 18"		
■ Sonic	3" x 12"	☐ Other:	Date 8/26/2017 / Date 8/27/2017
☐ Other: Air Knife	☐ 2" x 48"		
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Well Construction Summary

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0 to 87	Solid 2" PVC pipe	0 to 1	Concrete well pad	STICKUP
86 to 96	2" PVC screen	1 to 72	High solids grout	
to	Schedule 80	72 to 83	Med bentonite chip	
to		83 to 102	Filter sand	
to		to		

Depth in Feet	PID/OVM (ppm)	Sample I.D.	Run Length/Rec.	Penetrometer	Well Construction	Depth in Feet	USCS Designation	Description (soil type, admixtures, color, density, moisture, stain, odors)
100						100		grading change with depth to; limestone very dense, with course calcite cystalization, color light gray (N7)
101						101		
102						102		End of boring at 102' bgs
103						103		
104						104		
105						105		
106						106		
107						107		
108						108		
109						109		
110						110		
111						111		
112						112		
113						113		
114						114		
115						115		
116						116		
117						117		
118						118		
119						119		
120						120		

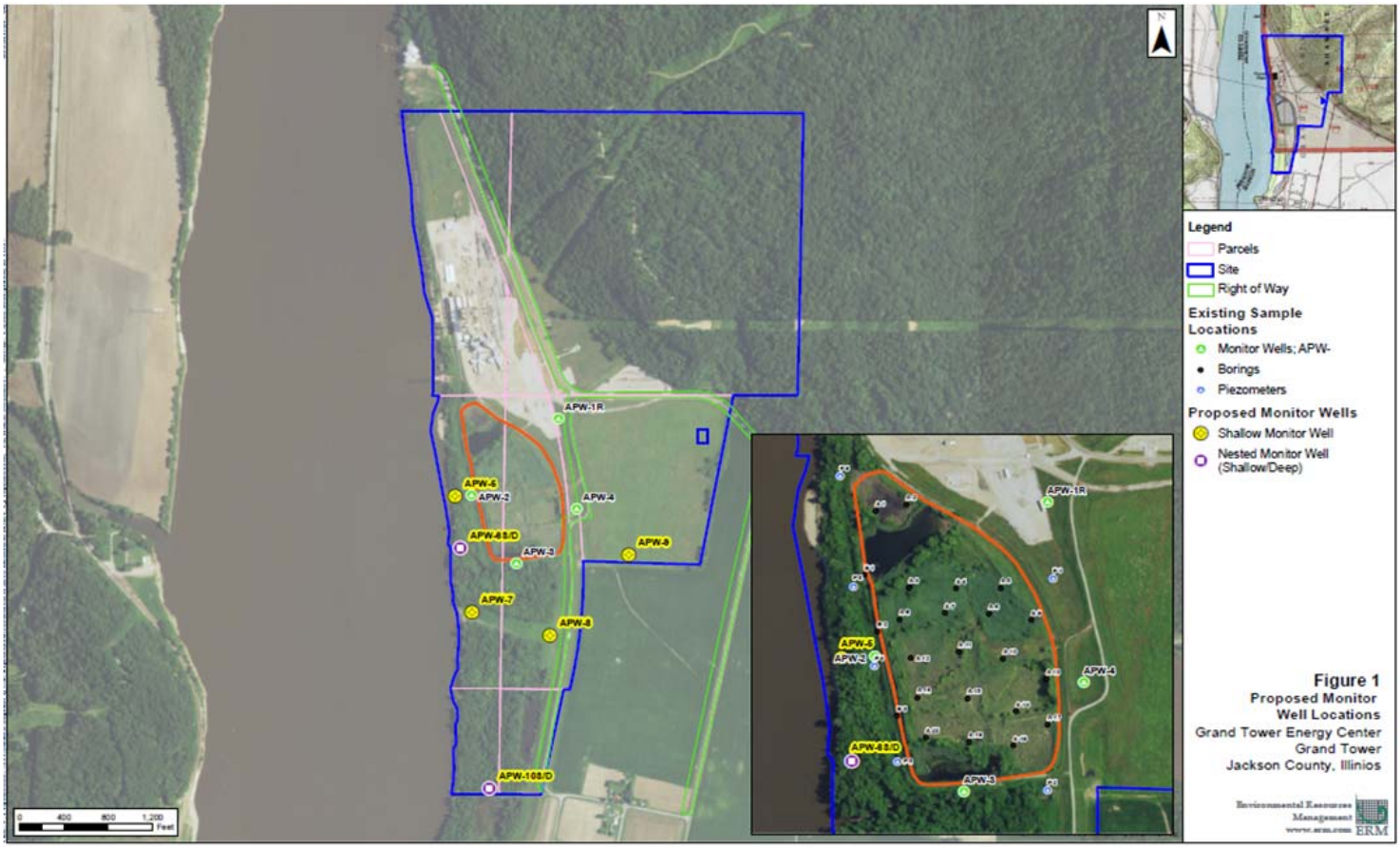
Appendix B
Laboratory Analytical Reports

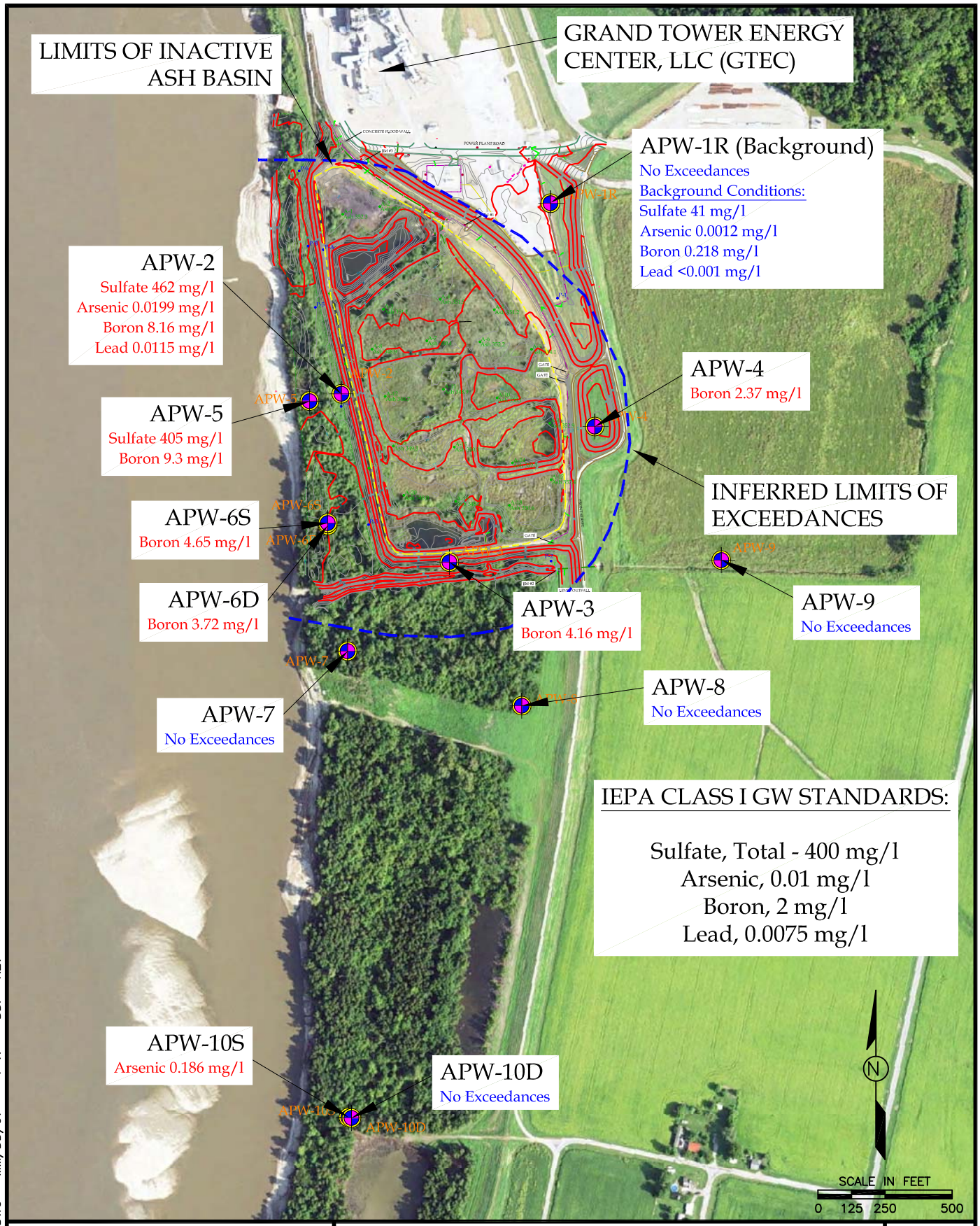
Event 1

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 1 **Date Samples Collected:** **From** 9/5/17 **To** 9/8/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	< 5	13	22	12	15	31	17	15	9	13	10	24
Sulfate, Total	mg/L	400	41	**462**	175	126	**407**	127	215	66	43	65	10	38
Fluoride, Total	mg/L	4	0.15	0.24	0.28	0.18	0.34	0.41	0.22	0.35	0.3	0.19	0.19	0.1
Lab pH		6.5 - 9.0	6.64	7.09	7.88	7.31	7.37	7.16	7.23	6.84	7.04	7.31	6.99	7.12
Total Dissolved Solids	mg/L	1200	400	858	464	460	842	500	558	762	438	364	708	466
Antimony	mg/L	0.006	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.01	0.0012	**0.0199**	0.0022	0.0025	0.0031	0.0017	0.0068	0.0014	< 0.001	0.0031	**0.186**	< 0.001
Barium	mg/L	2	0.168	0.479	0.111	0.145	0.226	0.222	0.173	0.465	0.207	0.227	0.613	0.437
Beryllium	mg/L	0.004	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Boron	mg/L	2	0.218	**8.16**	**4.16**	**2.37**	**9.3**	**4.65**	**3.72**	0.235	0.132	0.877	0.525	0.0999
Cadmium	mg/L	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Calcium	No Standard		84.3	148	86.3	101	136	101	99.9	192	97.4	85.9	136	118
Chromium	mg/L	0.1	0.0023	0.0374	0.0081	0.0041	0.0137	0.0027	< 0.001	0.0017	0.0018	0.0148	0.0091	0.0036
Cobalt	mg/L	1	< 0.001	0.0057	< 0.001	0.0013	< 0.001	< 0.001	0.0012	< 0.001	0.0017	0.0031	< 0.001	0.0039
Lead	mg/L	0.0075	< 0.001	**0.0115**	0.0021	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Lithium	No Standard		0.0155	0.05	0.0258	0.0404	0.0363	0.0335	0.016	0.0147	0.0196	0.0176	0.0263	0.0147
Molybdenum	No Standard		< 0.001	0.172	0.0778	0.0891	0.172	0.249	0.0646	0.0046	0.0011	0.0223	0.0017	0.0024
Nickel	mg/L	0.1	0.0044	0.0288	0.0055	0.0065	0.0074	0.0021	0.0032	0.0014	0.0039	0.012	0.0051	0.0095
Selenium	mg/L	0.05	0.0038	0.001	0.001	0.0158	< 0.001	< 0.001	< 0.001	< 0.001	0.008	0.0126	< 0.001	< 0.001
Thallium	mg/L	0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Mercury, Total	mg/L	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Radium-226	pCi/l	20	0.25	1.06	0.53	0.38	0.37	0.36	0.62	0.47	0.22	0.17	0.4	0.34
Radium-228	pCi/l	20	2.29	1.98	2.05	0.95	1.07	0.56	1.07	-0.42	1.13	0.91	0.38	1.16
Radium-226/228 Comb.	pCi/l	-----	2.54	3.04	2.58	1.33	1.44	0.92	1.69	0.47	1.35	1.08	0.78	1.5





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 1 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
1

October 04, 2017

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17090465

Dear Brett Carney:

TEKLAB, INC received 12 samples on 9/8/2017 1:57:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	18
Dates Report	19
Quality Control Results	24
Receiving Check List	34
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

Abbr	Definition
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

Cooler Receipt Temp: 2.82 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email jhriley@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 09/05/2017 15:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**400**	mg/L	1	09/11/2017 17:10	R237546
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**41**	mg/L	2	09/14/2017 11:53	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.64**		1	09/08/2017 16:00	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	09/13/2017 17:53	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	09/13/2017 0:03	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	09/15/2017 16:27	134177
Barium	NELAP	0.0010		**0.168**	mg/L	5	09/15/2017 16:27	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Boron	NELAP	0.0250		**0.218**	mg/L	5	09/15/2017 16:27	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Calcium	NELAP	0.125	S	**84.3**	mg/L	5	09/18/2017 16:11	134177
Chromium	NELAP	0.0010		**0.0023**	mg/L	5	09/15/2017 16:27	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Lithium		0.0010		**0.0155**	mg/L	5	09/15/2017 16:27	134177
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	09/18/2017 10:23	134177
Nickel	NELAP	0.0010		**0.0044**	mg/L	5	09/18/2017 16:11	134177
Selenium	NELAP	0.0010		**0.0038**	mg/L	5	09/15/2017 16:27	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:27	134177
Ca - Matrix interference present in sample. Verified by bench spike.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 11:55	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-002
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 09/05/2017 16:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20	R	**364**	mg/L	1	09/11/2017 17:11	R237546
RPD for DUP was outside of QC limit due to sample composition.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**65**	mg/L	2	09/14/2017 12:04	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.31**		1	09/08/2017 16:02	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	09/13/2017 17:56	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	09/13/2017 0:41	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:35	134177
Arsenic	NELAP	0.0010		**0.0031**	mg/L	5	09/15/2017 16:35	134177
Barium	NELAP	0.0010		**0.227**	mg/L	5	09/15/2017 16:35	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:35	134177
Boron	NELAP	0.0250		**0.877**	mg/L	5	09/15/2017 16:35	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:35	134177
Calcium	NELAP	0.125		**85.9**	mg/L	5	09/15/2017 16:35	134177
Chromium	NELAP	0.0010		**0.0148**	mg/L	5	09/15/2017 16:35	134177
Cobalt	NELAP	0.0010		**0.0031**	mg/L	5	09/15/2017 16:35	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:35	134177
Lithium		0.0010		**0.0176**	mg/L	5	09/15/2017 16:35	134177
Molybdenum	NELAP	0.0010		**0.0223**	mg/L	5	09/18/2017 10:31	134177
Nickel	NELAP	0.0010		**0.0120**	mg/L	5	09/18/2017 10:31	134177
Selenium	NELAP	0.0010		**0.0126**	mg/L	5	09/15/2017 16:35	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:35	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 11:57	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-003
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 09/06/2017 10:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**464**	mg/L	1	09/12/2017 16:12	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**175**	mg/L	10	09/13/2017 1:11	R237579
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.88**		1	09/08/2017 16:04	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.28**	mg/L	1	09/13/2017 17:58	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**22**	mg/L	1	09/13/2017 1:03	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
Arsenic	NELAP	0.0010		**0.0022**	mg/L	5	09/15/2017 16:43	134177
Barium	NELAP	0.0010		**0.111**	mg/L	5	09/15/2017 16:43	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
Boron	NELAP	0.0250		**4.16**	mg/L	5	09/15/2017 16:43	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
Calcium	NELAP	0.125		**86.3**	mg/L	5	09/15/2017 16:43	134177
Chromium	NELAP	0.0010		**0.0081**	mg/L	5	09/15/2017 16:43	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
Lead	NELAP	0.0010		**0.0021**	mg/L	5	09/15/2017 16:43	134177
Lithium		0.0010		**0.0258**	mg/L	5	09/15/2017 16:43	134177
Molybdenum	NELAP	0.0010		**0.0778**	mg/L	5	09/18/2017 10:39	134177
Nickel	NELAP	0.0010		**0.0055**	mg/L	5	09/18/2017 10:39	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:43	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:00	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-004
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 09/06/2017 12:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**842**	mg/L	1	09/12/2017 16:12	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**407**	mg/L	10	09/13/2017 1:32	R237579
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.37**		1	09/08/2017 16:06	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.34**	mg/L	1	09/13/2017 18:00	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	09/13/2017 1:11	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Arsenic	NELAP	0.0010		**0.0031**	mg/L	5	09/15/2017 16:51	134177
Barium	NELAP	0.0010		**0.226**	mg/L	5	09/15/2017 16:51	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Boron	NELAP	0.0250		**9.30**	mg/L	5	09/15/2017 16:51	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Calcium	NELAP	0.125		**136**	mg/L	5	09/15/2017 16:51	134177
Chromium	NELAP	0.0010		**0.0137**	mg/L	5	09/15/2017 16:51	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Lithium		0.0010		**0.0363**	mg/L	5	09/15/2017 16:51	134177
Molybdenum	NELAP	0.0010		**0.172**	mg/L	5	09/18/2017 10:48	134177
Nickel	NELAP	0.0010		**0.0074**	mg/L	5	09/18/2017 10:48	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 16:51	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:02	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-005
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 09/06/2017 13:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**858**	mg/L	1	09/12/2017 16:12	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**462**	mg/L	10	09/13/2017 1:40	R237579
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.09**		1	09/08/2017 16:08	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	09/13/2017 18:04	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	09/13/2017 1:32	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:00	134177
Arsenic	NELAP	0.0010		**0.0199**	mg/L	5	09/15/2017 17:00	134177
Barium	NELAP	0.0010		**0.479**	mg/L	5	09/15/2017 17:00	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:00	134177
Boron	NELAP	0.0250		**8.16**	mg/L	5	09/15/2017 17:00	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:00	134177
Calcium	NELAP	0.125		**148**	mg/L	5	09/15/2017 17:00	134177
Chromium	NELAP	0.0010		**0.0374**	mg/L	5	09/15/2017 17:00	134177
Cobalt	NELAP	0.0010		**0.0057**	mg/L	5	09/15/2017 17:00	134177
Lead	NELAP	0.0010		**0.0115**	mg/L	5	09/15/2017 17:00	134177
Lithium		0.0010		**0.0500**	mg/L	5	09/15/2017 17:00	134177
Molybdenum	NELAP	0.0010		**0.172**	mg/L	5	09/18/2017 10:56	134177
Nickel	NELAP	0.0010		**0.0288**	mg/L	5	09/18/2017 10:56	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:00	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:00	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:09	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-006
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 09/06/2017 14:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**558**	mg/L	1	09/12/2017 16:13	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**215**	mg/L	10	09/13/2017 1:49	R237579
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.23**		1	09/08/2017 16:11	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	09/13/2017 18:06	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	09/13/2017 1:40	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Arsenic	NELAP	0.0010		**0.0068**	mg/L	5	09/15/2017 17:08	134177
Barium	NELAP	0.0010		**0.173**	mg/L	5	09/15/2017 17:08	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Boron	NELAP	0.0250		**3.72**	mg/L	5	09/15/2017 17:08	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Calcium	NELAP	0.125		**99.9**	mg/L	5	09/15/2017 17:08	134177
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Cobalt	NELAP	0.0010		**0.0012**	mg/L	5	09/15/2017 17:08	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Lithium		0.0010		**0.0160**	mg/L	5	09/15/2017 17:08	134177
Molybdenum	NELAP	0.0010		**0.0646**	mg/L	5	09/18/2017 11:04	134177
Nickel	NELAP	0.0010		**0.0032**	mg/L	5	09/18/2017 11:04	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:08	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:12	133991
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-007
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 09/06/2017 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**500**	mg/L	1	09/12/2017 16:13	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**127**	mg/L	10	09/13/2017 1:57	R237579
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.16**		1	09/08/2017 16:12	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.41**	mg/L	1	09/13/2017 18:08	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**31**	mg/L	1	09/13/2017 1:48	R237578
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Arsenic	NELAP	0.0010		**0.0017**	mg/L	5	09/15/2017 17:33	134177
Barium	NELAP	0.0010		**0.222**	mg/L	5	09/15/2017 17:33	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Boron	NELAP	0.0250		**4.65**	mg/L	5	09/15/2017 17:33	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Calcium	NELAP	0.125		**101**	mg/L	5	09/15/2017 17:33	134177
Chromium	NELAP	0.0010		**0.0027**	mg/L	5	09/15/2017 17:33	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Lithium		0.0010		**0.0335**	mg/L	5	09/15/2017 17:33	134177
Molybdenum	NELAP	0.0010		**0.249**	mg/L	5	09/18/2017 11:12	134177
Nickel	NELAP	0.0010		**0.0021**	mg/L	5	09/18/2017 11:12	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:33	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:35	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

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Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-008
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 09/07/2017 11:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**466**	mg/L	1	09/12/2017 16:13	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**38**	mg/L	1	09/14/2017 12:39	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.12**		1	09/08/2017 16:14	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.10**	mg/L	1	09/13/2017 18:10	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**24**	mg/L	1	09/14/2017 12:37	R237675
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Barium	NELAP	0.0010		**0.437**	mg/L	5	09/15/2017 17:41	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Boron	NELAP	0.0250		**0.0999**	mg/L	5	09/15/2017 17:41	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Calcium	NELAP	0.125		**118**	mg/L	5	09/15/2017 17:41	134177
Chromium	NELAP	0.0010		**0.0036**	mg/L	5	09/15/2017 17:41	134177
Cobalt	NELAP	0.0010		**0.0039**	mg/L	5	09/15/2017 17:41	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Lithium		0.0010		**0.0147**	mg/L	5	09/15/2017 17:41	134177
Molybdenum	NELAP	0.0010		**0.0024**	mg/L	5	09/18/2017 11:20	134177
Nickel	NELAP	0.0010		**0.0095**	mg/L	5	09/18/2017 11:20	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:41	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:37	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-009
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 09/07/2017 12:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**708**	mg/L	1	09/12/2017 16:14	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**10**	mg/L	1	09/14/2017 12:47	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.99**		1	09/08/2017 16:16	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	09/13/2017 18:17	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	09/14/2017 12:45	R237675
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Arsenic	NELAP	0.0010		**0.186**	mg/L	5	09/15/2017 17:49	134177
Barium	NELAP	0.0010		**0.613**	mg/L	5	09/15/2017 17:49	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Boron	NELAP	0.0250		**0.525**	mg/L	5	09/15/2017 17:49	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Calcium	NELAP	0.125		**136**	mg/L	5	09/15/2017 17:49	134177
Chromium	NELAP	0.0010		**0.0091**	mg/L	5	09/15/2017 17:49	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Lithium		0.0010		**0.0263**	mg/L	5	09/15/2017 17:49	134177
Molybdenum	NELAP	0.0010		**0.0017**	mg/L	5	09/18/2017 11:47	134177
Nickel	NELAP	0.0010		**0.0051**	mg/L	5	09/18/2017 16:19	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:49	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:40	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-010
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 09/07/2017 14:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**438**	mg/L	1	09/12/2017 16:14	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**43**	mg/L	1	09/14/2017 12:56	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.04**		1	09/08/2017 16:18	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.30**	mg/L	1	09/13/2017 18:19	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	09/14/2017 12:53	R237675
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
Barium	NELAP	0.0010		**0.207**	mg/L	5	09/15/2017 17:57	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
Boron	NELAP	0.0250		**0.132**	mg/L	5	09/15/2017 17:57	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
Calcium	NELAP	0.125		**97.4**	mg/L	5	09/15/2017 17:57	134177
Chromium	NELAP	0.0010		**0.0018**	mg/L	5	09/15/2017 17:57	134177
Cobalt	NELAP	0.0010		**0.0017**	mg/L	5	09/15/2017 17:57	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
Lithium		0.0010		**0.0196**	mg/L	5	09/15/2017 17:57	134177
Molybdenum	NELAP	0.0010		**0.0011**	mg/L	5	09/18/2017 11:55	134177
Nickel	NELAP	0.0010		**0.0039**	mg/L	5	09/18/2017 16:27	134177
Selenium	NELAP	0.0010		**0.0080**	mg/L	5	09/15/2017 17:57	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 17:57	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:42	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-011
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 09/07/2017 16:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**762**	mg/L	1	09/12/2017 16:14	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**66**	mg/L	2	09/14/2017 14:49	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.84**		1	09/08/2017 16:23	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.35**	mg/L	1	09/13/2017 18:21	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	09/14/2017 13:01	R237675
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Arsenic	NELAP	0.0010		**0.0014**	mg/L	5	09/15/2017 18:05	134177
Barium	NELAP	0.0010		**0.465**	mg/L	5	09/15/2017 18:05	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Boron	NELAP	0.0250		**0.235**	mg/L	5	09/15/2017 18:05	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Calcium	NELAP	0.125		**192**	mg/L	5	09/15/2017 18:05	134177
Chromium	NELAP	0.0010		**0.0017**	mg/L	5	09/15/2017 18:05	134177
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Lithium		0.0010		**0.0147**	mg/L	5	09/15/2017 18:05	134177
Molybdenum	NELAP	0.0010		**0.0046**	mg/L	5	09/18/2017 12:04	134177
Nickel	NELAP	0.0010		**0.0014**	mg/L	5	09/18/2017 16:36	134177
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:05	134177
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:49	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17090465
Client Project: Grand Tower CCR GW
Report Date: 04-Oct-17
Lab ID: 17090465-012
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 09/08/2017 10:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**460**	mg/L	1	09/12/2017 16:14	R237592
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**126**	mg/L	5	09/14/2017 13:17	R237678
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.31**		1	09/08/2017 16:25	R237439
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.18**	mg/L	1	09/13/2017 18:25	R237626
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	09/14/2017 13:09	R237675
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:14	134177
Arsenic	NELAP	0.0010		**0.0025**	mg/L	5	09/15/2017 18:14	134177
Barium	NELAP	0.0010		**0.145**	mg/L	5	09/15/2017 18:14	134177
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:14	134177
Boron	NELAP	0.0250		**2.37**	mg/L	5	09/18/2017 16:44	134177
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:14	134177
Calcium	NELAP	0.125	S	**101**	mg/L	5	09/18/2017 16:44	134177
Chromium	NELAP	0.0010		**0.0041**	mg/L	5	09/15/2017 18:14	134177
Cobalt	NELAP	0.0010		**0.0013**	mg/L	5	09/15/2017 18:14	134177
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:14	134177
Lithium		0.0010		**0.0404**	mg/L	5	09/15/2017 18:14	134177
Molybdenum	NELAP	0.0010		**0.0891**	mg/L	5	09/18/2017 12:12	134177
Nickel	NELAP	0.0010		**0.0065**	mg/L	5	09/18/2017 16:44	134177
Selenium	NELAP	0.0010		**0.0158**	mg/L	5	09/15/2017 18:14	134177
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	09/15/2017 18:14	134177
Ca - Matrix interference present in sample. Verified by bench spike.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	09/11/2017 12:52	133992
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451
Radium-228		0		**See attached**	pci/L	1	09/28/2017 0:00	R238451

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17090465-001	APW-1R	Groundwater	3	09/05/2017 15:00
17090465-002	APW-9	Groundwater	3	09/05/2017 16:40
17090465-003	APW-3	Groundwater	3	09/06/2017 10:00
17090465-004	APW-5	Groundwater	3	09/06/2017 12:05
17090465-005	APW-2	Groundwater	3	09/06/2017 13:10
17090465-006	APW-6D	Groundwater	3	09/06/2017 14:20
17090465-007	APW-6S	Groundwater	3	09/06/2017 15:30
17090465-008	APW-10D	Groundwater	3	09/07/2017 11:00
17090465-009	APW-10S	Groundwater	3	09/07/2017 12:00
17090465-010	APW-8	Groundwater	3	09/07/2017 14:50
17090465-011	APW-7	Groundwater	3	09/07/2017 16:45
17090465-012	APW-4	Groundwater	3	09/08/2017 10:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17090465-001A	APW-1R	09/05/2017 15:00	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/11/2017 17:10
	SW-846 9036 (Total)				09/14/2017 11:53
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:00
	SW-846 9214 (Total)				09/13/2017 17:53
	SW-846 9251 (Total)				09/13/2017 0:03
17090465-001B	APW-1R	09/05/2017 15:00	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-001C	APW-1R	09/05/2017 15:00	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 16:27
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 10:23
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 16:11
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 11:55
17090465-002A	APW-9	09/05/2017 16:40	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/11/2017 17:11
	SW-846 9036 (Total)				09/14/2017 12:04
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:02
	SW-846 9214 (Total)				09/13/2017 17:56
	SW-846 9251 (Total)				09/13/2017 0:41
17090465-002B	APW-9	09/05/2017 16:40	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-002C	APW-9	09/05/2017 16:40	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 16:35
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 10:31
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 11:57
17090465-003A	APW-3	09/06/2017 10:00	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:12
	SW-846 9036 (Total)				09/13/2017 1:11
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:04
	SW-846 9214 (Total)				09/13/2017 17:58
	SW-846 9251 (Total)				09/13/2017 1:03
17090465-003B	APW-3	09/06/2017 10:00	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-003C	APW-3	09/06/2017 10:00	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 16:43
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 10:39

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 12:00
17090465-004A	APW-5	09/06/2017 12:05	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:12
	SW-846 9036 (Total)				09/13/2017 1:32
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:06
	SW-846 9214 (Total)				09/13/2017 18:00
	SW-846 9251 (Total)				09/13/2017 1:11
17090465-004B	APW-5	09/06/2017 12:05	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-004C	APW-5	09/06/2017 12:05	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 16:51
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 10:48
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 12:02
17090465-005A	APW-2	09/06/2017 13:10	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:12
	SW-846 9036 (Total)				09/13/2017 1:40
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:08
	SW-846 9214 (Total)				09/13/2017 18:04
	SW-846 9251 (Total)				09/13/2017 1:32
17090465-005B	APW-2	09/06/2017 13:10	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-005C	APW-2	09/06/2017 13:10	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:00
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 10:56
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 12:09
17090465-006A	APW-6D	09/06/2017 14:20	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:13
	SW-846 9036 (Total)				09/13/2017 1:49
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:11
	SW-846 9214 (Total)				09/13/2017 18:06
	SW-846 9251 (Total)				09/13/2017 1:40
17090465-006B	APW-6D	09/06/2017 14:20	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-006C	APW-6D	09/06/2017 14:20	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:08
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 11:04

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 7470A (Total)			09/08/2017 17:04	09/11/2017 12:12
17090465-007A	APW-6S	09/06/2017 15:30	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:13
	SW-846 9036 (Total)				09/13/2017 1:57
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:12
	SW-846 9214 (Total)				09/13/2017 18:08
	SW-846 9251 (Total)				09/13/2017 1:48
17090465-007B	APW-6S	09/06/2017 15:30	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-007C	APW-6S	09/06/2017 15:30	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:33
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 11:12
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:35
17090465-008A	APW-10D	09/07/2017 11:00	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:13
	SW-846 9036 (Total)				09/14/2017 12:39
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:14
	SW-846 9214 (Total)				09/13/2017 18:10
	SW-846 9251 (Total)				09/14/2017 12:37
17090465-008B	APW-10D	09/07/2017 11:00	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-008C	APW-10D	09/07/2017 11:00	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:41
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 11:20
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:37
17090465-009A	APW-10S	09/07/2017 12:00	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:14
	SW-846 9036 (Total)				09/14/2017 12:47
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:16
	SW-846 9214 (Total)				09/13/2017 18:17
	SW-846 9251 (Total)				09/14/2017 12:45
17090465-009B	APW-10S	09/07/2017 12:00	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-009C	APW-10S	09/07/2017 12:00	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:49
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 11:47

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 16:19
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:40
17090465-010A	APW-8	09/07/2017 14:50	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:14
	SW-846 9036 (Total)				09/14/2017 12:56
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:18
	SW-846 9214 (Total)				09/13/2017 18:19
	SW-846 9251 (Total)				09/14/2017 12:53
17090465-010B	APW-8	09/07/2017 14:50	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-010C	APW-8	09/07/2017 14:50	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 17:57
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 11:55
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 16:27
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:42
17090465-011A	APW-7	09/07/2017 16:45	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:14
	SW-846 9036 (Total)				09/14/2017 14:49
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:23
	SW-846 9214 (Total)				09/13/2017 18:21
	SW-846 9251 (Total)				09/14/2017 13:01
17090465-011B	APW-7	09/07/2017 16:45	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00
17090465-011C	APW-7	09/07/2017 16:45	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 18:05
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 12:04
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 16:36
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:49
17090465-012A	APW-4	09/08/2017 10:00	09/08/2017 13:57		
	Standard Methods 2540 C (Total)				09/12/2017 16:14
	SW-846 9036 (Total)				09/14/2017 13:17
	SW-846 9040B, Laboratory Analyzed				09/08/2017 16:25
	SW-846 9214 (Total)				09/13/2017 18:25
	SW-846 9251 (Total)				09/14/2017 13:09
17090465-012B	APW-4	09/08/2017 10:00	09/08/2017 13:57		
	EPA 903.0/904.0, Radium 226/228				09/28/2017 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
17090465-012C	APW-4	09/08/2017 10:00	09/08/2017 13:57		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/15/2017 18:14
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 12:12
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/14/2017 16:18	09/18/2017 16:44
	SW-846 7470A (Total)			09/08/2017 17:10	09/11/2017 12:52

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

STANDARD METHODS 2540 C (TOTAL)

Batch R237546 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						09/11/2017
Total Dissolved Solids	20		**< 20**						09/11/2017
Total Dissolved Solids	20		**< 20**						09/11/2017
Total Dissolved Solids	20		**< 20**						09/11/2017

Batch R237546 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**962**	1000	0	96.2	90	110	09/11/2017

Batch R237546 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**980**	1000	0	98.0	90	110	09/11/2017
Total Dissolved Solids	20		**964**	1000	0	96.4	90	110	09/11/2017
Total Dissolved Solids	20		**978**	1000	0	97.8	90	110	09/11/2017

Batch R237546 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17090465-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	R	**414**				364.0	12.85	09/11/2017

Batch R237592 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						09/12/2017
Total Dissolved Solids	20		**< 20**						09/12/2017
Total Dissolved Solids	20		**< 20**						09/12/2017

Batch R237592 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**990**	1000	0	99.0	90	110	09/12/2017

Batch R237592 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**984**	1000	0	98.4	90	110	09/12/2017
Total Dissolved Solids	20		**932**	1000	0	93.2	90	110	09/12/2017

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

STANDARD METHODS 2540 C (TOTAL)

Batch R237592 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17090465-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**478**				464.0	2.97	09/12/2017

SW-846 9036 (TOTAL)

Batch R237579 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						09/12/2017

Batch R237579 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	98.9	90	110	09/12/2017

Batch R237678 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						09/14/2017

Batch R237678 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	97.0	90	110	09/14/2017

Batch R237678 **SampType:** MS Units **mg/L**

SampID: 17090465-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**60**	20.00	41.22	93.5	85	115	09/14/2017

Batch R237678 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17090465-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**60**	20.00	41.22	92.9	59.91	0.18	09/14/2017

Batch R237678 **SampType:** MS Units **mg/L**

SampID: 17090465-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**86**	20.00	65.00	106.2	85	115	09/14/2017

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

SW-846 9036 (TOTAL)

Batch R237678 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17090465-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**86**	20.00	65.00	105.4	86.25	0.21	09/14/2017

SW-846 9040B, LABORATORY ANALYZED

Batch R237439 **SampType:** LCS Units

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.99**	7.000	0	99.9	99.1	100.8	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.67**				6.640	0.45	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.32**				7.310	0.14	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.90**				7.880	0.25	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.35**				7.370	0.27	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.10**				7.090	0.14	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.22**				7.230	0.14	09/08/2017

Client: ERM **Work Order:** 17090465

Client Project: Grand Tower CCR GW **Report Date:** 04-Oct-17

SW-846 9040B, LABORATORY ANALYZED

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.17**				7.160	0.14	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.12**				7.120	0.00	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.98**				6.990	0.14	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.03**				7.040	0.14	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.85**				6.840	0.15	09/08/2017

Batch R237439 **SampType:** DUP Units RPD Limit **10**

SampID: 17090465-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.33**				7.310	0.27	09/08/2017

SW-846 9214 (TOTAL)

Batch R237626 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						09/13/2017

Batch R237626 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.02**	1.000	0	102.0	90	110	09/13/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17090465
Report Date: 04-Oct-17

SW-846 9214 (TOTAL)

Batch R237626 **SampType:** MS Units **mg/L**
SampID: 17090465-004AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.51**	2.000	0.3400	108.4	85	115	09/13/2017

Batch R237626 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090465-004AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.41**	2.000	0.3400	103.3	2.508	4.15	09/13/2017

Batch R237626 **SampType:** MS Units **mg/L**
SampID: 17090465-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.47**	2.000	0.3520	105.8	85	115	09/13/2017

Batch R237626 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17090465-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.47**	2.000	0.3520	106.0	2.468	0.16	09/13/2017

SW-846 9251 (TOTAL)

Batch R237578 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						09/12/2017

Batch R237578 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.3	90	110	09/12/2017

Batch R237578 **SampType:** MS Units **mg/L**
SampID: 17090465-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**22**	20.00	2.140	97.4	85	115	09/13/2017

Batch R237578 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17090465-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**22**	20.00	2.140	99.4	21.61	1.88	09/13/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17090465
Report Date: 04-Oct-17

SW-846 9251 (TOTAL)

Batch R237578 **SampType:** MS Units **mg/L**
SampID: 17090465-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**32**	20.00	13.38	91.2	85	115	09/13/2017

Batch R237578 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17090465-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**32**	20.00	13.38	94.6	31.63	2.07	09/13/2017

Batch R237675 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						09/14/2017

Batch R237675 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.2	90	110	09/14/2017

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134177 **SampType:** MBLK Units **mg/L**
SampID: MBLK-134177

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	09/15/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	09/15/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	39.8	-100	100	09/18/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/18/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	09/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134177 **SampType:** LCS Units **mg/L**

SampID: LCS-134177

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.502**	0.5000	0	100.4	80	120	09/15/2017
Arsenic	0.0010		**0.519**	0.5000	0	103.9	80	120	09/15/2017
Barium	0.0010		**2.02**	2.000	0	101.2	80	120	09/15/2017
Beryllium	0.0010		**0.0525**	0.05000	0	105.1	80	120	09/15/2017
Boron	0.0250		**0.542**	0.5000	0	108.4	80	120	09/15/2017
Cadmium	0.0010		**0.0507**	0.05000	0	101.3	80	120	09/15/2017
Calcium	0.125		**2.51**	2.500	0	100.5	80	120	09/15/2017
Chromium	0.0010		**0.201**	0.2000	0	100.6	80	120	09/15/2017
Cobalt	0.0010		**0.513**	0.5000	0	102.7	80	120	09/15/2017
Lead	0.0010		**0.540**	0.5000	0	108.1	80	120	09/15/2017
Lithium	0.0010		**0.524**	0.5000	0	104.8	80	120	09/15/2017
Molybdenum	0.0010		**0.509**	0.5000	0	101.9	80	120	09/15/2017
Molybdenum	0.0010		**0.512**	0.5000	0	102.3	80	120	09/18/2017
Nickel	0.0010		**0.527**	0.5000	0	105.4	80	120	09/18/2017
Selenium	0.0010		**0.516**	0.5000	0	103.2	80	120	09/15/2017
Thallium	0.0010		**0.247**	0.2500	0	98.8	80	120	09/15/2017

Batch 134177 **SampType:** MS Units **mg/L**

SampID: 17090465-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.500**	0.5000	0	100.0	75	125	09/15/2017
Arsenic	0.0010		**0.516**	0.5000	0.001186	102.9	75	125	09/15/2017
Barium	0.0010		**2.16**	2.000	0.1683	99.4	75	125	09/15/2017
Beryllium	0.0010		**0.0533**	0.05000	0	106.5	75	125	09/15/2017
Boron	0.0250		**0.753**	0.5000	0.2179	107.0	75	125	09/15/2017
Cadmium	0.0010		**0.0488**	0.05000	0	97.7	75	125	09/15/2017
Calcium	0.125	S	**86.0**	2.500	84.34	67.4	75	125	09/18/2017
Chromium	0.0010		**0.200**	0.2000	0.002295	98.7	75	125	09/15/2017
Cobalt	0.0010		**0.494**	0.5000	0.0003645	98.6	75	125	09/15/2017
Lead	0.0010		**0.520**	0.5000	0	104.0	75	125	09/15/2017
Lithium	0.0010		**0.524**	0.5000	0.01545	101.7	75	125	09/15/2017
Molybdenum	0.0010		**0.490**	0.5000	0.0004278	97.9	75	125	09/18/2017
Nickel	0.0010		**0.498**	0.5000	0.004378	98.8	75	125	09/18/2017
Selenium	0.0010		**0.501**	0.5000	0.003839	99.4	75	125	09/15/2017
Thallium	0.0010		**0.246**	0.2500	0	98.3	75	125	09/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134177 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17090465-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.506**	0.5000	0	101.1	0.4998	1.14	09/15/2017
Arsenic	0.0010		**0.515**	0.5000	0.001186	102.8	0.5157	0.11	09/15/2017
Barium	0.0010		**2.17**	2.000	0.1683	100.1	2.156	0.69	09/15/2017
Beryllium	0.0010		**0.0524**	0.05000	0	104.9	0.05326	1.58	09/15/2017
Boron	0.0250		**0.759**	0.5000	0.2179	108.2	0.7530	0.78	09/15/2017
Cadmium	0.0010		**0.0503**	0.05000	0	100.6	0.04884	2.93	09/15/2017
Calcium	0.125	S	**83.3**	2.500	84.34	-43.4	86.02	3.28	09/18/2017
Chromium	0.0010		**0.198**	0.2000	0.002295	97.6	0.1997	1.06	09/15/2017
Cobalt	0.0010		**0.493**	0.5000	0.0003645	98.4	0.4935	0.20	09/15/2017
Lead	0.0010		**0.523**	0.5000	0	104.6	0.5198	0.59	09/15/2017
Lithium	0.0010		**0.516**	0.5000	0.01545	100.1	0.5242	1.57	09/15/2017
Molybdenum	0.0010		**0.495**	0.5000	0.0004278	98.9	0.4902	0.92	09/18/2017
Nickel	0.0010		**0.500**	0.5000	0.004378	99.0	0.4984	0.23	09/18/2017
Selenium	0.0010		**0.510**	0.5000	0.003839	101.3	0.5009	1.85	09/15/2017
Thallium	0.0010		**0.246**	0.2500	0	98.4	0.2458	0.06	09/15/2017

Batch 134177 **SampType:** MS Units **mg/L**

SampID: 17090465-012CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.490**	0.5000	0	98.0	75	125	09/15/2017
Arsenic	0.0010		**0.499**	0.5000	0.002469	99.2	75	125	09/15/2017
Barium	0.0010		**2.11**	2.000	0.1448	98.4	75	125	09/15/2017
Beryllium	0.0010		**0.0512**	0.05000	0	102.4	75	125	09/15/2017
Boron	0.0250		**2.80**	0.5000	2.371	84.9	75	125	09/18/2017
Cadmium	0.0010		**0.0487**	0.05000	0	97.4	75	125	09/15/2017
Calcium	0.125	S	**98.3**	2.500	101.4	-121.6	75	125	09/18/2017
Chromium	0.0010		**0.192**	0.2000	0.004052	94.2	75	125	09/15/2017
Cobalt	0.0010		**0.476**	0.5000	0.001272	95.0	75	125	09/15/2017
Lead	0.0010		**0.513**	0.5000	0.0005232	102.6	75	125	09/15/2017
Lithium	0.0010		**0.523**	0.5000	0.04040	96.6	75	125	09/15/2017
Molybdenum	0.0010		**0.575**	0.5000	0.08907	97.2	75	125	09/18/2017
Nickel	0.0010		**0.489**	0.5000	0.006499	96.6	75	125	09/18/2017
Selenium	0.0010		**0.507**	0.5000	0.01584	98.2	75	125	09/15/2017
Thallium	0.0010		**0.239**	0.2500	0	95.5	75	125	09/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134177 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17090465-012CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.554**	0.5000	0	110.8	0.4902	12.25	09/15/2017
Arsenic	0.0010		**0.565**	0.5000	0.002469	112.5	0.4986	12.51	09/15/2017
Barium	0.0010		**2.38**	2.000	0.1448	111.8	2.113	11.93	09/15/2017
Beryllium	0.0010		**0.0586**	0.05000	0	117.2	0.05119	13.46	09/15/2017
Boron	0.0250		**2.93**	0.5000	2.371	112.5	2.796	4.82	09/18/2017
Cadmium	0.0010		**0.0550**	0.05000	0	110.0	0.04869	12.22	09/15/2017
Calcium	0.125	S	**102**	2.500	101.4	31.0	98.32	3.81	09/18/2017
Chromium	0.0010		**0.219**	0.2000	0.004052	107.7	0.1924	13.09	09/15/2017
Cobalt	0.0010		**0.537**	0.5000	0.001272	107.1	0.4763	11.98	09/15/2017
Lead	0.0010		**0.578**	0.5000	0.0005232	115.5	0.5134	11.87	09/15/2017
Lithium	0.0010		**0.599**	0.5000	0.04040	111.7	0.5235	13.43	09/15/2017
Molybdenum	0.0010		**0.583**	0.5000	0.08907	98.9	0.5751	1.44	09/18/2017
Nickel	0.0010		**0.497**	0.5000	0.006499	98.2	0.4894	1.65	09/18/2017
Selenium	0.0010		**0.568**	0.5000	0.01584	110.5	0.5070	11.37	09/15/2017
Thallium	0.0010		**0.265**	0.2500	0	105.9	0.2388	10.28	09/15/2017

SW-846 7470A (TOTAL)

Batch 133991 **SampType:** MBLK Units **mg/L**

SampID: MBLK-133991

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	09/11/2017

Batch 133991 **SampType:** LCS Units **mg/L**

SampID: LCS-133991

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00510**	0.00500	0	102.0	85	115	09/11/2017

Batch 133991 **SampType:** MS Units **mg/L**

SampID: 17090465-004CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00486**	0.00500	0	97.2	75	125	09/11/2017

Batch 133991 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17090465-004CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00493**	0.00500	0	98.5	0.004859	1.38	09/11/2017

Batch 133992 **SampType:** MBLK Units **mg/L**

SampID: MBLK-133992

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	09/11/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

SW-846 7470A (TOTAL)

Batch **133992** **SampType:** **LCS** Units **mg/L**

SampID: LCS-133992

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00517**	0.00500	0	103.3	85	115	09/11/2017

Batch **133992** **SampType:** **MS** Units **mg/L**

SampID: 17090465-010CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00527**	0.00500	0	105.3	75	125	09/11/2017

Batch **133992** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17090465-010CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00523**	0.00500	0	104.7	0.005265	0.61	09/11/2017

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17090465

Report Date: 04-Oct-17

Carrier: Employee

Received By: TAC

Completed by: Kalyn Foecke
On: 08-Sep-17

Reviewed by: Marvin L. Darling II
On: 08-Sep-17

Pages to follow: Chain of custody 2 Extra pages included 25

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **2.82**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

http://www.teklabinc.com/

Client Project: Millscale 201702606 **Work Order:** 17090466

Report to: Standard Laboratories, Inc.
Attn: Steve Arndt
8451 River King Drive
Freeburg
IL 62243

Invoice to: Standard Laboratories, Inc.
Attn: Tim Hutchison
8451 River King Drive
Freeburg
IL 62243

DateReceived: 9/8/2017 2:06:00 PM Date Due: Standard TAT QClevel: LVL1

Project Manager: Marvin L. Darling Tel: (618)344-1004 ex 41 Email: mdarling@teklabinc.com

NOTICE Teklab will proceed with analysis as reported below unless otherwise notified. Call your Project Manager with questions.

Shipping container in good condition?	Yes
Ice present?	Ice
Chain of custody present?	Yes
Chain of custody signed when relinquished?	Yes
Chain of custody agrees with sample labels?	Yes
Samples in proper container/bottle?	Yes
Sample container intact?	Yes
Sufficient sample volume for indicated tests?	Yes
All samples received within holding time?	Yes
Container/Temp Blank temperature compliant?	Yes 1.82 Celcius

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Field parameters measured in Lab?	N/A
Water - TOX containers have zero headspace?	No TOX containers
Water - VOA vials have zero headspace?	No VOA Vials submitted
Water - pH acceptable upon receipt?	N/A
NPDES/CWA TCN interference checked/treated in field?	N/A

Comments

Station Location corrected from Ameren Sioux Processed Miss Scale to Ameren Sioux Processed Mill Scale. Client notified via work order summary. AMD 9/8/17

17090466-001	**201702606-001 Ameren Sioux Processed Mill Scale**	**Collected:** 8/30/2017			**Solid**
Test		**Hold**	**MS/MSD**	**Rush**	**Sub**
TPH & HEM, Solid	Oil & Grease	☐	☐	☐	☑

CHAIN OF CUSTODY RECORD

170904ell

STANDARD LABORATORIES, INC.

8451 RIVER KING DRIVE, FREEBURG, IL 62243-2352 (618) 539-5836 Facsimile (618) 539-5839

Project No.	Project Name	Millscale
Samplers *(Signature)*		

Station No.	Sample Date	Time	Comp.	Grab	Station Location	No. of Containers	TCLP SW846 As, Ba, Cd, Cr, Pb, Hg, Se, Ag	OIL & GREASE SW846 9071A&B	GRIND TO -60 MESH				Remarks
201702606-001	08/30/17	NA		X	Ameren Sioux Processed Miss Scale	1		X					170904ell-001
													TEKLAB
													If you have any questions, please contact:
													Steve Arndt
													Office (618) 539-5836
													Cell (618) 713-6839

Relinquished by: *(Signature)*	Date Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date Time	Received by: *(Signature)*
Steve Arndt	9/8/17 13:30			9/8/17 14:06	
Relinquished by: *(Signature)*	Date Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date Time	Received @ Lab by: *(Signature)*	Remarks 1.82°C ice		

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

October 04, 2017

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 17090465

Dear Mike Austin:

Order No.: 17090650

Summit Environmental Technologies, Inc. received 12 sample(s) on 9/13/2017 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Case Narrative

WO#: **17090650**
Date: **10/4/2017**

CLIENT: TEKLAB Inc,
Project: 17090465

WorkOrder Narrative:
17090650: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
TEL: (330) 253-8211 FAX: (330) 253-448
Website: http://www.settek.co

Qualifiers and Acronyms

WO#: **17090650**
Date: **10/4/2017**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Workorder Sample Summary

WO#: **17090650**
04-Oct-17

CLIENT: TEKLAB Inc,
Project: 17090465

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17090650-001	17090465-001		9/5/2017 3:00:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-002	17090465-002		9/5/2017 4:40:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-003	17090465-003		9/6/2017 10:00:00 AM	9/13/2017 1:45:00 PM	Groundwater
17090650-004	17090465-004		9/6/2017 12:05:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-005	17090465-005		9/6/2017 1:10:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-006	17090465-006		9/6/2017 2:20:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-007	17090465-007		9/6/2017 3:30:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-008	17090465-008		9/7/2017 11:00:00 AM	9/13/2017 1:45:00 PM	Groundwater
17090650-009	17090465-009		9/7/2017 12:00:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-010	17090465-010		9/7/2017 2:50:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-011	17090465-011		9/7/2017 4:45:00 PM	9/13/2017 1:45:00 PM	Groundwater
17090650-012	17090465-012		9/8/2017 10:00:00 AM	9/13/2017 1:45:00 PM	Groundwater

Summit Environmental Technologies, Inc.
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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

DATES REPORT

WO#: **17090650**
04-Oct-17

Client: TEKLAB Inc,
Project: 17090465

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17090650-001A	17090465-001	9/5/2017 3:00:00 PM	Groundwater	Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:16:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:46:00 PM
17090650-002A	17090465-002	9/5/2017 4:40:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:16:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:46:00 PM
17090650-003A	17090465-003	9/6/2017 10:00:00 AM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:16:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:46:00 PM
17090650-004A	17090465-004	9/6/2017 12:05:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:17:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:47:00 PM
17090650-005A	17090465-005	9/6/2017 1:10:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:17:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:47:00 PM
17090650-006A	17090465-006	9/6/2017 2:20:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:17:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:47:00 PM
17090650-007A	17090465-007	9/6/2017 3:30:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 8:17:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 3:47:00 PM
17090650-008A	17090465-008	9/7/2017 11:00:00 AM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 9:08:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017

Original

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

DATES REPORT

WO#: **17090650**
04-Oct-17

Client: TEKLAB Inc,
Project: 17090465

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17090650-008A	17090465-008	9/7/2017 11:00:00 AM	Groundwater	Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 4:24:00 PM
17090650-009A	17090465-009	9/7/2017 12:00:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 9:08:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 4:24:00 PM
17090650-010A	17090465-010	9/7/2017 2:50:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 9:09:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 4:24:00 PM
17090650-011A	17090465-011	9/7/2017 4:45:00 PM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 9:08:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 4:24:00 PM
17090650-012A	17090465-012	9/8/2017 10:00:00 AM		Radium-226 (903.0)		9/26/2017 2:01:10 PM	9/29/2017 9:08:00 AM
				Radium-226/228 (903.0/904.0)			9/29/2017
				Radium-228 (904.0)		9/26/2017 2:01:10 PM	9/28/2017 4:24:00 PM

Original

Summit Environmental Technologies, Inc.
3310 Win St.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/5/2017 3:00:00 PM
Project: 17090465
Lab ID: 17090650-001
Matrix: GROUNDWATER
Client Sample ID 17090465-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)				**MBDRA226RA22**			Analyst: **BRD**
Radium-226/Radium-228 Combined	2.54	2.00		pCi/L	± 1.1	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.25	1.00	U	pCi/L	± 0.12	1	9/29/2017 8:16:00 AM
Yield	1					1	9/29/2017 8:16:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	2.29	1.00		pCi/L	± 0.98	1	9/28/2017 3:46:00 PM
Yield	1					1	9/28/2017 3:46:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/5/2017 4:40:00 PM
Project: 17090465
Lab ID: 17090650-002
Matrix: GROUNDWATER
Client Sample ID 17090465-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	1.08	2.00	U	pCi/L	± 0.81	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.17	1.00	U	pCi/L	± 0.12	1	9/29/2017 8:16:00 AM
Yield	1					1	9/29/2017 8:16:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.91	1.00	J	pCi/L	± 0.69	1	9/28/2017 3:46:00 PM
Yield	1					1	9/28/2017 3:46:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/6/2017 10:00:00 AM
Project: 17090465
Lab ID: 17090650-003
Matrix: GROUNDWATER
Client Sample ID 17090465-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	2.58	2.00		pCi/L	± 1.14	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.53	1.00	U	pCi/L	± 0.18	1	9/29/2017 8:16:00 AM
Yield	1					1	9/29/2017 8:16:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	2.05	1.00		pCi/L	± 0.96	1	9/28/2017 3:46:00 PM
Yield	1					1	9/28/2017 3:46:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/6/2017 12:05:00 PM
Project: 17090465
Lab ID: 17090650-004
Matrix: GROUNDWATER
Client Sample ID 17090465-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	1.44	2.00	U	pCi/L	± 0.94	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.37	1.00	U	pCi/L	± 0.14	1	9/29/2017 8:17:00 AM
Yield	1					1	9/29/2017 8:17:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.07	1.00		pCi/L	± 0.8	1	9/28/2017 3:47:00 PM
Yield	1					1	9/28/2017 3:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/6/2017 1:10:00 PM
Project: 17090465
Lab ID: 17090650-005
Matrix: GROUNDWATER
Client Sample ID 17090465-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)				**MBDRA226RA22**			Analyst: **BRD**
Radium-226/Radium-228 Combined	3.04	2.00		pCi/L	± 1.16	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	1.06	1.00		pCi/L	± 0.21	1	9/29/2017 8:17:00 AM
Yield	1					1	9/29/2017 8:17:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.98	1.00		pCi/L	± 0.95	1	9/28/2017 3:47:00 PM
Yield	1					1	9/28/2017 3:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/6/2017 2:20:00 PM
Project: 17090465
Lab ID: 17090650-006
Matrix: GROUNDWATER
Client Sample ID 17090465-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	1.69	2.00	U	pCi/L	± 0.82	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.62	1.00	U	pCi/L	± 0.17	1	9/29/2017 8:17:00 AM
Yield	1					1	9/29/2017 8:17:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.07	1.00		pCi/L	± 0.65	1	9/28/2017 3:47:00 PM
Yield	1					1	9/28/2017 3:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/6/2017 3:30:00 PM
Project: 17090465
Lab ID: 17090650-007
Matrix: GROUNDWATER
Client Sample ID 17090465-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	0.92	2.00	U	pCi/L	± 0.91	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.36	1.00	U	pCi/L	± 0.14	1	9/29/2017 8:17:00 AM
Yield	1					1	9/29/2017 8:17:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.56	1.00	U	pCi/L	± 0.77	1	9/28/2017 3:47:00 PM
Yield	1					1	9/28/2017 3:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/7/2017 11:00:00 AM
Project: 17090465
Lab ID: 17090650-008
Matrix: GROUNDWATER
Client Sample ID 17090465-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	1.5	2.00	U	pCi/L	± 0.64	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.34	1.00	U	pCi/L	± 0.12	1	9/29/2017 9:08:00 AM
Yield	1					1	9/29/2017 9:08:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.16	1.00		pCi/L	± 0.52	1	9/28/2017 4:24:00 PM
Yield	1					1	9/28/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/7/2017 12:00:00 PM
Project: 17090465
Lab ID: 17090650-009
Matrix: GROUNDWATER
Client Sample ID 17090465-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	0.78	2.00	U	pCi/L	± 0.61	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.4	1.00	U	pCi/L	± 0.14	1	9/29/2017 9:08:00 AM
Yield	1					1	9/29/2017 9:08:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.38	1.00	U	pCi/L	± 0.47	1	9/28/2017 4:24:00 PM
Yield	1					1	9/28/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/7/2017 2:50:00 PM
Project: 17090465
Lab ID: 17090650-010
Matrix: GROUNDWATER
Client Sample ID 17090465-010

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	1.35	2.00	U	pCi/L	± 0.75	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.22	1.00	U	pCi/L	± 0.12	1	9/29/2017 9:09:00 AM
Yield	1					1	9/29/2017 9:09:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.13	1.00		pCi/L	± 0.63	1	9/28/2017 4:24:00 PM
Yield	1					1	9/28/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/7/2017 4:45:00 PM
Project: 17090465
Lab ID: 17090650-011
Matrix: GROUNDWATER
Client Sample ID 17090465-011

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)					**MBDRA226RA22**		Analyst: **BRD**
Radium-226/Radium-228 Combined	0.47	2.00	U	pCi/L	± 0.94	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.47	1.00	U	pCi/L	± 0.15	1	9/29/2017 9:08:00 AM
Yield	1					1	9/29/2017 9:08:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	-0.42	1.00	U	pCi/L	± 0.79	1	9/28/2017 4:24:00 PM
Yield	1					1	9/28/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17090650**

Date Reported: **10/4/2017**

CLIENT: TEKLAB Inc,

Collection Date: 9/8/2017 10:00:00 AM

Project: 17090465

Lab ID: 17090650-012

Matrix: GROUNDWATER

Client Sample ID 17090465-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM-226/228 RADIUM-226/228 (903.0/904.0)				**MBDRA226RA22**			Analyst: **BRD**
Radium-226/Radium-228 Combined	1.33	2.00	U	pCi/L	± 0.8	1	9/29/2017
COMBINED RADIUM-226/228 RADIUM-226 (903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.38	1.00	U	pCi/L	± 0.16	1	9/29/2017 9:08:00 AM
Yield	1					1	9/29/2017 9:08:00 AM
COMBINED RADIUM-226/228 RADIUM-228 (904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.95	1.00	J	pCi/L	± 0.64	1	9/28/2017 4:24:00 PM
Yield	1					1	9/28/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17090650**
04-Oct-17

Client: TEKLAB Inc,
Project: 17090465 **BatchID:** **28943**

Sample ID **MB-28943** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75341**
Client ID: **PBW** Batch ID: **28943** TestNo: **E904.0** **E903-904** Analysis Date: **9/28/2017** SeqNo: **1276825**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Sample ID **17090650-001adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75341**
Client ID: **17090465-001** Batch ID: **28943** TestNo: **E904.0** **E903-904** Analysis Date: **9/28/2017** SeqNo: **1276827**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	2.05	1.00		0	0			2.286	11.1	20	
Yield	0.88			0	0			1.000	12.8		

Sample ID **17090650-002adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75341**
Client ID: **17090465-002** Batch ID: **28943** TestNo: **E904.0** **E903-904** Analysis Date: **9/28/2017** SeqNo: **1276829**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	0.90	1.00		0	0			0.9056	0.152	20	J
Yield	1			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17090650**
04-Oct-17

Client: TEKLAB Inc,
Project: 17090465 **BatchID:** **28943**

Sample ID **mb-28943** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **PBW** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277159**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **lcs-28943** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **LCSW** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277160**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.60	1.00	5.000	0	92.0	70	130				

Sample ID **LCSD-28943** SampType: **LCSD** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **LCSS02** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277163**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.14	1.00	5.000	0	103	70	130	4.600	11.1	20	

Sample ID **17090640-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **BatchQC** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277164**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17090650**
04-Oct-17

Client: TEKLAB Inc,
Project: 17090465 **BatchID:** **28943**

Sample ID **17090640-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **BatchQC** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277164**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.93	1.00	5.000	0	119	70	130				

Sample ID **17090650-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **17090465-001** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277167**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	0.02	1.00						0	0	20	U
Yield	0.59							1.000	51.6	0	

Sample ID **17090650-002adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **9/26/2017** RunNo: **75358**
Client ID: **17090465-002** Batch ID: **28943** TestNo: **E903.0** **E903-904** Analysis Date: **9/29/2017** SeqNo: **1277169**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	0.1	1.00						0	0	20	U
Yield	1							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 2

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested.
Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project# 17090465

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25151 Phone: 618-344-1004 ext 18

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

KF 9/11/17

17090650-001-012

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix (Groundwater)	Radium 226/228	Combined Radium										
	17090465-001	9/5/17 15.00	HNO3	Drinking Water	✓	✓										
	17090465-002	9/5/17 16.40	HNO3	Drinking Water	✓	✓										
	17090465-003	9/6/17 10.00	HNO3	Drinking Water	✓	✓										
	17090465-004	9/6/17 12.05	HNO3	Drinking Water	✓	✓										
	17090465-005	9/6/17 13.10	HNO3	Drinking Water	✓	✓										
	17090465-006	9/6/17 14.20	HNO3	Drinking Water	✓	✓										
	17090465-007	9/6/17 15.30	HNO3	Drinking Water	✓	✓										
	17090465-008	9/7/17 11.00	HNO3	Drinking Water	✓	✓										
	17090465-009	9/7/17 12.00	HNO3	Drinking Water	✓	✓										
	17090465-010	9/7/17 14.50	HNO3	Drinking Water	✓	✓										
	17090465-011	9/7/17 16.45	HNO3	Drinking Water	✓	✓										

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	9/11/17	[illegible]	9-13-17 1345

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 2

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested.
Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project# 17090465

Contact: Michael Austin Email: maustin@teklabinc.com

Requested Due Date: NTAT Billing/PO: 25151 Phone: 618-344-1004 ext 18

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

KFallin

Grand Water

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226/228	Combined Radium										
	17090465-012	9/8/17 10.00	HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										
			HNO3	Drinking Water	✓	✓										

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	9/11/17	[illegible]	9-13-17 1348

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

Figure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1

Initials of person inspecting cooler and samples: AMB

Client: TekLab.

Order Number: 17090650

Date Received: 9-13-17 Time Received: 1345 Date cooler(s) opened and samples inspected: 9-13-17

Number of Coolers/Boxes: 1 N/A

Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging: Peanuts Bubble Wrap Paper Foam None Other:

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A

Ice 1 Blue ice _____ present absent melted N/A

Cooler Temperature IR Gun #16020459 CF 0 °C Temp: 18.0 °C N/A

Radiological Testing Instrument serial #35127 Y N N/A (see page 2 for scan results)
Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s):

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Sufficient sample for QC	Y	N	N/A
Samples received within holding time	Y	N	N/A
Do any 40 mL vials contain bubbles**	Y	N	N/A

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm:

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:

Date/Time:

Logged in by:

Comments:

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	**pH Strip (2.8-4.6) SET#:** OES-01-0250
Total DPD packet SET#: OES-02-0239	**Free DPD packet SET#:** OES-01-0290
Disp. Pipette SET#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1		2		32	
2		2		28	
3		2		30	
4		2		31	
5		2		15	
6		2		19	
7		2		48	
8		2		33	
9		2		29	
10		2		38	
11		2		51	
12		2		30	

P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst

REMIT TO: **TEKLAB, INC**
Accounts Receivable
5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
TEL: (618) 344-1004
Email: AccountsReceivable@teklabinc.com

INVOICE

INV DATE: Oct 4, 2017
DUE DATE: *Nov 3, 2017*

Invoice No: 205874

INVOICE TO: ERM
68 Villa Grove
Springfield, IL 62712

PO Number:

Attention: Accounts Payable
Project Name: Grand Tower CCR GW
Project Contact: Brett Carney

Samples Received: Sep 8, 2017
Quote Number:
Teklab Work Order#: 17090465

Item	*Remarks*	*Qty*	*Unit Price*	*Test Total*
Chloride, Aqueous (Total)		12	$12.00	$144.00
Fluoride, Aqueous (Total)		12	$16.00	$192.00
Mercury, Aqueous, (Total)		12	$15.00	$180.00
Metals, Aqueous, by ICPMS (Total)	15 ICPMS Metals	12	$112.50	$1,350.00
pH, Aqueous, Laboratory Analyzed		12	$7.50	$90.00
Radium 226/228, Aqueous	226/228/Combined	12	$155.00	$1,860.00
Sulfate, Aqueous (Total)		12	$15.50	$186.00
Total Dissolved Solids, Aqueous		12	$12.00	$144.00

Subtotal:	**$4,146.00**
Discount:	0.00%
Surcharge:	0.00%
Misc Charges:	**$0.00**
Payment Received:	$0.00
INVOICE Total:	**$4,146.00**

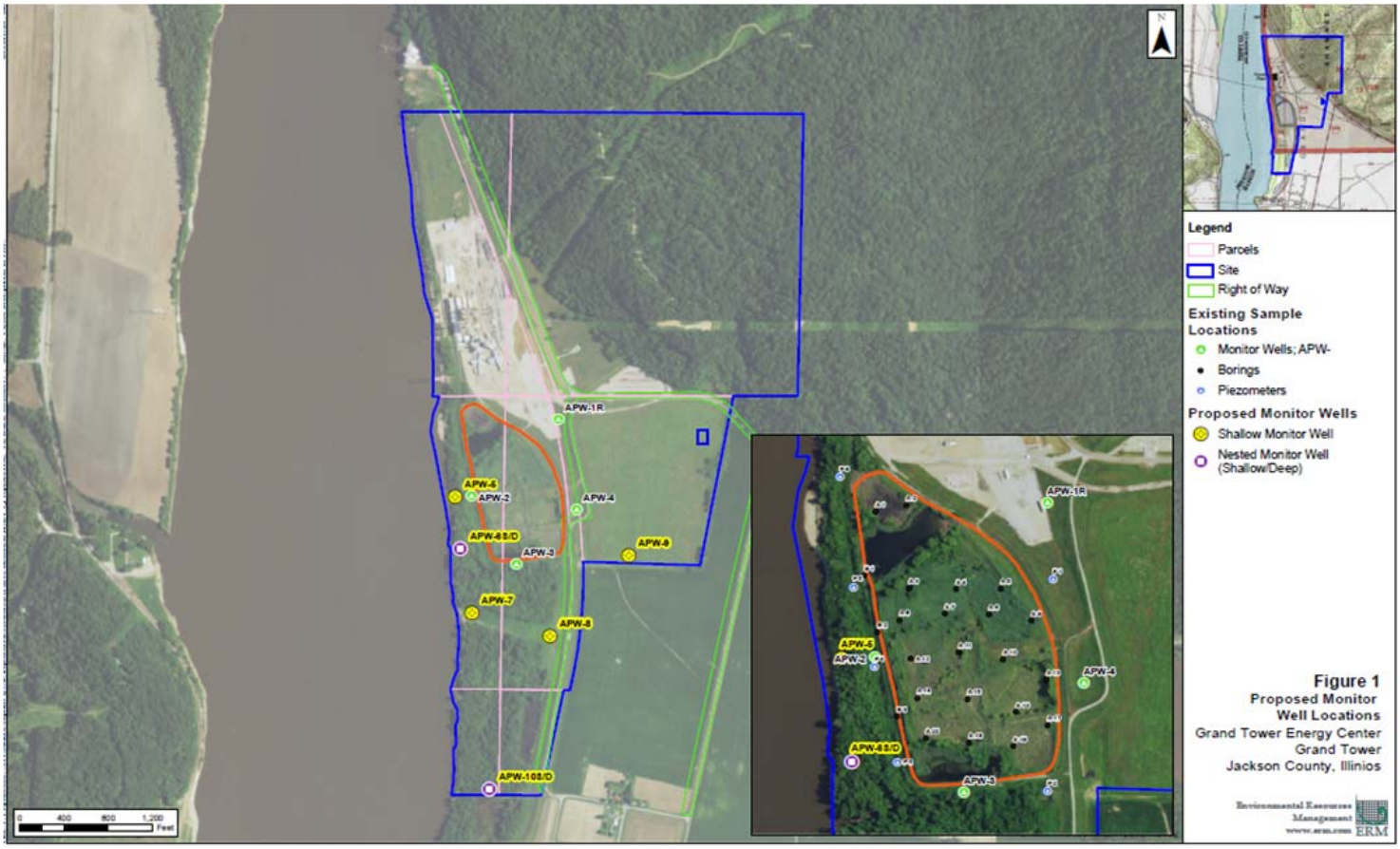
We appreciate your business!!!!

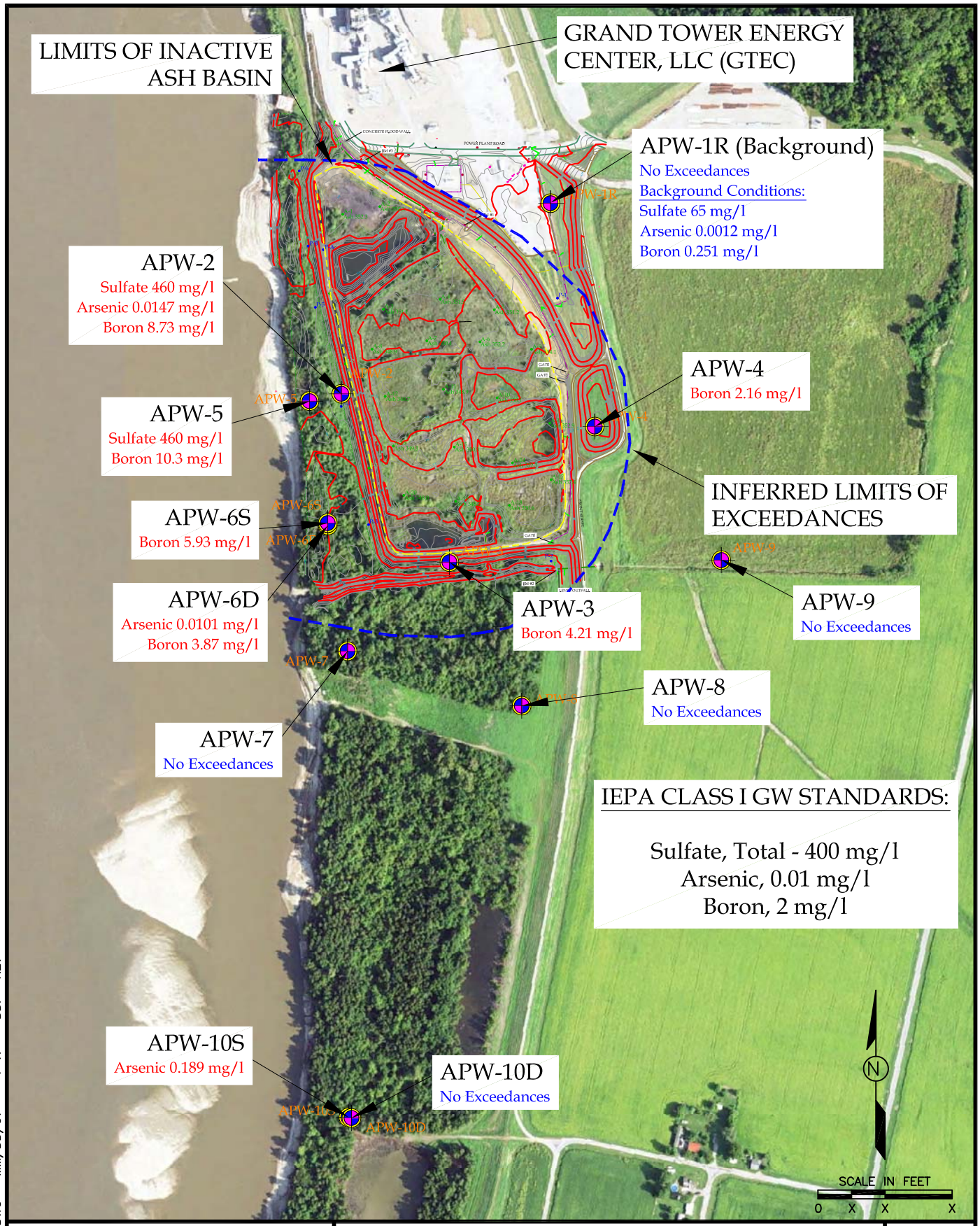
Event 2

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 2 **Date Samples Collected:** **From** 9/27/17 **To** 9/29/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	<5	12	21	11	15	28	17	15	10	13	7	17
Sulfate, Total	mg/L	400	65	**460**	222	116	**460**	177	228	59	40	47	<10	44
Fluoride, Total	mg/L	4	0.17	0.26	0.29	0.19	0.34	0.26	0.23	0.21	0.3	0.22	0.21	0.12
Lab pH		6.5 - 9.0	6.54	7.05	7.46	7.33	7.3	7.06	7.25	6.84	7.07	7.35	6.96	7.11
Total Dissolved Solids	mg/L	1200	428	880	514	484	832	546	560	786	458	372	720	474
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.0012	**0.0147**	0.0029	0.0018	0.0026	0.0016	**0.0101**	0.0012	0.0011	0.0024	**0.189**	<0.001
Barium	mg/L	2	0.193	0.355	0.146	0.139	0.233	0.237	0.172	0.448	0.256	0.171	0.634	0.304
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.251	**8.73**	**4.21**	**2.16**	**10.3**	**5.93**	**3.87**	0.308	0.154	0.569	0.544	0.101
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		93	145	104	105	142	97.2	110	204	105	85.3	144	136
Chromium	mg/L	0.1	0.0021	0.0455	0.0053	0.0025	<0.001	0.0173	0.0013	0.0063	0.0023	0.0021	0.0019	0.0078
Cobalt	mg/L	1	<0.001	0.0023	0.0015	<0.001	<0.001	<0.001	0.001	<0.001	0.0013	0.0014	<0.001	0.0024
Lead	mg/L	0.0075	<0.001	0.0054	0.0042	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.018	0.0455	0.0262	0.0403	0.0443	0.0413	0.0176	0.0181	0.0206	0.0173	0.0278	0.0155
Molybdenum	No Standard		<0.001	0.147	0.0754	0.084	0.195	0.287	0.0606	0.0036	<0.001	0.0252	0.0016	<0.001
Nickel	mg/L	0.1	0.0062	0.0263	0.0051	0.0034	0.0012	0.009	0.0028	0.0033	0.0043	0.0032	0.0012	0.0077
Selenium	mg/L	0.05	0.004	<0.001	<0.001	0.015	<0.001	<0.001	<0.001	<0.001	0.0141	0.0139	<0.001	0.0011
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	0.18	0.03	0.04	0.02	0.19	0.09	0.37	0	0.12	0.03	0.19	-0.11
Radium-228	pCi/l	20	0.51	-0.01	1.01	-0.45	0.89	1.06	0.61	0.76	0.88	0.67	0.98	1.72
Radium-226/228 Comb.	pCi/l	-----	0.69	0.03	1.05	0.02	1.08	1.15	0.98	0.76	1	0.7	1.17	1.72





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 2 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
2

November 06, 2017

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17091780

Dear Brett Carney:

TEKLAB, INC received 12 samples on 9/29/2017 2:35:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

This reporting package includes the following:

Cover Letter	1
Report Contents	2
Definitions	3
Case Narrative	4
Accreditations	5
Laboratory Results	6
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Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

Abbr Definition

CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

Cooler Receipt Temp: 2.62 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
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Phone (618) 344-1004
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Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 09/27/2017 12:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**428**	mg/L	1	10/02/2017 16:37	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**65**	mg/L	2	10/05/2017 13:01	R238497
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.54**		1	10/02/2017 13:55	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	09/29/2017 17:47	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	10/03/2017 23:46	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:25	134682
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	10/06/2017 0:57	134682
Barium	NELAP	0.0010		**0.193**	mg/L	5	10/03/2017 15:25	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 0:57	134682
Boron	NELAP	0.0250		**0.251**	mg/L	5	10/06/2017 0:57	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 0:57	134682
Calcium	NELAP	0.125	S	**93.0**	mg/L	5	10/10/2017 10:30	134682
Chromium	NELAP	0.0010		**0.0021**	mg/L	5	10/06/2017 0:57	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 15:57	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:25	134682
Lithium		0.0010		**0.0180**	mg/L	5	10/06/2017 0:57	134682
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 0:57	134682
Nickel	NELAP	0.0010		**0.0062**	mg/L	5	10/06/2017 0:57	134682
Selenium	NELAP	0.0010		**0.0040**	mg/L	5	10/06/2017 0:57	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:25	134682
MS QC limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 9:39	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-002
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 09/27/2017 13:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**372**	mg/L	1	10/02/2017 16:38	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**47**	mg/L	2	10/03/2017 23:57	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.35**		1	10/02/2017 13:58	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	09/29/2017 17:49	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	10/03/2017 23:49	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:34	134682
Arsenic	NELAP	0.0010		**0.0024**	mg/L	5	10/03/2017 15:34	134682
Barium	NELAP	0.0010		**0.171**	mg/L	5	10/03/2017 15:34	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:05	134682
Boron	NELAP	0.0250		**0.569**	mg/L	5	10/06/2017 1:05	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:34	134682
Calcium	NELAP	0.125		**85.3**	mg/L	5	10/10/2017 13:18	134682
Chromium	NELAP	0.0010		**0.0021**	mg/L	5	10/06/2017 1:05	134682
Cobalt	NELAP	0.0010		**0.0014**	mg/L	5	10/06/2017 16:30	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:34	134682
Lithium		0.0010		**0.0173**	mg/L	5	10/06/2017 1:05	134682
Molybdenum	NELAP	0.0010		**0.0252**	mg/L	5	10/03/2017 15:34	134682
Nickel	NELAP	0.0010		**0.0032**	mg/L	5	10/06/2017 1:05	134682
Selenium	NELAP	0.0010		**0.0139**	mg/L	5	10/03/2017 15:34	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:34	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 9:42	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-003
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 09/27/2017 15:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**474**	mg/L	1	10/02/2017 16:38	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**44**	mg/L	2	10/04/2017 0:11	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.11**		1	10/02/2017 14:00	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	09/29/2017 17:54	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	10/03/2017 23:57	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:42	134682
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:13	134682
Barium	NELAP	0.0010		**0.304**	mg/L	5	10/03/2017 15:42	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:13	134682
Boron	NELAP	0.0250		**0.101**	mg/L	5	10/06/2017 1:13	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:13	134682
Calcium	NELAP	0.125		**136**	mg/L	5	10/10/2017 13:26	134682
Chromium	NELAP	0.0010		**0.0078**	mg/L	5	10/06/2017 1:13	134682
Cobalt	NELAP	0.0010		**0.0024**	mg/L	5	10/06/2017 16:39	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:42	134682
Lithium		0.0010		**0.0155**	mg/L	5	10/06/2017 1:13	134682
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/09/2017 16:36	134682
Nickel	NELAP	0.0010		**0.0077**	mg/L	5	10/06/2017 1:13	134682
Selenium	NELAP	0.0010		**0.0011**	mg/L	5	10/06/2017 1:13	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:42	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 9:45	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

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Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-004
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 09/27/2017 16:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**720**	mg/L	1	10/02/2017 16:38	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	10/04/2017 0:35	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.96**		1	10/02/2017 14:03	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	09/29/2017 17:57	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**7**	mg/L	1	10/04/2017 0:32	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:50	134682
Arsenic	NELAP	0.0010		**0.189**	mg/L	5	10/06/2017 1:21	134682
Barium	NELAP	0.0010		**0.634**	mg/L	5	10/03/2017 15:50	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:21	134682
Boron	NELAP	0.0250		**0.544**	mg/L	5	10/06/2017 1:21	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:21	134682
Calcium	NELAP	0.125		**144**	mg/L	5	10/10/2017 13:35	134682
Chromium	NELAP	0.0010		**0.0019**	mg/L	5	10/06/2017 1:21	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 16:47	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:50	134682
Lithium		0.0010		**0.0278**	mg/L	5	10/06/2017 1:21	134682
Molybdenum	NELAP	0.0010		**0.0016**	mg/L	5	10/09/2017 16:44	134682
Nickel	NELAP	0.0010		**0.0012**	mg/L	5	10/06/2017 1:21	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:21	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:50	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 9:52	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

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Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-005
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 09/28/2017 11:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**832**	mg/L	1	10/02/2017 16:38	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**460**	mg/L	20	10/05/2017 13:04	R238497
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.30**		1	10/02/2017 14:06	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.34**	mg/L	1	09/29/2017 17:59	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	10/04/2017 0:35	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:58	134682
Arsenic	NELAP	0.0010		**0.0026**	mg/L	5	10/06/2017 1:29	134682
Barium	NELAP	0.0010		**0.233**	mg/L	5	10/03/2017 15:58	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:29	134682
Boron	NELAP	0.0250		**10.3**	mg/L	5	10/06/2017 1:29	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:29	134682
Calcium	NELAP	0.125		**142**	mg/L	5	10/10/2017 13:43	134682
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:29	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 16:55	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:58	134682
Lithium		0.0010		**0.0443**	mg/L	5	10/06/2017 1:29	134682
Molybdenum	NELAP	0.0010		**0.195**	mg/L	5	10/06/2017 1:29	134682
Nickel	NELAP	0.0010		**0.0012**	mg/L	5	10/06/2017 1:29	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:29	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 15:58	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:00	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-006
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 09/28/2017 12:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**880**	mg/L	1	10/02/2017 16:39	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**460**	mg/L	20	10/04/2017 0:51	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.05**		1	10/02/2017 14:08	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.26**	mg/L	1	09/29/2017 18:01	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	10/04/2017 0:43	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:07	134682
Arsenic	NELAP	0.0010		**0.0147**	mg/L	5	10/04/2017 2:46	134682
Barium	NELAP	0.0010		**0.355**	mg/L	5	10/03/2017 16:07	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/04/2017 2:46	134682
Boron	NELAP	0.0250		**8.73**	mg/L	5	10/04/2017 2:46	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/04/2017 2:46	134682
Calcium	NELAP	0.125		**145**	mg/L	5	10/04/2017 2:46	134682
Chromium	NELAP	0.0010		**0.0455**	mg/L	5	10/04/2017 2:46	134682
Cobalt	NELAP	0.0010		**0.0023**	mg/L	5	10/04/2017 2:46	134682
Lead	NELAP	0.0010		**0.0054**	mg/L	5	10/03/2017 16:07	134682
Lithium		0.0010		**0.0455**	mg/L	5	10/04/2017 2:46	134682
Molybdenum	NELAP	0.0010		**0.147**	mg/L	5	10/04/2017 2:46	134682
Nickel	NELAP	0.0010		**0.0263**	mg/L	5	10/04/2017 2:46	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/04/2017 2:46	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:07	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:03	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-007
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 09/28/2017 13:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**560**	mg/L	1	10/02/2017 16:39	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**228**	mg/L	10	10/05/2017 13:09	R238497
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.25**		1	10/02/2017 14:10	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.23**	mg/L	1	09/29/2017 18:03	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	10/04/2017 0:51	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:22	134682
Arsenic	NELAP	0.0010		**0.0101**	mg/L	5	10/03/2017 16:22	134682
Barium	NELAP	0.0010		**0.172**	mg/L	5	10/03/2017 16:22	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:38	134682
Boron	NELAP	0.0250		**3.87**	mg/L	5	10/06/2017 1:38	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:22	134682
Calcium	NELAP	0.125		**110**	mg/L	5	10/10/2017 13:51	134682
Chromium	NELAP	0.0010		**0.0013**	mg/L	5	10/06/2017 1:38	134682
Cobalt	NELAP	0.0010		**0.0010**	mg/L	5	10/06/2017 17:03	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:22	134682
Lithium		0.0010		**0.0176**	mg/L	5	10/06/2017 1:38	134682
Molybdenum	NELAP	0.0010		**0.0606**	mg/L	5	10/03/2017 16:22	134682
Nickel	NELAP	0.0010		**0.0028**	mg/L	5	10/06/2017 1:38	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:22	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:22	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:05	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-008
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 09/28/2017 14:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**546**	mg/L	1	10/02/2017 16:39	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**177**	mg/L	5	10/04/2017 1:07	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.06**		1	10/02/2017 14:12	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.26**	mg/L	1	09/29/2017 18:05	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**28**	mg/L	1	10/04/2017 0:59	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:30	134682
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	10/06/2017 1:46	134682
Barium	NELAP	0.0010		**0.237**	mg/L	5	10/03/2017 16:30	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:46	134682
Boron	NELAP	0.0250		**5.93**	mg/L	5	10/06/2017 1:46	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:46	134682
Calcium	NELAP	0.125		**97.2**	mg/L	5	10/10/2017 13:59	134682
Chromium	NELAP	0.0010		**0.0173**	mg/L	5	10/06/2017 1:46	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 17:11	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:30	134682
Lithium		0.0010		**0.0413**	mg/L	5	10/06/2017 1:46	134682
Molybdenum	NELAP	0.0010		**0.287**	mg/L	5	10/06/2017 1:46	134682
Nickel	NELAP	0.0010		**0.0090**	mg/L	5	10/06/2017 1:46	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:46	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:30	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:08	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-009
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 09/28/2017 16:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**458**	mg/L	1	10/02/2017 16:39	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**40**	mg/L	2	10/04/2017 1:37	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.07**		1	10/02/2017 14:14	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.30**	mg/L	1	09/29/2017 18:10	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	10/04/2017 1:07	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:39	134682
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	10/06/2017 1:54	134682
Barium	NELAP	0.0010		**0.256**	mg/L	5	10/03/2017 16:39	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:54	134682
Boron	NELAP	0.0250		**0.154**	mg/L	5	10/06/2017 17:28	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 1:54	134682
Calcium	NELAP	0.125		**105**	mg/L	5	10/10/2017 14:08	134682
Chromium	NELAP	0.0010		**0.0023**	mg/L	5	10/06/2017 1:54	134682
Cobalt	NELAP	0.0010		**0.0013**	mg/L	5	10/06/2017 17:28	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:39	134682
Lithium		0.0010		**0.0206**	mg/L	5	10/06/2017 1:54	134682
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/09/2017 18:06	134682
Nickel	NELAP	0.0010		**0.0043**	mg/L	5	10/06/2017 1:54	134682
Selenium	NELAP	0.0010		**0.0141**	mg/L	5	10/06/2017 1:54	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 16:39	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:10	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-010
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 09/28/2017 16:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**786**	mg/L	1	10/02/2017 16:39	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**59**	mg/L	2	10/04/2017 1:53	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.84**		1	10/02/2017 14:17	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	09/29/2017 18:12	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	10/04/2017 1:45	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:03	134682
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	10/06/2017 2:02	134682
Barium	NELAP	0.0010		**0.448**	mg/L	5	10/03/2017 17:03	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:02	134682
Boron	NELAP	0.0250		**0.308**	mg/L	5	10/06/2017 2:02	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:02	134682
Calcium	NELAP	0.125		**204**	mg/L	5	10/10/2017 14:16	134682
Chromium	NELAP	0.0010		**0.0063**	mg/L	5	10/06/2017 2:02	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 17:36	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:03	134682
Lithium		0.0010		**0.0181**	mg/L	5	10/06/2017 2:02	134682
Molybdenum	NELAP	0.0010		**0.0036**	mg/L	5	10/09/2017 18:14	134682
Nickel	NELAP	0.0010		**0.0033**	mg/L	5	10/06/2017 2:02	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:02	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:03	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:12	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-011
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 09/29/2017 9:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**514**	mg/L	1	10/02/2017 16:40	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**222**	mg/L	5	10/04/2017 2:01	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.46**		1	10/02/2017 14:23	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	09/29/2017 18:14	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**21**	mg/L	1	10/04/2017 1:53	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:11	134682
Arsenic	NELAP	0.0010		**0.0029**	mg/L	5	10/06/2017 2:11	134682
Barium	NELAP	0.0010		**0.146**	mg/L	5	10/03/2017 17:11	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:11	134682
Boron	NELAP	0.0250	S	**4.21**	mg/L	5	10/09/2017 18:22	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:11	134682
Calcium	NELAP	0.125	S	**104**	mg/L	5	10/10/2017 14:57	134682
Chromium	NELAP	0.0010		**0.0053**	mg/L	5	10/06/2017 2:11	134682
Cobalt	NELAP	0.0010		**0.0015**	mg/L	5	10/09/2017 18:22	134682
Lead	NELAP	0.0010		**0.0042**	mg/L	5	10/03/2017 17:11	134682
Lithium		0.0010		**0.0262**	mg/L	5	10/06/2017 2:11	134682
Molybdenum	NELAP	0.0010		**0.0754**	mg/L	5	10/06/2017 2:11	134682
Nickel	NELAP	0.0010		**0.0051**	mg/L	5	10/09/2017 18:22	134682
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 2:11	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:11	134682
MS QC limits for Ca are not applicable due to high sample/spike ratio.								
MS QC limits for B are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:14	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17091780
Client Project: Grand Tower CCR GW
Report Date: 06-Nov-17
Lab ID: 17091780-012
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 09/29/2017 10:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**484**	mg/L	1	10/02/2017 16:40	R238372
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**116**	mg/L	5	10/04/2017 2:23	R238430
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.33**		1	10/02/2017 14:25	R238333
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	09/29/2017 18:16	R238280
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	10/04/2017 2:01	R238425
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:20	134682
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	10/06/2017 3:24	134682
Barium	NELAP	0.0010		**0.139**	mg/L	5	10/03/2017 17:20	134682
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 3:24	134682
Boron	NELAP	0.0250		**2.16**	mg/L	5	10/06/2017 3:24	134682
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 3:24	134682
Calcium	NELAP	0.125		**105**	mg/L	5	10/10/2017 14:24	134682
Chromium	NELAP	0.0010		**0.0025**	mg/L	5	10/06/2017 3:24	134682
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/06/2017 18:17	134682
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:20	134682
Lithium		0.0010		**0.0403**	mg/L	5	10/06/2017 3:24	134682
Molybdenum	NELAP	0.0010		**0.0840**	mg/L	5	10/06/2017 3:24	134682
Nickel	NELAP	0.0010		**0.0034**	mg/L	5	10/06/2017 3:24	134682
Selenium	NELAP	0.0010		**0.0150**	mg/L	5	10/06/2017 3:24	134682
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/03/2017 17:20	134682
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/04/2017 10:17	134762
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610
Radium-228		0		**See attached**	pci/L	1	10/27/2017 0:00	R239610

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17091780-001	APW-1R	Groundwater	3	09/27/2017 12:10
17091780-002	APW-9	Groundwater	3	09/27/2017 13:55
17091780-003	APW-10D	Groundwater	3	09/27/2017 15:25
17091780-004	APW-10S	Groundwater	3	09/27/2017 16:15
17091780-005	APW-5	Groundwater	3	09/28/2017 11:00
17091780-006	APW-2	Groundwater	3	09/28/2017 12:30
17091780-007	APW-6D	Groundwater	3	09/28/2017 13:45
17091780-008	APW-6S	Groundwater	3	09/28/2017 14:45
17091780-009	APW-8	Groundwater	3	09/28/2017 16:00
17091780-010	APW-7	Groundwater	3	09/28/2017 16:50
17091780-011	APW-3	Groundwater	3	09/29/2017 9:00
17091780-012	APW-4	Groundwater	3	09/29/2017 10:25

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17091780-001A	APW-1R	09/27/2017 12:10	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:37
	SW-846 9036 (Total)				10/05/2017 13:01
	SW-846 9040B, Laboratory Analyzed				10/02/2017 13:55
	SW-846 9214 (Total)				09/29/2017 17:47
	SW-846 9251 (Total)				10/03/2017 23:46
17091780-001B	APW-1R	09/27/2017 12:10	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-001C	APW-1R	09/27/2017 12:10	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 15:25
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 0:57
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 15:57
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 10:30
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 9:39
17091780-002A	APW-9	09/27/2017 13:55	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:38
	SW-846 9036 (Total)				10/03/2017 23:57
	SW-846 9040B, Laboratory Analyzed				10/02/2017 13:58
	SW-846 9214 (Total)				09/29/2017 17:49
	SW-846 9251 (Total)				10/03/2017 23:49
17091780-002B	APW-9	09/27/2017 13:55	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-002C	APW-9	09/27/2017 13:55	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 15:34
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:05
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 16:30
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:18
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 9:42
17091780-003A	APW-10D	09/27/2017 15:25	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:38
	SW-846 9036 (Total)				10/04/2017 0:11
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:00
	SW-846 9214 (Total)				09/29/2017 17:54
	SW-846 9251 (Total)				10/03/2017 23:57
17091780-003B	APW-10D	09/27/2017 15:25	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
17091780-003C	APW-10D	09/27/2017 15:25	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 15:42
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:13
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 16:39
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/09/2017 16:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:26
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 9:45
17091780-004A	APW-10S	09/27/2017 16:15	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:38
	SW-846 9036 (Total)				10/04/2017 0:35
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:03
	SW-846 9214 (Total)				09/29/2017 17:57
	SW-846 9251 (Total)				10/04/2017 0:32
17091780-004B	APW-10S	09/27/2017 16:15	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-004C	APW-10S	09/27/2017 16:15	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 15:50
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:21
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 16:47
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/09/2017 16:44
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:35
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 9:52
17091780-005A	APW-5	09/28/2017 11:00	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:38
	SW-846 9036 (Total)				10/05/2017 13:04
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:06
	SW-846 9214 (Total)				09/29/2017 17:59
	SW-846 9251 (Total)				10/04/2017 0:35
17091780-005B	APW-5	09/28/2017 11:00	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-005C	APW-5	09/28/2017 11:00	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 15:58
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:29
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 16:55
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:43
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:00
17091780-006A	APW-2	09/28/2017 12:30	09/29/2017 14:35		

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
	Standard Methods 2540 C (Total)				10/02/2017 16:39
	SW-846 9036 (Total)				10/04/2017 0:51
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:08
	SW-846 9214 (Total)				09/29/2017 18:01
	SW-846 9251 (Total)				10/04/2017 0:43
17091780-006B	APW-2	09/28/2017 12:30	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-006C	APW-2	09/28/2017 12:30	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 16:07
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/04/2017 2:46
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:03
17091780-007A	APW-6D	09/28/2017 13:45	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:39
	SW-846 9036 (Total)				10/05/2017 13:09
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:10
	SW-846 9214 (Total)				09/29/2017 18:03
	SW-846 9251 (Total)				10/04/2017 0:51
17091780-007B	APW-6D	09/28/2017 13:45	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-007C	APW-6D	09/28/2017 13:45	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 16:22
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:38
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 17:03
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:51
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:05
17091780-008A	APW-6S	09/28/2017 14:45	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:39
	SW-846 9036 (Total)				10/04/2017 1:07
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:12
	SW-846 9214 (Total)				09/29/2017 18:05
	SW-846 9251 (Total)				10/04/2017 0:59
17091780-008B	APW-6S	09/28/2017 14:45	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-008C	APW-6S	09/28/2017 14:45	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 16:30
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:46
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 17:11

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 13:59
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:08
17091780-009A	APW-8	09/28/2017 16:00	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:39
	SW-846 9036 (Total)				10/04/2017 1:37
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:14
	SW-846 9214 (Total)				09/29/2017 18:10
	SW-846 9251 (Total)				10/04/2017 1:07
17091780-009B	APW-8	09/28/2017 16:00	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-009C	APW-8	09/28/2017 16:00	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 16:39
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 1:54
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 17:28
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/09/2017 18:06
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 14:08
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:10
17091780-010A	APW-7	09/28/2017 16:50	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:39
	SW-846 9036 (Total)				10/04/2017 1:53
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:17
	SW-846 9214 (Total)				09/29/2017 18:12
	SW-846 9251 (Total)				10/04/2017 1:45
17091780-010B	APW-7	09/28/2017 16:50	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-010C	APW-7	09/28/2017 16:50	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 17:03
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 2:02
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 17:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/09/2017 18:14
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 14:16
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:12
17091780-011A	APW-3	09/29/2017 9:00	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:40
	SW-846 9036 (Total)				10/04/2017 2:01
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:23
	SW-846 9214 (Total)				09/29/2017 18:14

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
	SW-846 9251 (Total)				10/04/2017 1:53
17091780-011B	APW-3	09/29/2017 9:00	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-011C	APW-3	09/29/2017 9:00	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 17:11
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 2:11
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/09/2017 18:22
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 14:57
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:14
17091780-012A	APW-4	09/29/2017 10:25	09/29/2017 14:35		
	Standard Methods 2540 C (Total)				10/02/2017 16:40
	SW-846 9036 (Total)				10/04/2017 2:23
	SW-846 9040B, Laboratory Analyzed				10/02/2017 14:25
	SW-846 9214 (Total)				09/29/2017 18:16
	SW-846 9251 (Total)				10/04/2017 2:01
17091780-012B	APW-4	09/29/2017 10:25	09/29/2017 14:35		
	EPA 903.0/904.0, Radium 226/228				10/27/2017 0:00
17091780-012C	APW-4	09/29/2017 10:25	09/29/2017 14:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/03/2017 17:20
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 3:24
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/06/2017 18:17
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			09/29/2017 16:25	10/10/2017 14:24
	SW-846 7470A (Total)			10/03/2017 14:10	10/04/2017 10:17

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

STANDARD METHODS 2540 C (TOTAL)

Batch R238372 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						10/02/2017
Total Dissolved Solids	20		**< 20**						10/02/2017
Total Dissolved Solids	20		**< 20**						10/02/2017
Total Dissolved Solids	20		**< 20**						10/02/2017

Batch R238372 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**936**	1000	0	93.6	90	110	10/02/2017

Batch R238372 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**976**	1000	0	97.6	90	110	10/02/2017
Total Dissolved Solids	20		**984**	1000	0	98.4	90	110	10/02/2017
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	10/02/2017

Batch R238372 **SampType:** MS Units **mg/L**
SampID: 17091780-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**912**	500.0	428.0	96.8	85	115	10/02/2017

Batch R238372 **SampType:** MSD Units **mg/L** RPD Limit **5**
SampID: 17091780-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**924**	500.0	428.0	99.2	912.0	1.31	10/02/2017

Batch R238372 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 17091780-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**496**				514.0	3.56	10/02/2017

SW-846 9036 (TOTAL)

Batch R238430 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						10/03/2017

Batch R238430 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	101.4	90	110	10/03/2017

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

SW-846 9036 (TOTAL)

Batch R238430 **SampType:** MS Units **mg/L**

SampID: 17091780-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**63**	20.00	43.81	94.2	85	115	10/04/2017

Batch R238430 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17091780-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**65**	20.00	43.81	107.6	62.64	4.20	10/04/2017

Batch R238430 **SampType:** MS Units **mg/L**

SampID: 17091780-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**59**	20.00	39.58	95.4	85	115	10/04/2017

Batch R238430 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17091780-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**59**	20.00	39.58	95.8	58.65	0.14	10/04/2017

Batch R238497 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						10/05/2017

Batch R238497 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.8	90	110	10/05/2017

SW-846 9040B, LABORATORY ANALYZED

Batch R238333 **SampType:** LCS Units

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.98**	7.000	0	99.7	99.1	100.8	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.57**				6.540	0.46	10/02/2017

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

SW-846 9040B, LABORATORY ANALYZED

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.34**				7.350	0.14	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.09**				7.110	0.28	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.95**				6.960	0.14	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.26**				7.300	0.55	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.05**				7.050	0.00	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.24**				7.250	0.14	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.07**				7.060	0.14	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.06**				7.070	0.14	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.83**				6.840	0.15	10/02/2017

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

SW-846 9040B, LABORATORY ANALYZED

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.48**				7.460	0.27	10/02/2017

Batch R238333 **SampType:** DUP Units RPD Limit **10**

SampID: 17091780-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.35**				7.330	0.27	10/02/2017

SW-846 9214 (TOTAL)

Batch R238280 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						09/29/2017

Batch R238280 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.00**	1.000	0	100.3	90	110	09/29/2017

Batch R238280 **SampType:** MS Units **mg/L**

SampID: 17091780-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.34**	2.000	0.2200	106.0	85	115	09/29/2017

Batch R238280 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17091780-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.47**	2.000	0.2200	112.7	2.339	5.61	09/29/2017

Batch R238280 **SampType:** MS Units **mg/L**

SampID: 17091780-012AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.31**	2.000	0.1910	105.9	85	115	09/29/2017

Batch R238280 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17091780-012AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.35**	2.000	0.1910	107.8	2.309	1.59	09/29/2017

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

SW-846 9251 (TOTAL)

Batch R238425 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						10/03/2017

Batch R238425 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	103.8	90	110	10/03/2017

Batch R238425 **SampType:** MS Units **mg/L**
SampID: 17091780-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**36**	20.00	17.46	90.5	85	115	10/04/2017

Batch R238425 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17091780-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**35**	20.00	17.46	89.0	35.55	0.82	10/04/2017

Batch R238425 **SampType:** MS Units **mg/L**
SampID: 17091780-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**29**	20.00	9.890	94.1	85	115	10/04/2017

Batch R238425 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17091780-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**28**	20.00	9.890	92.6	28.70	1.05	10/04/2017

Batch R238555 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						10/05/2017

Batch R238555 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.3	90	110	10/05/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134682 **SampType:** MBLK Units **mg/L**

SampID: MBLK-134682

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	25.6	-100	100	10/03/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/06/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	10/06/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	10/10/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/06/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/06/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	91.2	-100	100	10/06/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/06/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/03/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	50.8	-100	100	10/03/2017

Batch 134682 **SampType:** LCS Units **mg/L**

SampID: LCS-134682

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.490**	0.5000	0	98.0	80	120	10/03/2017
Arsenic	0.0010		**0.518**	0.5000	0	103.6	80	120	10/06/2017
Barium	0.0010		**2.02**	2.000	0	101.0	80	120	10/03/2017
Beryllium	0.0010		**0.0539**	0.05000	0	107.8	80	120	10/06/2017
Boron	0.0250		**0.543**	0.5000	0	108.7	80	120	10/06/2017
Cadmium	0.0010		**0.0492**	0.05000	0	98.4	80	120	10/06/2017
Calcium	0.125		**2.52**	2.500	0	100.8	80	120	10/10/2017
Chromium	0.0010		**0.201**	0.2000	0	100.7	80	120	10/06/2017
Cobalt	0.0010		**0.495**	0.5000	0	99.0	80	120	10/06/2017
Lead	0.0010		**0.509**	0.5000	0	101.7	80	120	10/03/2017
Lithium	0.0010		**0.523**	0.5000	0	104.7	80	120	10/06/2017
Molybdenum	0.0010		**0.495**	0.5000	0	98.9	80	120	10/06/2017
Nickel	0.0010		**0.517**	0.5000	0	103.5	80	120	10/06/2017
Selenium	0.0010		**0.497**	0.5000	0	99.3	80	120	10/06/2017
Thallium	0.0010		**0.244**	0.2500	0	97.6	80	120	10/03/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134682 **SampType:** MS Units **mg/L**

SampID: 17091780-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.492**	0.5000	0.0004476	98.3	75	125	10/03/2017
Arsenic	0.0010		**0.517**	0.5000	0.001217	103.2	75	125	10/05/2017
Barium	0.0010		**2.18**	2.000	0.1931	99.4	75	125	10/03/2017
Beryllium	0.0010		**0.0513**	0.05000	0	102.6	75	125	10/05/2017
Boron	0.0250		**0.727**	0.5000	0.2512	95.2	75	125	10/05/2017
Cadmium	0.0010		**0.0484**	0.05000	0	96.9	75	125	10/05/2017
Calcium	0.125	S	**94.0**	2.500	93.01	40.0	75	125	10/10/2017
Chromium	0.0010		**0.198**	0.2000	0.002090	98.0	75	125	10/05/2017
Cobalt	0.0010		**0.534**	0.5000	0.0003417	106.7	75	125	10/06/2017
Lead	0.0010		**0.509**	0.5000	0.0003294	101.8	75	125	10/03/2017
Lithium	0.0010		**0.506**	0.5000	0.01804	97.6	75	125	10/05/2017
Molybdenum	0.0010		**0.484**	0.5000	0.0004161	96.8	75	125	10/05/2017
Nickel	0.0010		**0.493**	0.5000	0.006180	97.4	75	125	10/05/2017
Selenium	0.0010		**0.511**	0.5000	0.004048	101.4	75	125	10/05/2017
Thallium	0.0010		**0.250**	0.2500	0	99.8	75	125	10/03/2017

Batch 134682 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17091780-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.501**	0.5000	0.0004476	100.2	0.4918	1.89	10/03/2017
Arsenic	0.0010		**0.528**	0.5000	0.001217	105.4	0.5172	2.13	10/05/2017
Barium	0.0010		**2.21**	2.000	0.1931	100.8	2.180	1.35	10/03/2017
Beryllium	0.0010		**0.0545**	0.05000	0	109.0	0.05128	6.12	10/05/2017
Boron	0.0250		**0.750**	0.5000	0.2512	99.7	0.7273	3.04	10/05/2017
Cadmium	0.0010		**0.0499**	0.05000	0	99.7	0.04843	2.90	10/05/2017
Calcium	0.125		**95.0**	2.500	93.01	80.1	94.01	1.06	10/10/2017
Chromium	0.0010		**0.205**	0.2000	0.002090	101.7	0.1981	3.66	10/05/2017
Cobalt	0.0010		**0.544**	0.5000	0.0003417	108.8	0.5340	1.88	10/06/2017
Lead	0.0010		**0.515**	0.5000	0.0003294	102.9	0.5092	1.09	10/03/2017
Lithium	0.0010		**0.533**	0.5000	0.01804	103.1	0.5061	5.24	10/05/2017
Molybdenum	0.0010		**0.502**	0.5000	0.0004161	100.2	0.4842	3.54	10/05/2017
Nickel	0.0010		**0.511**	0.5000	0.006180	100.9	0.4933	3.47	10/05/2017
Selenium	0.0010		**0.518**	0.5000	0.004048	102.8	0.5109	1.38	10/05/2017
Thallium	0.0010		**0.256**	0.2500	0	102.2	0.2496	2.34	10/03/2017

Client: ERM **Work Order:** 17091780

Client Project: Grand Tower CCR GW **Report Date:** 06-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 134682 **SampType:** MS Units **mg/L**

SampID: 17091780-011CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.493**	0.5000	0	98.6	75	125	10/03/2017
Arsenic	0.0010		**0.531**	0.5000	0.002917	105.6	75	125	10/05/2017
Barium	0.0010		**2.16**	2.000	0.1464	100.8	75	125	10/03/2017
Beryllium	0.0010		**0.0539**	0.05000	0	107.9	75	125	10/05/2017
Boron	0.0250		**4.83**	0.5000	4.205	123.9	75	125	10/09/2017
Cadmium	0.0010		**0.0507**	0.05000	0.0004615	100.5	75	125	10/05/2017
Calcium	0.125	S	**105**	2.500	103.6	71.3	75	125	10/10/2017
Chromium	0.0010		**0.209**	0.2000	0.005299	101.7	75	125	10/05/2017
Cobalt	0.0010		**0.499**	0.5000	0.001490	99.5	75	125	10/09/2017
Lead	0.0010		**0.523**	0.5000	0.004205	103.8	75	125	10/03/2017
Lithium	0.0010		**0.543**	0.5000	0.02615	103.3	75	125	10/05/2017
Molybdenum	0.0010		**0.583**	0.5000	0.07540	101.5	75	125	10/05/2017
Nickel	0.0010		**0.507**	0.5000	0.005051	100.4	75	125	10/09/2017
Selenium	0.0010		**0.497**	0.5000	0	99.4	75	125	10/05/2017
Thallium	0.0010		**0.254**	0.2500	0	101.7	75	125	10/03/2017

Batch 134682 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17091780-011CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.494**	0.5000	0	98.7	0.4928	0.20	10/03/2017
Arsenic	0.0010		**0.520**	0.5000	0.002917	103.5	0.5309	1.99	10/06/2017
Barium	0.0010		**2.18**	2.000	0.1464	101.5	2.163	0.66	10/03/2017
Beryllium	0.0010		**0.0536**	0.05000	0	107.2	0.05393	0.59	10/06/2017
Boron	0.0250	S	**4.85**	0.5000	4.205	128.0	4.825	0.42	10/09/2017
Cadmium	0.0010		**0.0496**	0.05000	0.0004615	98.3	0.05073	2.18	10/06/2017
Calcium	0.125	S	**105**	2.500	103.6	67.2	105.4	0.10	10/10/2017
Chromium	0.0010		**0.209**	0.2000	0.005299	101.7	0.2087	0.03	10/06/2017
Cobalt	0.0010		**0.494**	0.5000	0.001490	98.5	0.4990	1.06	10/09/2017
Lead	0.0010		**0.533**	0.5000	0.004205	105.7	0.5232	1.85	10/03/2017
Lithium	0.0010		**0.546**	0.5000	0.02615	103.9	0.5425	0.55	10/06/2017
Molybdenum	0.0010		**0.578**	0.5000	0.07540	100.6	0.5831	0.82	10/06/2017
Nickel	0.0010		**0.503**	0.5000	0.005051	99.6	0.5071	0.78	10/09/2017
Selenium	0.0010		**0.489**	0.5000	0	97.8	0.4969	1.59	10/06/2017
Thallium	0.0010		**0.255**	0.2500	0	101.9	0.2542	0.21	10/03/2017

SW-846 7470A (TOTAL)

Batch 134762 **SampType:** MBLK Units **mg/L**

SampID: MBLK-134762

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	10/04/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

SW-846 7470A (TOTAL)

Batch **134762** **SampType:** **LCS** Units **mg/L**

SampID: LCS-134762

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00521**	0.00500	0	104.1	85	115	10/04/2017

Batch **134762** **SampType:** **MS** Units **mg/L**

SampID: 17091780-003CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00494**	0.00500	0	98.8	75	125	10/04/2017

Batch **134762** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17091780-003CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00496**	0.00500	0	99.1	0.004939	0.34	10/04/2017

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17091780

Report Date: 06-Nov-17

Carrier: Employee

Received By: KF

Completed by: Amber M. Dilallo
On: 29-Sep-17

Reviewed by: Elizabeth A. Hurley
On: 29-Sep-17

Pages to follow: Chain of custody 2 Extra pages included 26

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **2.62**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 17091780

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 2.62 °C
Preserved in: ☐ LAB ☒ FIELD
Lab Notes am 9/29/17

FOR LAB USE ONLY

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.
NOTE: Preservative spilled on outside of containers as received from Teklab.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M. Halley / E. Shavers

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
17091780-001	APW-1R	9/27/17 1210	1	3												X	X	X	X	X	X	X	X
002	APW-9	9/27/17 1355																					
003	APW-10D	9/27/17 1525																					
004	APW-10S	9/27/17 1615																					
005	APW-5	9/28/17 1100																					
006	APW-2	1230																					
007	APW-6D	1345																					
008	APW-6S	1445																					
009	APW-8	1600																					
010	APW-7	1650																					

Relinquished By	Date/Time	Received By	Date/Time
[signature]	9/29/17 1435	[signature]	9/29/17 1435

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 39877

am 9/29/17

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 17091780

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE _____ °C
Preserved in: ☒ LAB ☒ FIELD
FOR LAB USE ONLY
Lab Notes

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.
NOTE- Preservative spill(s) on outside of containers upon receipt from Teklab

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M. Halley / E. Shavers

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
17091780-01	APW-3	9/29/17 0900	1	3						X						X	X	X	X	X	X	X	X
02	APW-4	9/29/17 1025	1	3						X						X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	9/29/17 1435	[signature]	9/29/17 1435

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 39877

Summit Environmental Technologies, Inc.
3310 Win St.
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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

November 01, 2017

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 17091780

Dear Mike Austin:

Order No.: 17100266

Summit Environmental Technologies, Inc. received 12 sample(s) on 10/4/2017 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

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Case Narrative

WO#: **17100266**
Date: **11/1/2017**

CLIENT: TEKLAB Inc,
Project: 17091780

WorkOrder Narrative:
17100266: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
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Qualifiers and Acronyms

WO#: **17100266**
Date: **11/1/2017**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **17100266**
01-Nov-17

CLIENT: TEKLAB Inc,
Project: 17091780

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17100266-001	17091780-001		9/27/2017 12:10:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-002	17091780-002		9/27/2017 1:55:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-003	17091780-003		9/27/2017 3:25:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-004	17091780-004		9/27/2017 4:15:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-005	17091780-005		9/28/2017 11:00:00 AM	10/4/2017 2:20:00 PM	Groundwater
17100266-006	17091780-006		9/28/2017 12:30:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-007	17091780-007		9/28/2017 1:45:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-008	17091780-008		9/28/2017 2:45:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-009	17091780-009		9/28/2017 4:00:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-010	17091780-010		9/28/2017 4:50:00 PM	10/4/2017 2:20:00 PM	Groundwater
17100266-011	17091780-011		9/29/2017 9:00:00 AM	10/4/2017 2:20:00 PM	Groundwater
17100266-012	17091780-012		9/29/2017 10:25:00 AM	10/4/2017 2:20:00 PM	Groundwater

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DATES REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,
Project: 17091780

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17100266-001A	17091780-001	9/27/2017 12:10:00 PM	Groundwater	Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:36:00 PM
17100266-002A	17091780-002	9/27/2017 1:55:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:36:00 PM
17100266-003A	17091780-003	9/27/2017 3:25:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:37:00 PM
17100266-004A	17091780-004	9/27/2017 4:15:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:37:00 PM
17100266-005A	17091780-005	9/28/2017 11:00:00 AM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:37:00 PM
17100266-006A	17091780-006	9/28/2017 12:30:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 8:59:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 2:37:00 PM
17100266-007A	17091780-007	9/28/2017 1:45:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:33:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM
17100266-008A	17091780-008	9/28/2017 2:45:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:34:00 AM

Original

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DATES REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,

Project: 17091780

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17100266-008A	17091780-008	9/28/2017 2:45:00 PM	Groundwater	Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM
17100266-009A	17091780-009	9/28/2017 4:00:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:34:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM
17100266-010A	17091780-010	9/28/2017 4:50:00 PM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:34:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM
17100266-011A	17091780-011	9/29/2017 9:00:00 AM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:35:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM
17100266-012A	17091780-012	9/29/2017 10:25:00 AM		Combined Radium (EPA903+904)			10/30/2017
				Radium-226 (EPA 903.0)		10/25/2017 9:50:58 AM	10/30/2017 11:35:00 AM
				Radium-228 (EPA 904.0)		10/25/2017 9:50:58 AM	10/27/2017 3:16:00 PM

Original

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/27/2017 12:10:00 PM
Project: 17091780
Lab ID: 17100266-001
Matrix: GROUNDWATER
Client Sample ID 17091780-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.69	2.00	U	pCi/L	± 0.48	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.18	1.00	U	pCi/L	± 0.09	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.51	1.00	U	pCi/L	± 0.39	1	10/27/2017 2:36:00 PM
Yield	1					1	10/27/2017 2:36:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/27/2017 1:55:00 PM
Project: 17091780
Lab ID: 17100266-002
Matrix: GROUNDWATER
Client Sample ID 17091780-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.7	2.00	U	pCi/L	± 0.63	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.03	1.00	U	pCi/L	± 0.07	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.67	1.00	U	pCi/L	± 0.56	1	10/27/2017 2:36:00 PM
Yield	1					1	10/27/2017 2:36:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/27/2017 3:25:00 PM
Project: 17091780
Lab ID: 17100266-003
Matrix: GROUNDWATER
Client Sample ID 17091780-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.72	2.00	U	pCi/L	± 0.74	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	-0.11	1.00	U	pCi/L	± 0.1	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.72	1.00		pCi/L	± 0.64	1	10/27/2017 2:37:00 PM
Yield	1					1	10/27/2017 2:37:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/27/2017 4:15:00 PM
Project: 17091780
Lab ID: 17100266-004
Matrix: GROUNDWATER
Client Sample ID 17091780-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.17	2.00	U	pCi/L	± 0.81	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.19	1.00	U	pCi/L	± 0.11	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.98	1.00	J	pCi/L	± 0.7	1	10/27/2017 2:37:00 PM
Yield	1					1	10/27/2017 2:37:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 11:00:00 AM
Project: 17091780
Lab ID: 17100266-005
Matrix: GROUNDWATER
Client Sample ID 17091780-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.08	2.00	U	pCi/L	± 0.65	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.19	1.00	U	pCi/L	± 0.1	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.89	1.00	J	pCi/L	± 0.55	1	10/27/2017 2:37:00 PM
Yield	1					1	10/27/2017 2:37:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 12:30:00 PM
Project: 17091780
Lab ID: 17100266-006
Matrix: GROUNDWATER
Client Sample ID 17091780-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.03	2.00	U	pCi/L	± 0.7	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.03	1.00	U	pCi/L	± 0.1	1	10/30/2017 8:59:00 AM
Yield	1					1	10/30/2017 8:59:00 AM
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	-0.01	1.00	U	pCi/L	± 0.6	1	10/27/2017 2:37:00 PM
Yield	1					1	10/27/2017 2:37:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 1:45:00 PM
Project: 17091780
Lab ID: 17100266-007
Matrix: GROUNDWATER
Client Sample ID 17091780-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.98	2.00	U	pCi/L	± 0.44	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.37	1.00	U	pCi/L	± 0.11	1	10/30/2017 11:33:00 A
Yield	1					1	10/30/2017 11:33:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.61	1.00	U	pCi/L	± 0.33	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 2:45:00 PM
Project: 17091780
Lab ID: 17100266-008
Matrix: GROUNDWATER
Client Sample ID 17091780-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.15	2.00	U	pCi/L	± 0.61	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.09	1.00	U	pCi/L	± 0.08	1	10/30/2017 11:34:00 A
Yield	1					1	10/30/2017 11:34:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.06	1.00		pCi/L	± 0.53	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 4:00:00 PM
Project: 17091780
Lab ID: 17100266-009
Matrix: GROUNDWATER
Client Sample ID 17091780-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1	2.00	U	pCi/L	± 0.56	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.12	1.00	U	pCi/L	± 0.08	1	10/30/2017 11:34:00 A
Yield	1					1	10/30/2017 11:34:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.88	1.00	J	pCi/L	± 0.48	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/28/2017 4:50:00 PM
Project: 17091780
Lab ID: 17100266-010
Matrix: GROUNDWATER
Client Sample ID 17091780-010

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.76	2.00	U	pCi/L	± 0.67	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0	1.00	U	pCi/L	± 0.06	1	10/30/2017 11:34:00 A
Yield	1					1	10/30/2017 11:34:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.76	1.00	J	pCi/L	± 0.61	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/29/2017 9:00:00 AM
Project: 17091780
Lab ID: 17100266-011
Matrix: GROUNDWATER
Client Sample ID 17091780-011

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.05	2.00	U	pCi/L	± 0.66	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.04	1.00	U	pCi/L	± 0.09	1	10/30/2017 11:35:00 A
Yield	1					1	10/30/2017 11:35:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.01	1.00		pCi/L	± 0.57	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17100266**

Date Reported: **11/1/2017**

CLIENT: TEKLAB Inc,
Collection Date: 9/29/2017 10:25:00 AM
Project: 17091780
Lab ID: 17100266-012
Matrix: GROUNDWATER
Client Sample ID 17091780-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.02	2.00	U	pCi/L	± 0.76	1	10/30/2017
RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.02	1.00	U	pCi/L	± 0.08	1	10/30/2017 11:35:00 A
Yield	1					1	10/30/2017 11:35:00 A
RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	-0.45	1.00	U	pCi/L	± 0.68	1	10/27/2017 3:16:00 PM
Yield	1					1	10/27/2017 3:16:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,
Project: 17091780 **BatchID:** **29395**

Sample ID **LCS-29395** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76641**
Client ID: **LCSW** Batch ID: **29395** TestNo: **E904.0** **E903-904** Analysis Date: **10/27/2017** SeqNo: **1307812**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.69	1.00	5.000	0	73.7	70	130				
Yield	0.710			0	0						

Sample ID **lcsd-29395** SampType: **LCSD** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76641**
Client ID: **LCSS02** Batch ID: **29395** TestNo: **E904.0** **E903-904** Analysis Date: **10/27/2017** SeqNo: **1307814**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.90	1.00	5.000	0	78.0	70	130	3.686	5.67	20	
Yield	1.00			0	0			0.7100	33.9		

Sample ID **17100319-001aMS** SampType: **MS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76641**
Client ID: **BatchQC** Batch ID: **29395** TestNo: **E904.0** **E903-904** Analysis Date: **10/27/2017** SeqNo: **1307817**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.54	1.00	5.000	0	70.8	70	130				
Yield	0.690			1.000	0						

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,
Project: 17091780 **BatchID:** **29395**

Sample ID **17100318-001adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76641**
Client ID: **BatchQC** Batch ID: **29395** TestNo: **E904.0** **E903-904** Analysis Date: **10/27/2017** SeqNo: **1307836**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0	0	20	U
Yield	1.00			0	0			1.000	0		

Sample ID **mb-29395** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76641**
Client ID: **PBW** Batch ID: **29395** TestNo: **E904.0** **E903-904** Analysis Date: **10/27/2017** SeqNo: **1307838**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,
Project: 17091780 **BatchID:** **29395**

Sample ID **mb-29395** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76648**
Client ID: **PBW** Batch ID: **29395** TestNo: **E903.0** **E903-904** Analysis Date: **10/30/2017** SeqNo: **1308016**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **LCS-29395** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76648**
Client ID: **LCSW** Batch ID: **29395** TestNo: **E903.0** **E903-904** Analysis Date: **10/30/2017** SeqNo: **1308018**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.94	1.00	5.000	0	98.8	70	130				

Sample ID **17100319-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76648**
Client ID: **BatchQC** Batch ID: **29395** TestNo: **E903.0** **E903-904** Analysis Date: **10/30/2017** SeqNo: **1308021**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.09	1.00	5.000	0	81.8	70	130				

Sample ID **17100318-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76648**
Client ID: **BatchQC** Batch ID: **29395** TestNo: **E903.0** **E903-904** Analysis Date: **10/30/2017** SeqNo: **1308040**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17100266**

01-Nov-17

Client: TEKLAB Inc,
Project: 17091780

BatchID: **29395**

Sample ID **17100318-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **10/25/2017** RunNo: **76648**
Client ID: **BatchQC** Batch ID: **29395** TestNo: **E903.0** **E903-904** Analysis Date: **10/30/2017** SeqNo: **1308040**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 17091780

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25235 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium									
	17091780-001	9/27/17 12:10	HNO3	Groundwater	✓	✓	✓									
	17091780-002	9/27/17 13:55	HNO3	Groundwater	✓	✓	✓									
	17091780-003	9/27/17 15.25	HNO3	Groundwater	✓	✓	✓									
	17091780-004	9/27/17 16:15	HNO3	Groundwater	✓	✓	✓									
	17091780-005	9/28/17 11:00	HNO3	Groundwater	✓	✓	✓									
	17091780-006	9/28/17 12:30	HNO3	Groundwater	✓	✓	✓									
	17091780-007	9/28/17 13:45	HNO3	Groundwater	✓	✓	✓									
	17091780-008	9/28/17 14:45	HNO3	Groundwater	✓	✓	✓									
	17091780-009	9/28/17 16:00	HNO3	Groundwater	✓	✓	✓									
	17091780-010	9/28/17 16:50	HNO3	Groundwater	✓	✓	✓									
	17091780-011	9/29/17 9:00	HNO3	Groundwater	✓	✓	✓									

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]		[illegible]	10-4-17 1420

17100266-001-012

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization, and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 17091780

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25235 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium										
	17091780-012	9/29/17 10:25	HNO3	Groundwater	✓	✓	✓										
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													

17100266 001 - 012

*Relinquished By	Date/Time	Received By	Date/Time
Amber Ruccello			10-4-17 1420

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization, and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

Figure 1 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 1

Client: TekLab

Initials of person inspecting cooler and samples: AMB

Order Number: 17100266

Date Received: 10-4-17 Time Received: 1420 Date cooler(s) opened and samples inspected: 10-4-17

Number of Coolers/Boxes: 3

N/A

Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging: Peanuts Bubble Wrap Paper Foam None Other:

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A
Ice_____ Blue ice _____	present	absent	melted N/A

Cooler Temperature IR Gun #16020459 CF 0.0 °C Temp: 21.9 °C N/A

Radiological Testing Instrument serial #35127 Y N N/A (see page 2 for scan results)
Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s):

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Sufficient sample for QC	Y	N	N/A
Samples received within holding time	Y	N	N/A
Do any 40 mL vials contain bubbles**	Y	N	N/A

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm:

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:

Date/Time:

Logged in by:

Comments:

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	**pH Strip (2.8-4.6) SET#:** OES-01-0250
Total DPD packet SET#: OES-02-0239	**Free DPD packet SET#:** OES-01-0290
Disp. Pipette SET#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1		2		44	
2		2		16	
3		2		38	
4		2		19	
5		2		24	
6		2		36	
7		2		17	
8		2		21	
9		2		27	
10		2		13	
11		2		22	
12		2		26	

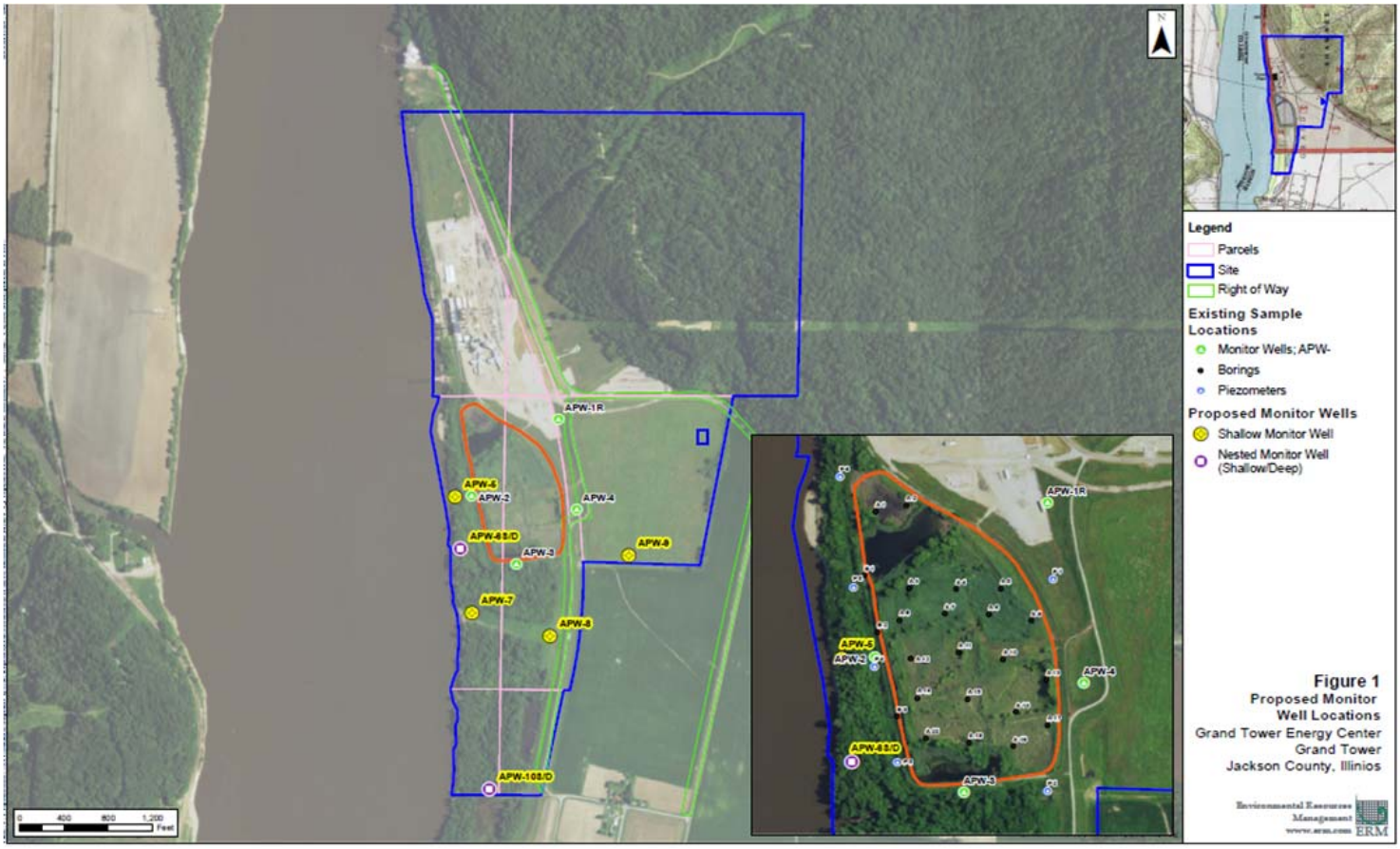
P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst

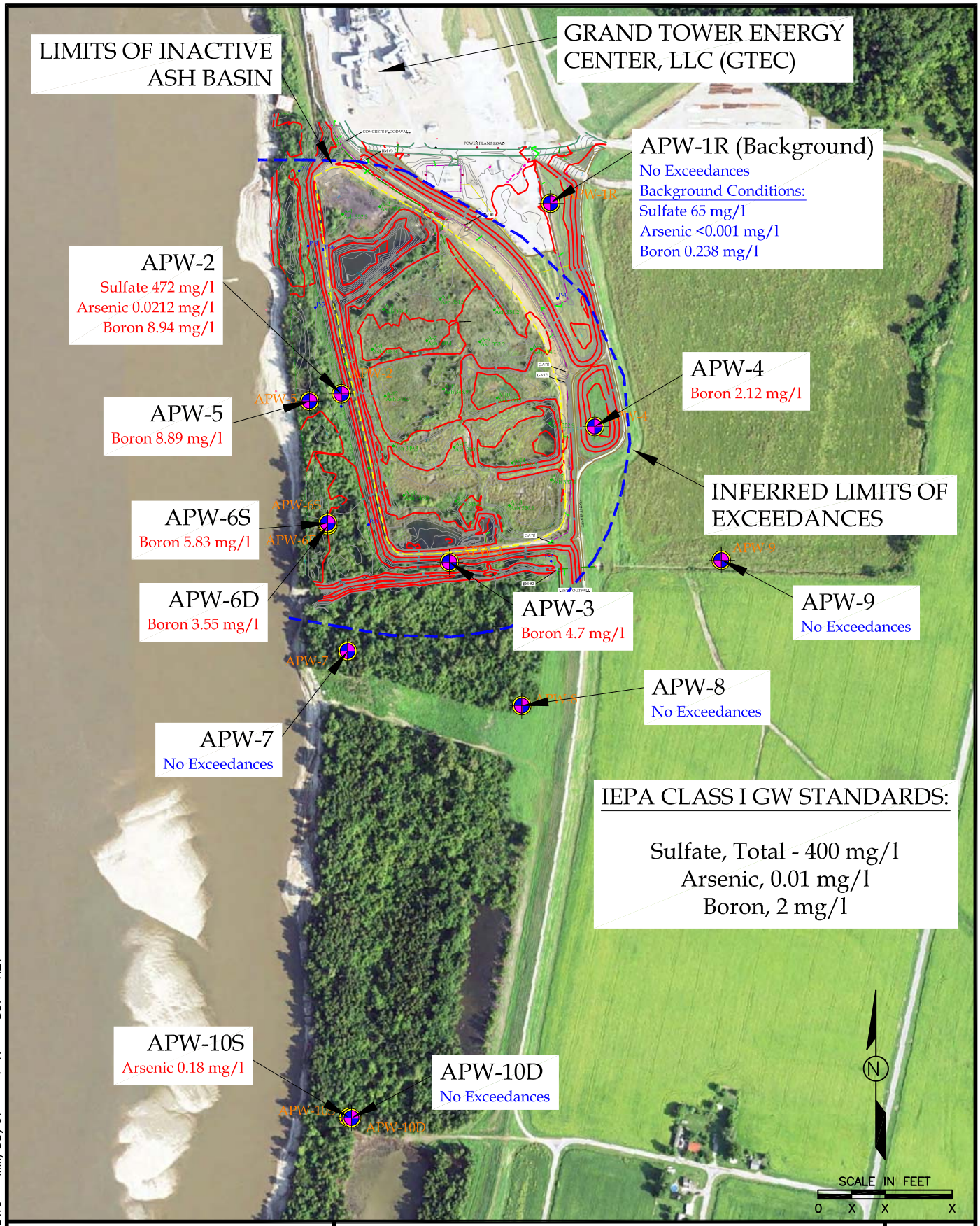
Event 3

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 3 **Date Samples Collected:** **From** 10/18/17 **To** 10/20/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	<5	11	21	11	15	27	16	14	10	13	6	17
Sulfate, Total	mg/L	400	65	**472**	201	109	399	167	206	52	38	53	<10	43
Fluoride, Total	mg/L	4	0.16	0.25	0.29	0.18	0.32	0.25	0.21	0.19	0.29	0.21	0.16	0.1
Lab pH		6.5 - 9.0	6.6	7.08	7.65	7.31	7.26	7.18	7.23	6.86	7	7.39	6.95	7.05
Total Dissolved Solids	mg/L	1200	376	934	486	452	804	574	562	624	436	324	678	442
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	<0.001	**0.0212**	0.0021	0.0016	0.0015	0.0018	0.0075	<0.001	<0.001	0.0018	**0.18**	<0.001
Barium	mg/L	2	0.171	0.685	0.104	0.123	0.183	0.205	0.142	0.394	0.219	0.118	0.543	0.363
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.238	**8.94**	**4.7**	**2.12**	**8.89**	**5.83**	**3.55**	0.302	0.135	0.668	0.536	0.0843
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		86.2	171	88.1	89.4	119	87.5	96.7	171	92.6	76.5	135	120
Chromium	mg/L	0.1	0.0033	0.0503	0.0026	0.0017	0.0041	0.0028	<0.001	0.0026	<0.001	<0.001	<0.001	0.0022
Cobalt	mg/L	1	<0.001	0.0097	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0025
Lead	mg/L	0.0075	<0.001	**0.0201**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.0173	0.0647	0.0259	0.0412	0.0393	0.04	0.0161	0.0172	0.0207	0.0174	0.0272	0.0146
Molybdenum	No Standard		<0.001	0.214	0.0761	0.0793	0.201	0.272	0.0582	0.0033	<0.001	0.0327	<0.001	<0.001
Nickel	mg/L	0.1	0.0054	0.0412	0.0019	0.0029	0.0023	0.0021	0.0018	0.0013	0.0029	<0.001	<0.001	0.0065
Selenium	mg/L	0.05	0.0034	<0.001	<0.001	0.0149	<0.001	<0.001	<0.001	<0.001	0.0132	0.017	<0.001	0.0012
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	0.664	0.933	0.634	0.893	0.718	0.467	0.959	0.465	0.718	0.908	0.161	0.653
Radium-228	pCi/l	20	0.662	0.738	0.733	0.741	0.764	0.598	0.724	0.731	0.896	0.661	0.639	0.676
Radium-226/228 Comb.	pCi/l	-----	1.306	1.671	1.367	1.634	1.482	1.065	1.683	1.196	1.614	1.569	0.8	1.329





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 3 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
3

November 15, 2017

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17101317

Dear Brett Carney:

TEKLAB, INC received 12 samples on 10/20/2017 2:20:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

This reporting package includes the following:

Cover Letter	1
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Quality Control Results	24
Receiving Check List	34
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

Abbr	Definition
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Cooler Receipt Temp: 2.02 °C

Radium Analysis performed by Pace Analytical Services, LLC. See attached report for results and QC.

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 10/18/2017 13:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**376**	mg/L	1	10/24/2017 14:05	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**65**	mg/L	2	10/23/2017 20:50	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.60**		1	10/20/2017 18:27	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	10/20/2017 19:07	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	10/23/2017 20:42	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:11	135448
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:11	135448
Barium	NELAP	0.0010		**0.171**	mg/L	5	10/25/2017 1:11	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:16	135448
Boron	NELAP	0.0250		**0.238**	mg/L	5	10/25/2017 18:16	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:11	135448
Calcium	NELAP	2.50	S	**86.2**	mg/L	100	11/01/2017 20:39	135448
Chromium	NELAP	0.0010		**0.0033**	mg/L	5	10/25/2017 18:16	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:16	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:11	135448
Lithium		0.0010		**0.0173**	mg/L	5	10/25/2017 18:16	135448
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/26/2017 21:51	135448
Nickel	NELAP	0.0010		**0.0054**	mg/L	5	10/25/2017 18:16	135448
Selenium	NELAP	0.0010		**0.0034**	mg/L	5	10/25/2017 1:11	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:11	135448
MS QC limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:15	135450
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-002
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 10/18/2017 14:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**324**	mg/L	1	10/24/2017 14:05	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**53**	mg/L	2	10/23/2017 21:12	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.39**		1	10/20/2017 18:30	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	10/20/2017 19:10	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	10/23/2017 20:50	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:36	135448
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	10/25/2017 1:36	135448
Barium	NELAP	0.0010		**0.118**	mg/L	5	10/25/2017 1:36	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:24	135448
Boron	NELAP	0.0250		**0.668**	mg/L	5	10/25/2017 18:24	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:36	135448
Calcium	NELAP	2.50		**76.5**	mg/L	100	11/01/2017 20:48	135448
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:24	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:24	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:36	135448
Lithium		0.0010		**0.0174**	mg/L	5	10/25/2017 18:24	135448
Molybdenum	NELAP	0.0010		**0.0327**	mg/L	5	10/26/2017 20:20	135448
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:24	135448
Selenium	NELAP	0.0010		**0.0170**	mg/L	5	10/25/2017 1:36	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:36	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:18	135450
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-003
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 10/18/2017 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**436**	mg/L	1	10/24/2017 14:43	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**38**	mg/L	1	10/23/2017 21:14	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.00**		1	10/20/2017 18:32	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	10/20/2017 19:12	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	10/23/2017 21:12	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:44	135448
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:44	135448
Barium	NELAP	0.0010		**0.219**	mg/L	5	10/25/2017 1:44	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:32	135448
Boron	NELAP	0.0250		**0.135**	mg/L	5	10/25/2017 18:32	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:44	135448
Calcium	NELAP	2.50		**92.6**	mg/L	100	11/01/2017 20:56	135448
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:32	135448
Cobalt	NELAP	0.0010		**0.0010**	mg/L	5	10/25/2017 18:32	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:44	135448
Lithium		0.0010		**0.0207**	mg/L	5	10/25/2017 18:32	135448
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/26/2017 20:28	135448
Nickel	NELAP	0.0010		**0.0029**	mg/L	5	10/25/2017 18:32	135448
Selenium	NELAP	0.0010		**0.0132**	mg/L	5	10/25/2017 1:44	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:44	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:24	135450
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-004
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 10/19/2017 9:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**624**	mg/L	1	10/24/2017 14:43	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**52**	mg/L	2	10/23/2017 21:41	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.86**		1	10/20/2017 18:35	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	10/20/2017 19:13	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**14**	mg/L	1	10/23/2017 21:33	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
Barium	NELAP	0.0010		**0.394**	mg/L	5	10/25/2017 1:52	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:40	135448
Boron	NELAP	0.0250		**0.302**	mg/L	5	10/25/2017 18:40	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
Calcium	NELAP	2.50		**171**	mg/L	100	11/01/2017 21:04	135448
Chromium	NELAP	0.0010		**0.0026**	mg/L	5	10/25/2017 18:40	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:40	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
Lithium		0.0010		**0.0172**	mg/L	5	10/25/2017 18:40	135448
Molybdenum	NELAP	0.0010		**0.0033**	mg/L	5	10/26/2017 20:37	135448
Nickel	NELAP	0.0010		**0.0013**	mg/L	5	10/25/2017 18:40	135448
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 1:52	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:36	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-005
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 10/19/2017 10:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**442**	mg/L	1	10/24/2017 14:44	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**43**	mg/L	1	10/23/2017 21:44	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.05**		1	10/20/2017 18:37	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.10**	mg/L	1	10/20/2017 19:18	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	10/23/2017 21:41	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:00	135448
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:00	135448
Barium	NELAP	0.0010		**0.363**	mg/L	5	10/25/2017 2:00	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:48	135448
Boron	NELAP	0.0250		**0.0843**	mg/L	5	10/25/2017 18:48	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:00	135448
Calcium	NELAP	2.50		**120**	mg/L	100	11/01/2017 21:12	135448
Chromium	NELAP	0.0010		**0.0022**	mg/L	5	10/25/2017 18:48	135448
Cobalt	NELAP	0.0010		**0.0025**	mg/L	5	10/25/2017 18:48	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:00	135448
Lithium		0.0010		**0.0146**	mg/L	5	10/25/2017 18:48	135448
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/26/2017 20:45	135448
Nickel	NELAP	0.0010		**0.0065**	mg/L	5	10/25/2017 18:48	135448
Selenium	NELAP	0.0010		**0.0012**	mg/L	5	10/25/2017 2:00	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:00	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:38	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-006
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 10/19/2017 11:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**678**	mg/L	1	10/24/2017 14:44	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	10/23/2017 22:03	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.95**		1	10/20/2017 18:40	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	10/20/2017 19:20	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	10/23/2017 22:00	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:08	135448
Arsenic	NELAP	0.0010		**0.180**	mg/L	5	10/25/2017 2:08	135448
Barium	NELAP	0.0010		**0.543**	mg/L	5	10/25/2017 2:08	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:57	135448
Boron	NELAP	0.0250		**0.536**	mg/L	5	10/25/2017 18:57	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:08	135448
Calcium	NELAP	2.50		**135**	mg/L	100	11/01/2017 21:37	135448
Chromium	NELAP	0.0010		**0.0010**	mg/L	5	10/25/2017 18:57	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:57	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:08	135448
Lithium		0.0010		**0.0272**	mg/L	5	10/25/2017 18:57	135448
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	10/26/2017 21:09	135448
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 18:57	135448
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:08	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:08	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:41	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-007
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 10/19/2017 13:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**452**	mg/L	1	10/24/2017 14:44	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**109**	mg/L	5	10/23/2017 22:11	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.31**		1	10/20/2017 18:43	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.18**	mg/L	1	10/20/2017 19:22	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	10/23/2017 22:03	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:17	135448
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	10/25/2017 2:17	135448
Barium	NELAP	0.0010		**0.123**	mg/L	5	10/25/2017 2:17	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:05	135448
Boron	NELAP	0.0250		**2.12**	mg/L	5	10/25/2017 19:05	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:17	135448
Calcium	NELAP	2.50		**89.4**	mg/L	100	11/01/2017 21:45	135448
Chromium	NELAP	0.0010		**0.0017**	mg/L	5	10/25/2017 19:05	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:05	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:17	135448
Lithium		0.0010		**0.0412**	mg/L	5	10/25/2017 19:05	135448
Molybdenum	NELAP	0.0010		**0.0793**	mg/L	5	10/26/2017 21:18	135448
Nickel	NELAP	0.0010		**0.0029**	mg/L	5	10/25/2017 19:05	135448
Selenium	NELAP	0.0010		**0.0149**	mg/L	5	10/25/2017 2:17	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:17	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:43	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-008
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 10/19/2017 14:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**562**	mg/L	1	10/24/2017 14:45	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**206**	mg/L	10	10/23/2017 22:19	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.23**		1	10/20/2017 18:44	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	10/20/2017 19:23	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	10/23/2017 22:11	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:25	135448
Arsenic	NELAP	0.0010		**0.0075**	mg/L	5	10/25/2017 2:25	135448
Barium	NELAP	0.0010		**0.142**	mg/L	5	10/25/2017 2:25	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:29	135448
Boron	NELAP	0.0250		**3.55**	mg/L	5	10/25/2017 19:29	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:25	135448
Calcium	NELAP	2.50		**96.7**	mg/L	100	11/01/2017 21:53	135448
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:29	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:29	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:25	135448
Lithium		0.0010		**0.0161**	mg/L	5	10/25/2017 19:29	135448
Molybdenum	NELAP	0.0010		**0.0582**	mg/L	5	10/26/2017 21:26	135448
Nickel	NELAP	0.0010		**0.0018**	mg/L	5	10/25/2017 19:29	135448
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:25	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:25	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:50	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-009
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 10/19/2017 15:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**574**	mg/L	1	10/24/2017 14:45	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**167**	mg/L	5	10/23/2017 22:27	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.18**		1	10/20/2017 18:46	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.25**	mg/L	1	10/20/2017 19:29	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**27**	mg/L	1	10/23/2017 22:19	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:33	135448
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	10/25/2017 2:33	135448
Barium	NELAP	0.0010		**0.205**	mg/L	5	10/25/2017 2:33	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:38	135448
Boron	NELAP	0.0250		**5.83**	mg/L	5	10/25/2017 19:38	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:33	135448
Calcium	NELAP	2.50		**87.5**	mg/L	100	11/01/2017 22:01	135448
Chromium	NELAP	0.0010		**0.0028**	mg/L	5	10/25/2017 19:38	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:38	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:33	135448
Lithium		0.0010		**0.0400**	mg/L	5	10/25/2017 19:38	135448
Molybdenum	NELAP	0.0010		**0.272**	mg/L	5	10/26/2017 21:34	135448
Nickel	NELAP	0.0010		**0.0021**	mg/L	5	10/25/2017 19:38	135448
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:33	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:33	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:52	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-010
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 10/19/2017 16:35

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**804**	mg/L	1	10/24/2017 14:45	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**399**	mg/L	10	10/23/2017 22:35	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.26**		1	10/20/2017 18:49	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.32**	mg/L	1	10/20/2017 19:31	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	10/23/2017 22:27	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:41	135448
Arsenic	NELAP	0.0010		**0.0015**	mg/L	5	10/25/2017 2:41	135448
Barium	NELAP	0.0010		**0.183**	mg/L	5	10/25/2017 2:41	135448
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:46	135448
Boron	NELAP	0.0250		**8.89**	mg/L	5	10/25/2017 19:46	135448
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:41	135448
Calcium	NELAP	2.50		**119**	mg/L	100	11/01/2017 22:10	135448
Chromium	NELAP	0.0010		**0.0041**	mg/L	5	10/25/2017 19:46	135448
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 19:46	135448
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:41	135448
Lithium		0.0010		**0.0393**	mg/L	5	10/25/2017 19:46	135448
Molybdenum	NELAP	0.0010		**0.201**	mg/L	5	10/26/2017 21:42	135448
Nickel	NELAP	0.0010		**0.0023**	mg/L	5	10/25/2017 19:46	135448
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:41	135448
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 2:41	135448
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 9:54	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

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Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-011
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 10/20/2017 9:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**934**	mg/L	1	10/24/2017 14:45	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200	S	**472**	mg/L	20	10/25/2017 13:55	R239310
MS and/or MSD did not recover within control limits due to matrix interference.								
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.08**		1	10/20/2017 18:57	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.25**	mg/L	1	10/20/2017 19:34	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	10/23/2017 22:35	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:09	135462
Arsenic	NELAP	0.0010		**0.0212**	mg/L	5	10/25/2017 5:09	135462
Barium	NELAP	0.0010		**0.685**	mg/L	5	10/25/2017 21:16	135462
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 21:16	135462
Boron	NELAP	0.0250	S	**8.94**	mg/L	5	10/25/2017 21:16	135462
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:09	135462
Calcium	NELAP	0.125	S	**171**	mg/L	5	10/28/2017 0:57	135462
Chromium	NELAP	0.0010		**0.0503**	mg/L	5	10/25/2017 21:16	135462
Cobalt	NELAP	0.0010		**0.0097**	mg/L	5	10/25/2017 21:16	135462
Lead	NELAP	0.0010		**0.0201**	mg/L	5	10/25/2017 5:09	135462
Lithium		0.0010		**0.0647**	mg/L	5	10/25/2017 21:16	135462
Molybdenum	NELAP	0.0010		**0.214**	mg/L	5	10/26/2017 18:34	135462
Nickel	NELAP	0.0010		**0.0412**	mg/L	5	10/25/2017 21:16	135462
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:09	135462
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:09	135462
MS QC limits for Ca are not applicable due to high sample/spike ratio.								
MS QC limits for B are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 10:01	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17101317
Client Project: Grand Tower CCR GW
Report Date: 15-Nov-17
Lab ID: 17101317-012
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 10/20/2017 10:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL)								
Total Dissolved Solids	NELAP	20		**486**	mg/L	1	10/24/2017 14:46	R239304
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**201**	mg/L	10	10/23/2017 23:05	R239258
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.65**		1	10/20/2017 18:59	R239080
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	10/20/2017 19:35	R239142
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**21**	mg/L	1	10/23/2017 22:57	R239254
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:18	135462
Arsenic	NELAP	0.0010		**0.0021**	mg/L	5	10/25/2017 5:18	135462
Barium	NELAP	0.0010		**0.104**	mg/L	5	10/25/2017 20:02	135462
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 20:02	135462
Boron	NELAP	0.0250		**4.70**	mg/L	5	10/25/2017 20:02	135462
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:18	135462
Calcium	NELAP	0.125		**88.1**	mg/L	5	10/28/2017 0:16	135462
Chromium	NELAP	0.0010		**0.0026**	mg/L	5	10/25/2017 20:02	135462
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 20:02	135462
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:18	135462
Lithium		0.0010		**0.0259**	mg/L	5	10/25/2017 20:02	135462
Molybdenum	NELAP	0.0010		**0.0761**	mg/L	5	10/26/2017 17:53	135462
Nickel	NELAP	0.0010		**0.0019**	mg/L	5	10/25/2017 20:02	135462
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:18	135462
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	10/25/2017 5:18	135462
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	10/23/2017 10:03	135451
EPA 903.0/904.0, RADIUM 226/228								
Radium-226		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074
Radium-228		0		**See attached**	pci/L	1	11/02/2017 0:00	R240074

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17101317-001	APW-1R	Groundwater	3	10/18/2017 13:00
17101317-002	APW-9	Groundwater	3	10/18/2017 14:25
17101317-003	APW-8	Groundwater	3	10/18/2017 15:30
17101317-004	APW-7	Groundwater	3	10/19/2017 9:20
17101317-005	APW-10D	Groundwater	3	10/19/2017 10:20
17101317-006	APW-10S	Groundwater	3	10/19/2017 11:30
17101317-007	APW-4	Groundwater	3	10/19/2017 13:00
17101317-008	APW-6D	Groundwater	3	10/19/2017 14:30
17101317-009	APW-6S	Groundwater	3	10/19/2017 15:20
17101317-010	APW-5	Groundwater	3	10/19/2017 16:35
17101317-011	APW-2	Groundwater	3	10/20/2017 9:30
17101317-012	APW-3	Groundwater	3	10/20/2017 10:40

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17101317-001A	APW-1R	10/18/2017 13:00	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:05
	SW-846 9036 (Total)				10/23/2017 20:50
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:27
	SW-846 9214 (Total)				10/20/2017 19:07
	SW-846 9251 (Total)				10/23/2017 20:42
17101317-001B	APW-1R	10/18/2017 13:00	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-001C	APW-1R	10/18/2017 13:00	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 1:11
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:16
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:51
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 20:39
	SW-846 7470A (Total)			10/20/2017 16:57	10/23/2017 9:15
17101317-002A	APW-9	10/18/2017 14:25	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:05
	SW-846 9036 (Total)				10/23/2017 21:12
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:30
	SW-846 9214 (Total)				10/20/2017 19:10
	SW-846 9251 (Total)				10/23/2017 20:50
17101317-002B	APW-9	10/18/2017 14:25	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-002C	APW-9	10/18/2017 14:25	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 1:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:24
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 20:20
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 20:48
	SW-846 7470A (Total)			10/20/2017 16:57	10/23/2017 9:18
17101317-003A	APW-8	10/18/2017 15:30	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:43
	SW-846 9036 (Total)				10/23/2017 21:14
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:32
	SW-846 9214 (Total)				10/20/2017 19:12
	SW-846 9251 (Total)				10/23/2017 21:12
17101317-003B	APW-8	10/18/2017 15:30	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17101317-003C	APW-8	10/18/2017 15:30	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 1:44
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:32
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 20:28
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 20:56
	SW-846 7470A (Total)			10/20/2017 16:57	10/23/2017 9:24
17101317-004A	APW-7	10/19/2017 9:20	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:43
	SW-846 9036 (Total)				10/23/2017 21:41
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:35
	SW-846 9214 (Total)				10/20/2017 19:13
	SW-846 9251 (Total)				10/23/2017 21:33
17101317-004B	APW-7	10/19/2017 9:20	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-004C	APW-7	10/19/2017 9:20	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 1:52
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:40
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 20:37
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 21:04
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:36
17101317-005A	APW-10D	10/19/2017 10:20	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:44
	SW-846 9036 (Total)				10/23/2017 21:44
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:37
	SW-846 9214 (Total)				10/20/2017 19:18
	SW-846 9251 (Total)				10/23/2017 21:41
17101317-005B	APW-10D	10/19/2017 10:20	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-005C	APW-10D	10/19/2017 10:20	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:00
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:48
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 20:45
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 21:12
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:38
17101317-006A	APW-10S	10/19/2017 11:30	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:44
	SW-846 9036 (Total)				10/23/2017 22:03

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:40
	SW-846 9214 (Total)				10/20/2017 19:20
	SW-846 9251 (Total)				10/23/2017 22:00
17101317-006B	APW-10S	10/19/2017 11:30	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-006C	APW-10S	10/19/2017 11:30	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:08
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 18:57
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 21:37
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:41
17101317-007A	APW-4	10/19/2017 13:00	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:44
	SW-846 9036 (Total)				10/23/2017 22:11
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:43
	SW-846 9214 (Total)				10/20/2017 19:22
	SW-846 9251 (Total)				10/23/2017 22:03
17101317-007B	APW-4	10/19/2017 13:00	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-007C	APW-4	10/19/2017 13:00	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:17
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 19:05
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:18
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 21:45
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:43
17101317-008A	APW-6D	10/19/2017 14:30	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:45
	SW-846 9036 (Total)				10/23/2017 22:19
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:44
	SW-846 9214 (Total)				10/20/2017 19:23
	SW-846 9251 (Total)				10/23/2017 22:11
17101317-008B	APW-6D	10/19/2017 14:30	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-008C	APW-6D	10/19/2017 14:30	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:25
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 19:29
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:26

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 21:53
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:50
17101317-009A	APW-6S	10/19/2017 15:20	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:45
	SW-846 9036 (Total)				10/23/2017 22:27
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:46
	SW-846 9214 (Total)				10/20/2017 19:29
	SW-846 9251 (Total)				10/23/2017 22:19
17101317-009B	APW-6S	10/19/2017 15:20	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-009C	APW-6S	10/19/2017 15:20	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:33
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 19:38
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:34
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 22:01
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:52
17101317-010A	APW-5	10/19/2017 16:35	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:45
	SW-846 9036 (Total)				10/23/2017 22:35
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:49
	SW-846 9214 (Total)				10/20/2017 19:31
	SW-846 9251 (Total)				10/23/2017 22:27
17101317-010B	APW-5	10/19/2017 16:35	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-010C	APW-5	10/19/2017 16:35	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 2:41
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/25/2017 19:46
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	10/26/2017 21:42
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/20/2017 16:46	11/01/2017 22:10
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 9:54
17101317-011A	APW-2	10/20/2017 9:30	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:45
	SW-846 9036 (Total)				10/25/2017 13:55
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:57
	SW-846 9214 (Total)				10/20/2017 19:34
	SW-846 9251 (Total)				10/23/2017 22:35
17101317-011B	APW-2	10/20/2017 9:30	10/20/2017 14:20		

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-011C	APW-2	10/20/2017 9:30	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/25/2017 5:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/25/2017 21:16
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/26/2017 18:34
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/28/2017 0:57
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 10:01
17101317-012A	APW-3	10/20/2017 10:40	10/20/2017 14:20		
	Standard Methods 2540 C (Total)				10/24/2017 14:46
	SW-846 9036 (Total)				10/23/2017 23:05
	SW-846 9040B, Laboratory Analyzed				10/20/2017 18:59
	SW-846 9214 (Total)				10/20/2017 19:35
	SW-846 9251 (Total)				10/23/2017 22:57
17101317-012B	APW-3	10/20/2017 10:40	10/20/2017 14:20		
	EPA 903.0/904.0, Radium 226/228				11/02/2017 0:00
17101317-012C	APW-3	10/20/2017 10:40	10/20/2017 14:20		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/25/2017 5:18
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/25/2017 20:02
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/26/2017 17:53
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			10/23/2017 9:07	10/28/2017 0:16
	SW-846 7470A (Total)			10/20/2017 17:03	10/23/2017 10:03

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

STANDARD METHODS 2540 C (TOTAL)

Batch R239304 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						10/24/2017
Total Dissolved Solids	20		**< 20**						10/24/2017
Total Dissolved Solids	20		**< 20**						10/24/2017

Batch R239304 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	10/24/2017

Batch R239304 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**966**	1000	0	96.6	90	110	10/24/2017
Total Dissolved Solids	20		**996**	1000	0	99.6	90	110	10/24/2017

Batch R239304 **SampType:** MS Units **mg/L**

SampID: 17101317-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**960**	500.0	436.0	104.8	85	115	10/24/2017

Batch R239304 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 17101317-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**916**	500.0	436.0	96.0	960.0	4.69	10/24/2017

Batch R239304 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17101317-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**544**				562.0	3.25	10/24/2017

SW-846 9036 (TOTAL)

Batch R239258 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						10/23/2017

Batch R239258 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	92.8	90	110	10/23/2017

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

SW-846 9036 (TOTAL)

Batch R239258 **SampType:** MS Units **mg/L**
SampID: 17101317-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**47**	10.00	37.57	90.4	85	115	10/23/2017

Batch R239258 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17101317-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10		**47**	10.00	37.57	95.1	46.61	1.00	10/23/2017

Batch R239310 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						10/25/2017

Batch R239310 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	92.6	90	110	10/25/2017

Batch R239310 **SampType:** MS Units **mg/L**
SampID: 17101317-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	200	S	**710**	200.0	472.3	118.8	85	115	10/25/2017

Batch R239310 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17101317-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	200		**683**	200.0	472.3	105.4	710.0	3.87	10/25/2017

SW-846 9040B, LABORATORY ANALYZED

Batch R239080 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.99**	7.000	0	99.9	99.1	100.8	10/19/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**
SampID: 17101317-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.64**				6.600	0.60	10/20/2017

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

SW-846 9040B, LABORATORY ANALYZED

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.40**				7.390	0.14	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.05**				7.000	0.71	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.90**				6.860	0.58	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.12**				7.050	0.99	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.00**				6.950	0.72	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.35**				7.310	0.55	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.20**				7.230	0.42	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.15**				7.180	0.42	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.32**				7.260	0.82	10/20/2017

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

SW-846 9040B, LABORATORY ANALYZED

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.14**				7.080	0.84	10/20/2017

Batch R239080 **SampType:** DUP Units RPD Limit **10**

SampID: 17101317-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.69**				7.650	0.52	10/20/2017

SW-846 9214 (TOTAL)

Batch R239142 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						10/20/2017

Batch R239142 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.99**	1.000	0	98.8	90	110	10/20/2017

Batch R239142 **SampType:** MS Units **mg/L**

SampID: 17101317-004AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.30**	2.000	0.1930	105.4	85	115	10/20/2017

Batch R239142 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17101317-004AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.35**	2.000	0.1930	108.0	2.301	2.23	10/20/2017

Batch R239142 **SampType:** MS Units **mg/L**

SampID: 17101317-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.38**	2.000	0.3230	102.9	85	115	10/20/2017

Batch R239142 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17101317-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.40**	2.000	0.3230	103.9	2.381	0.84	10/20/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17101317
Report Date: 15-Nov-17

SW-846 9251 (TOTAL)

Batch R239254 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						10/23/2017

Batch R239254 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**19**	20.00	0	96.7	90	110	10/23/2017

Batch R239254 **SampType:** MS Units **mg/L**
SampID: 17101317-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**28**	20.00	9.610	91.7	85	115	10/23/2017

Batch R239254 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17101317-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**28**	20.00	9.610	92.8	27.95	0.82	10/23/2017

Batch R239311 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						10/25/2017

Batch R239311 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**19**	20.00	0	97.5	90	110	10/25/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **135448** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-135448

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	10/25/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	11/01/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	30.0	-100	100	10/25/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	70.3	-100	100	10/25/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/26/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017

Batch **135448** **SampType:** **LCS** Units **mg/L**

SampID: LCS-135448

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.457**	0.5000	0	91.3	85	115	10/25/2017
Arsenic	0.0010		**0.462**	0.5000	0	92.4	85	115	10/25/2017
Barium	0.0010		**1.84**	2.000	0	91.8	85	115	10/25/2017
Beryllium	0.0010		**0.0524**	0.05000	0	104.8	85	115	10/25/2017
Boron	0.0250		**0.522**	0.5000	0	104.4	85	115	10/25/2017
Cadmium	0.0010		**0.0444**	0.05000	0	88.8	85	115	10/25/2017
Calcium	0.125		**2.36**	2.500	0	94.3	80	120	11/01/2017
Chromium	0.0010		**0.189**	0.2000	0	94.6	85	115	10/25/2017
Cobalt	0.0010		**0.483**	0.5000	0	96.6	85	115	10/25/2017
Lead	0.0010		**0.483**	0.5000	0	96.6	85	115	10/25/2017
Lithium	0.0010		**0.519**	0.5000	0	103.8	85	115	10/25/2017
Molybdenum	0.0010		**0.502**	0.5000	0	100.4	80	120	10/26/2017
Nickel	0.0010		**0.486**	0.5000	0	97.1	85	115	10/25/2017
Selenium	0.0010		**0.473**	0.5000	0	94.5	85	115	10/25/2017
Thallium	0.0010		**0.224**	0.2500	0	89.5	85	115	10/25/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 135448 **SampType:** MS Units **mg/L**

SampID: 17101317-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.457**	0.5000	0	91.3	75	125	10/25/2017
Arsenic	0.0010		**0.458**	0.5000	0.0009364	91.5	75	125	10/25/2017
Barium	0.0010		**2.00**	2.000	0.1706	91.5	75	125	10/25/2017
Beryllium	0.0010		**0.0532**	0.05000	0	106.4	75	125	10/25/2017
Boron	0.0250		**0.796**	0.5000	0.2380	111.6	75	125	10/25/2017
Cadmium	0.0010		**0.0441**	0.05000	0	88.2	75	125	10/25/2017
Calcium	2.50	S	**90.0**	2.500	86.24	150.4	75	125	11/01/2017
Chromium	0.0010		**0.193**	0.2000	0.003272	94.7	75	125	10/25/2017
Cobalt	0.0010		**0.473**	0.5000	0.0002908	94.6	75	125	10/25/2017
Lead	0.0010		**0.474**	0.5000	0	94.9	75	125	10/25/2017
Lithium	0.0010		**0.547**	0.5000	0.01726	106.0	75	125	10/25/2017
Molybdenum	0.0010		**0.485**	0.5000	0.0008204	96.9	75	125	10/26/2017
Nickel	0.0010		**0.479**	0.5000	0.005409	94.7	75	125	10/25/2017
Selenium	0.0010		**0.465**	0.5000	0.003429	92.4	75	125	10/25/2017
Thallium	0.0010		**0.222**	0.2500	0	88.9	75	125	10/25/2017

Batch 135448 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17101317-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.451**	0.5000	0	90.2	0.4567	1.31	10/25/2017
Arsenic	0.0010		**0.464**	0.5000	0.0009364	92.6	0.4584	1.25	10/25/2017
Barium	0.0010		**1.94**	2.000	0.1706	88.7	2.000	2.83	10/25/2017
Beryllium	0.0010		**0.0534**	0.05000	0	106.7	0.05319	0.31	10/25/2017
Boron	0.0250		**0.786**	0.5000	0.2380	109.6	0.7961	1.30	10/25/2017
Cadmium	0.0010		**0.0442**	0.05000	0	88.5	0.04411	0.29	10/25/2017
Calcium	2.50	S	**85.9**	2.500	86.24	-14.9	90.00	4.70	11/01/2017
Chromium	0.0010		**0.191**	0.2000	0.003272	94.1	0.1928	0.72	10/25/2017
Cobalt	0.0010		**0.477**	0.5000	0.0002908	95.2	0.4732	0.69	10/25/2017
Lead	0.0010		**0.471**	0.5000	0	94.1	0.4744	0.81	10/25/2017
Lithium	0.0010		**0.549**	0.5000	0.01726	106.3	0.5471	0.34	10/25/2017
Molybdenum	0.0010		**0.490**	0.5000	0.0008204	97.8	0.4855	0.85	10/26/2017
Nickel	0.0010		**0.477**	0.5000	0.005409	94.4	0.4788	0.31	10/25/2017
Selenium	0.0010		**0.464**	0.5000	0.003429	92.2	0.4654	0.24	10/25/2017
Thallium	0.0010		**0.222**	0.2500	0	88.9	0.2222	0.01	10/25/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **135462** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-135462

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Boron	0.0250		**< 0.0250**	0.02500	0	69.5	-100	100	10/25/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	10/28/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/26/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	10/25/2017

Batch **135462** **SampType:** **LCS** Units **mg/L**

SampID: LCS-135462

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.455**	0.5000	0	91.1	80	120	10/25/2017
Arsenic	0.0010		**0.469**	0.5000	0	93.9	80	120	10/25/2017
Barium	0.0010		**2.05**	2.000	0	102.3	80	120	10/25/2017
Beryllium	0.0010		**0.0509**	0.05000	0	101.8	80	120	10/25/2017
Boron	0.0250		**0.502**	0.5000	0	100.4	80	120	10/25/2017
Cadmium	0.0010		**0.0450**	0.05000	0	90.0	80	120	10/25/2017
Calcium	0.125		**2.37**	2.500	0	94.9	80	120	10/28/2017
Chromium	0.0010		**0.194**	0.2000	0	97.0	80	120	10/25/2017
Cobalt	0.0010		**0.495**	0.5000	0	99.0	80	120	10/25/2017
Lead	0.0010		**0.485**	0.5000	0	97.1	80	120	10/25/2017
Lithium	0.0010		**0.516**	0.5000	0	103.2	80	120	10/25/2017
Molybdenum	0.0010		**0.512**	0.5000	0	102.5	80	120	10/26/2017
Nickel	0.0010		**0.494**	0.5000	0	98.8	80	120	10/25/2017
Selenium	0.0010		**0.461**	0.5000	0	92.3	80	120	10/25/2017
Thallium	0.0010		**0.225**	0.2500	0	89.9	80	120	10/25/2017

Client: ERM **Work Order:** 17101317

Client Project: Grand Tower CCR GW **Report Date:** 15-Nov-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **135462** **SampType:** **MS** Units **mg/L**

SampID: 17101317-011CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.382**	0.5000	0.0009224	76.3	75	125	10/25/2017
Arsenic	0.0010		**0.490**	0.5000	0.02122	93.8	75	125	10/25/2017
Barium	0.0010		**2.75**	2.000	0.6851	103.1	75	125	10/25/2017
Beryllium	0.0010		**0.0537**	0.05000	0.0008142	105.8	75	125	10/25/2017
Boron	0.0250	S	**9.73**	0.5000	8.944	157.1	75	125	10/25/2017
Cadmium	0.0010		**0.0457**	0.05000	0.0006996	90.1	75	125	10/25/2017
Calcium	0.125		**174**	2.500	170.6	122.6	75	125	10/28/2017
Chromium	0.0010		**0.244**	0.2000	0.05025	96.8	75	125	10/25/2017
Cobalt	0.0010		**0.497**	0.5000	0.009666	97.5	75	125	10/25/2017
Lead	0.0010		**0.497**	0.5000	0.02011	95.4	75	125	10/25/2017
Lithium	0.0010		**0.593**	0.5000	0.06468	105.7	75	125	10/25/2017
Molybdenum	0.0010		**0.722**	0.5000	0.2138	101.6	75	125	10/26/2017
Nickel	0.0010		**0.521**	0.5000	0.04115	95.9	75	125	10/25/2017
Selenium	0.0010		**0.459**	0.5000	0	91.8	75	125	10/25/2017
Thallium	0.0010		**0.225**	0.2500	0.0005006	89.9	75	125	10/25/2017

Batch **135462** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 17101317-011CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.388**	0.5000	0.0009224	77.3	0.3822	1.37	10/25/2017
Arsenic	0.0010		**0.495**	0.5000	0.02122	94.7	0.4902	0.90	10/25/2017
Barium	0.0010		**2.78**	2.000	0.6851	104.6	2.747	1.08	10/25/2017
Beryllium	0.0010		**0.0546**	0.05000	0.0008142	107.6	0.05371	1.64	10/25/2017
Boron	0.0250	S	**10.1**	0.5000	8.944	227.8	9.729	3.57	10/25/2017
Cadmium	0.0010		**0.0464**	0.05000	0.0006996	91.3	0.04574	1.35	10/25/2017
Calcium	0.125	S	**192**	2.500	170.6	852.4	173.7	9.98	10/28/2017
Chromium	0.0010		**0.248**	0.2000	0.05025	99.0	0.2438	1.79	10/25/2017
Cobalt	0.0010		**0.504**	0.5000	0.009666	99.0	0.4973	1.43	10/25/2017
Lead	0.0010		**0.502**	0.5000	0.02011	96.3	0.4969	0.98	10/25/2017
Lithium	0.0010		**0.610**	0.5000	0.06468	109.0	0.5931	2.76	10/25/2017
Molybdenum	0.0010		**0.736**	0.5000	0.2138	104.4	0.7218	1.92	10/26/2017
Nickel	0.0010		**0.535**	0.5000	0.04115	98.7	0.5207	2.66	10/25/2017
Selenium	0.0010		**0.456**	0.5000	0	91.1	0.4592	0.79	10/25/2017
Thallium	0.0010		**0.227**	0.2500	0.0005006	90.5	0.2252	0.66	10/25/2017

SW-846 7470A (TOTAL)

Batch **135450** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-135450

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	10/23/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

SW-846 7470A (TOTAL)

Batch 135450 **SampType:** LCS Units **mg/L**

SampID: LCS-135450

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00494**	0.00500	0	98.8	85	115	10/23/2017

Batch 135450 **SampType:** MS Units **mg/L**

SampID: 17101317-002CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00508**	0.00500	0	101.7	75	125	10/23/2017

Batch 135450 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17101317-002CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00532**	0.00500	0	106.3	0.005085	4.46	10/23/2017

Batch 135451 **SampType:** MBLK Units **mg/L**

SampID: MBLK-135451

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	10/23/2017

Batch 135451 **SampType:** LCS Units **mg/L**

SampID: LCS-135451

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00506**	0.00500	0	101.3	85	115	10/23/2017

Batch 135451 **SampType:** MS Units **mg/L**

SampID: 17101317-007CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00522**	0.00500	0	104.4	75	125	10/23/2017

Batch 135451 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17101317-007CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00513**	0.00500	0	102.6	0.005218	1.76	10/23/2017

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17101317

Report Date: 15-Nov-17

Carrier: Employee

Received By: KF

Completed by: Kalyn Foecke
On: 20-Oct-17

Reviewed by: Elizabeth A. Hurley
On: 20-Oct-17

Pages to follow: Chain of custody 2 Extra pages included 26

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **2.02**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

Additional nitric acid was needed in ADW-8, ADW-7, ADW-10S, and ADW-2 upon arrival at the laboratory. MLDII 10/20/17

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 1710131N

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 2.02 °C
Preserved in: ☒ LAB ☐ FIELD
FOR LAB USE ONLY
Lab Notes Added HNO_3 to Rad containers for ADW-5, ADW-7, ADW-10S, and 1of 2 ADW-2. mwD II 10/20/17

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
W Halloy / E. Shavers

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1710131N-001	APW-1R	10/18/17; 1300	1	3												X	X	X	X	X	X	X	X
002	APW-9	10/18/17; 1425																					
003	APW-8	10/18/17; 1530																					
004	APW-7	10/19/17; 0920																					
005	APW-10D	10/19/17; 1020																					
006	APW-10S	10/19/17; 1130																					
007	APW-4	10/19/17; 1300																					
008	APW-6D	10/19/17; 1430																					
009	APW-6S	10/19/17; 1520																					
010	APW-5	10/19/17; 1635																					

Relinquished By	Date/Time	Received By	Date/Time
[signature]	10/20/17 1420	Kleeke	10/20/17 1420

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40221

mD 10/20/17

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 1710131 7

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE _____ °C
Preserved in: ☐ LAB ☐ FIELD
FOR LAB USE ONLY
Lab Notes

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1710131 7-011	APW-2	10/20/17; 0930	1	3												X	X	X	X	X	X	X	X
012	APW-3	10/20/17; 1040	1	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	10/20/17 1420	[signature]	10/20/17 1420

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40221

Pace Analytical Services, LLC
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

November 10, 2017

Mr. Mike Austin
Teklab Inc.
5445 Horseshoe Lake Road
Collinsville, IL 62234

RE: Project: 17101317
Pace Project No.: 30234029

Dear Mr. Austin:
Enclosed are the analytical results for sample(s) received by the laboratory on October 25, 2017. 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,

Carin A. Ferris

Carin Ferris
carin.ferris@pacelabs.com
724-850-5615
Project Manager

Enclosures

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CERTIFICATIONS

Project: 17101317
Pace Project No.: 30234029

Pennsylvania Certification IDs

1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
L-A-B DOD-ELAP Accreditation #: L2417
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Georgia Certification #: C040
Guam Certification
Hawaii Certification
Idaho Certification
Illinois Certification
Indiana Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification #: PA014572015-1
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification #: PA01457
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
Rhode Island Certification #: 65-00282
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188-14-8
Utah/TNI Certification #: PA014572015-5
USDA Soil Permit #: P330-14-00213
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin Certification
Wyoming Certification #: 8TMS-L

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SAMPLE SUMMARY

Project: 17101317
Pace Project No.: 30234029

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30234029001	**17101317-001**	Water	10/18/17 13:00	10/25/17 09:50
30234029002	**17101317-002**	Water	10/18/17 14:25	10/25/17 09:50
30234029003	**17101317-003**	Water	10/18/17 15:30	10/25/17 09:50
30234029004	**17101317-004**	Water	10/19/17 09:20	10/25/17 09:50
30234029005	**17101317-005**	Water	10/19/17 10:20	10/25/17 09:50
30234029006	**17101317-006**	Water	10/19/17 11:30	10/25/17 09:50
30234029007	**17101317-007**	Water	10/19/17 13:00	10/25/17 09:50
30234029008	**17101317-008**	Water	10/19/17 14:30	10/25/17 09:50
30234029009	**17101317-009**	Water	10/19/17 15:20	10/25/17 09:50
30234029010	**17101317-010**	Water	10/19/17 16:35	10/25/17 09:50
30234029011	**17101317-011**	Water	10/20/17 09:30	10/25/17 09:50
30234029012	**17101317-012**	Water	10/20/17 10:40	10/25/17 09:50

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SAMPLE ANALYTE COUNT

Project: 17101317
Pace Project No.: 30234029

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30234029001	**17101317-001**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029002	**17101317-002**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029003	**17101317-003**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029004	**17101317-004**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029005	**17101317-005**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029006	**17101317-006**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029007	**17101317-007**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029008	**17101317-008**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029009	**17101317-009**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029010	**17101317-010**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029011	**17101317-011**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1
30234029012	**17101317-012**	EPA 903.1	WRR	1
		EPA 904.0	VAL	1
		Total Radium Calculation	CMC	1

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PROJECT NARRATIVE

Project: 17101317
Pace Project No.: 30234029

Method: **EPA 903.1**
Description: 903.1 Radium 226
Client: Teklab Inc.
Date: November 10, 2017

General Information:
12 samples were analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: 17101317
Pace Project No.: 30234029

Method: **EPA 904.0**
Description: 904.0 Radium 228
Client: Teklab Inc.
Date: November 10, 2017

General Information:
12 samples were analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

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PROJECT NARRATIVE

Project: 17101317
Pace Project No.: 30234029

Method: **Total Radium Calculation**
Description: Total Radium 228+226
Client: Teklab Inc.
Date: November 10, 2017

General Information:
12 samples were analyzed for Total Radium Calculation. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-001 **Lab ID: 30234029001** Collected: 10/18/17 13:00 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.120 ± 0.332 (0.644)** **C:NA T:101%**	pCi/L	11/02/17 12:50	13982-63-3	
Radium-228	EPA 904.0	**0.307 ± 0.320 (0.662)** **C:75% T:88%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**0.427 ± 0.652 (1.31)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-002 **Lab ID: 30234029002** Collected: 10/18/17 14:25 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**-0.229 ± 0.389 (0.908) C:NA T:97%**	pCi/L	11/02/17 12:50	13982-63-3	
Radium-228	EPA 904.0	**0.275 ± 0.316 (0.661) C:73% T:85%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**0.275 ± 0.705 (1.57)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-003 **Lab ID: 30234029003** Collected: 10/18/17 15:30 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.200 ± 0.393 (0.718)** **C:NA T:89%**	pCi/L	11/02/17 12:50	13982-63-3	
Radium-228	EPA 904.0	**1.30 ± 0.545 (0.896)** **C:76% T:77%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**1.50 ± 0.938 (1.61)**	pCi/L	11/10/17 12:45	7440-14-4	

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Greensburg, PA 15601
(724)850-5600

ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-004 **Lab ID: 30234029004** Collected: 10/19/17 09:20 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.505 ± 0.396 (0.465)** **C:NA T:92%**	pCi/L	11/02/17 13:06	13982-63-3	
Radium-228	EPA 904.0	**0.785 ± 0.412 (0.731)** **C:75% T:85%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**1.29 ± 0.808 (1.20)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-005 **Lab ID: 30234029005** Collected: 10/19/17 10:20 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.121 ± 0.337 (0.653)** **C:NA T:94%**	pCi/L	11/02/17 13:06	13982-63-3	
Radium-228	EPA 904.0	**0.633 ± 0.366 (0.676)** **C:78% T:92%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**0.754 ± 0.703 (1.33)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-006 **Lab ID: 30234029006** Collected: 10/19/17 11:30 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.774 ± 0.430 (0.161)** **C:NA T:97%**	pCi/L	11/02/17 13:06	13982-63-3	
Radium-228	EPA 904.0	**0.856 ± 0.391 (0.639)** **C:77% T:81%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**1.63 ± 0.821 (0.800)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-007 **Lab ID: 30234029007** Collected: 10/19/17 13:00 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**-0.272 ± 0.328 (0.893) C:NA T:84%**	pCi/L	11/02/17 13:06	13982-63-3	
Radium-228	EPA 904.0	**0.530 ± 0.382 (0.741) C:77% T:78%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**0.530 ± 0.710 (1.63)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-008 **Lab ID: 30234029008** Collected: 10/19/17 14:30 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**1.22 ± 0.744 (0.959) C:NA T:88%**	pCi/L	11/02/17 13:06	13982-63-3	
Radium-228	EPA 904.0	**0.549 ± 0.377 (0.724) C:71% T:88%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**1.77 ± 1.12 (1.68)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-009 **Lab ID: 30234029009** Collected: 10/19/17 15:20 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.317 ± 0.331 (0.467)** **C:NA T:94%**	pCi/L	11/02/17 13:19	13982-63-3	
Radium-228	EPA 904.0	**0.481 ± 0.316 (0.598)** **C:77% T:93%**	pCi/L	11/09/17 14:42	15262-20-1	
Total Radium	Total Radium Calculation	**0.798 ± 0.647 (1.07)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-010 **Lab ID: 30234029010** Collected: 10/19/17 16:35 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.133 ± 0.370 (0.718)** **C:NA T:87%**	pCi/L	11/02/17 13:19	13982-63-3	
Radium-228	EPA 904.0	**0.661 ± 0.410 (0.764)** **C:75% T:77%**	pCi/L	11/09/17 14:43	15262-20-1	
Total Radium	Total Radium Calculation	**0.794 ± 0.780 (1.48)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-011 **Lab ID: 30234029011** Collected: 10/20/17 09:30 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**-0.132 ± 0.410 (0.933) C:NA T:88%**	pCi/L	11/02/17 13:19	13982-63-3	
Radium-228	EPA 904.0	**0.504 ± 0.378 (0.738) C:76% T:78%**	pCi/L	11/09/17 14:43	15262-20-1	
Total Radium	Total Radium Calculation	**0.504 ± 0.788 (1.67)**	pCi/L	11/10/17 12:45	7440-14-4	

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

Sample: 17101317-012 **Lab ID: 30234029012** Collected: 10/20/17 10:40 Received: 10/25/17 09:50 Matrix: Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.409 ± 0.426 (0.634) C:NA T:86%**	pCi/L	11/02/17 19:55	13982-63-3	
Radium-228	EPA 904.0	**0.492 ± 0.373 (0.733) C:76% T:83%**	pCi/L	11/09/17 14:43	15262-20-1	
Total Radium	Total Radium Calculation	**0.901 ± 0.799 (1.37)**	pCi/L	11/10/17 12:45	7440-14-4	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

QC Batch: 276889 Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30234029001, 30234029002, 30234029003, 30234029004, 30234029005, 30234029006, 30234029007, 30234029008, 30234029009, 30234029010, 30234029011

METHOD BLANK: 1360955 Matrix: Water
Associated Lab Samples: 30234029001, 30234029002, 30234029003, 30234029004, 30234029005, 30234029006, 30234029007, 30234029008, 30234029009, 30234029010, 30234029011

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.328 ± 0.500 (0.861) C:NA T:91%	pCi/L	11/02/17 12:11	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

QC Batch: 276901 | Analysis Method: EPA 904.0
QC Batch Method: EPA 904.0 | Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30234029001, 30234029002, 30234029003, 30234029004, 30234029005, 30234029006, 30234029007, 30234029008, 30234029009, 30234029010, 30234029011, 30234029012

METHOD BLANK: 1361001 | Matrix: Water
Associated Lab Samples: 30234029001, 30234029002, 30234029003, 30234029004, 30234029005, 30234029006, 30234029007, 30234029008, 30234029009, 30234029010, 30234029011, 30234029012

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.0752 ± 0.309 (0.701) C:79% T:87%	pCi/L	11/09/17 14:41	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: 17101317
Pace Project No.: 30234029

QC Batch: 276902 | Analysis Method: EPA 903.1
QC Batch Method: EPA 903.1 | Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30234029012

METHOD BLANK: 1361002 | Matrix: Water
Associated Lab Samples: 30234029012

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.486 ± 0.480 (0.730) C:NA T:96%	pCi/L	11/02/17 19:17	

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QUALIFIERS

Project: 17101317
Pace Project No.: 30234029

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.

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.

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.

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TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 2

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested.
IL samples

Project# 17101317

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25337 Phone: 618-344-1004 ext 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

WO#: 30234029
30234029

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226/228											
	17101317-001	10/18/17 13.00	HNO3	Groundwater	✓											001
	17101317-002	10/18/17 14.25	HNO3	Groundwater	✓											002
	17101317-003	10/18/17 15.30	HNO3	Groundwater	✓											003
	17101317-004	10/19/17 9.20	HNO3	Groundwater	✓											004
	17101317-005	10/19/17 10.20	HNO3	Groundwater	✓											005
	17101317-006	10/19/17 11.30	HNO3	~~Aqueous~~ GW	✓											006
	17101317-007	10/19/17 13.00	HNO3	Groundwater	✓											007
	17101317-008	10/19/17 14.30	HNO3	Groundwater	✓											008
	17101317-009	10/19/17 15.20	HNO3	Groundwater	✓											009
	17101317-~~009~~ 010	10/19/17 16.35	HNO3	Groundwater	✓											010
	17101317-~~010~~ 011	~~10/19/17~~ 9.30	HNO3	Groundwater	✓											011

KF 10/20/17

*Relinquished By	Date/Time	Received By	Date/Time
Kleek	10/23/17	[illegible]	10/23/17 2570

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SubCocRevA
3/2/2016

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: client QC Level: 2

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested.

Project# 17101317

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25337 Phone: 618-344-1004 ext 16

30234029

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226/228											
	17101317-012	10/20/17 10.40	HNO3	Groundwater	✓											012
			Other	Drinking Water												
			Unpres	Aqueous												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			HNO3	Drinking Water												
			Unpres	Aqueous												

*Relinquished By	Date/Time	Received By	Date/Time
KKaesch	10/23/17		

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Pittsburgh Lab Sample Condition Upon Receipt

Pace Analytical

Client Name: TEKLAB Project # 30234029

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 7462155D4097

Label 7H
LIMS Login ANL

Custody Seal on Cooler/Box Present: ☐ yes ☐ no Seals intact: ☐ yes ☐ no

Thermometer Used N/A Type of Ice: Wet Blue None

Cooler Temperature Observed Temp N/A °C Correction Factor: — °C Final Temp: — °C

Temp should be above freezing to 6°C

Date and Initials of person examining contents: 10/05/17 COC

Comments:	Yes	No	N/A	
Chain of Custody Present:	✓			1.
Chain of Custody Filled Out:	✓			2.
Chain of Custody Relinquished:	✓			3.
Sampler Name & Signature on COC:		✓		4.
Sample Labels match COC: -Includes date/time/ID Matrix: WT	✓			5.
Samples Arrived within Hold Time:	✓			6.
Short Hold Time Analysis (<72hr remaining):		✓		7.
Rush Turn Around Time Requested:		✓		8.
Sufficient Volume:	✓			9.
Correct Containers Used:	✓			10.
-Pace Containers Used:		✓		
Containers Intact:	✓			11.
Orthophosphate field filtered			✓	12.
Hex Cr Aqueous Compliance/NPDES sample field filtered			✓	13.
Organic Samples checked for dechlorination:			✓	14.
Filtered volume received for Dissolved tests			✓	15.
All containers have been checked for preservation.	✓			16. pH2
All containers needing preservation are found to be in compliance with EPA recommendation.	✓			
exceptions: VOA, coliform, TOC, O&G, Phenolics				Initial when completed CC Date/time of preservation Lot # of added preservative
Headspace in VOA Vials (>6mm):			✓	17.
Trip Blank Present:			✓	18.
Trip Blank Custody Seals Present			✓	
Rad Aqueous Samples Screened > 0.5 mrem/hr		✓		Initial when completed: CC Date: 10/05/17

Client Notification/ Resolution:

Person Contacted: _____ Date/Time: _____ Contacted By: _____

Comments/ Resolution: _____

☐ **A check in this box indicates that additional information has been stored in ereports.**

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)

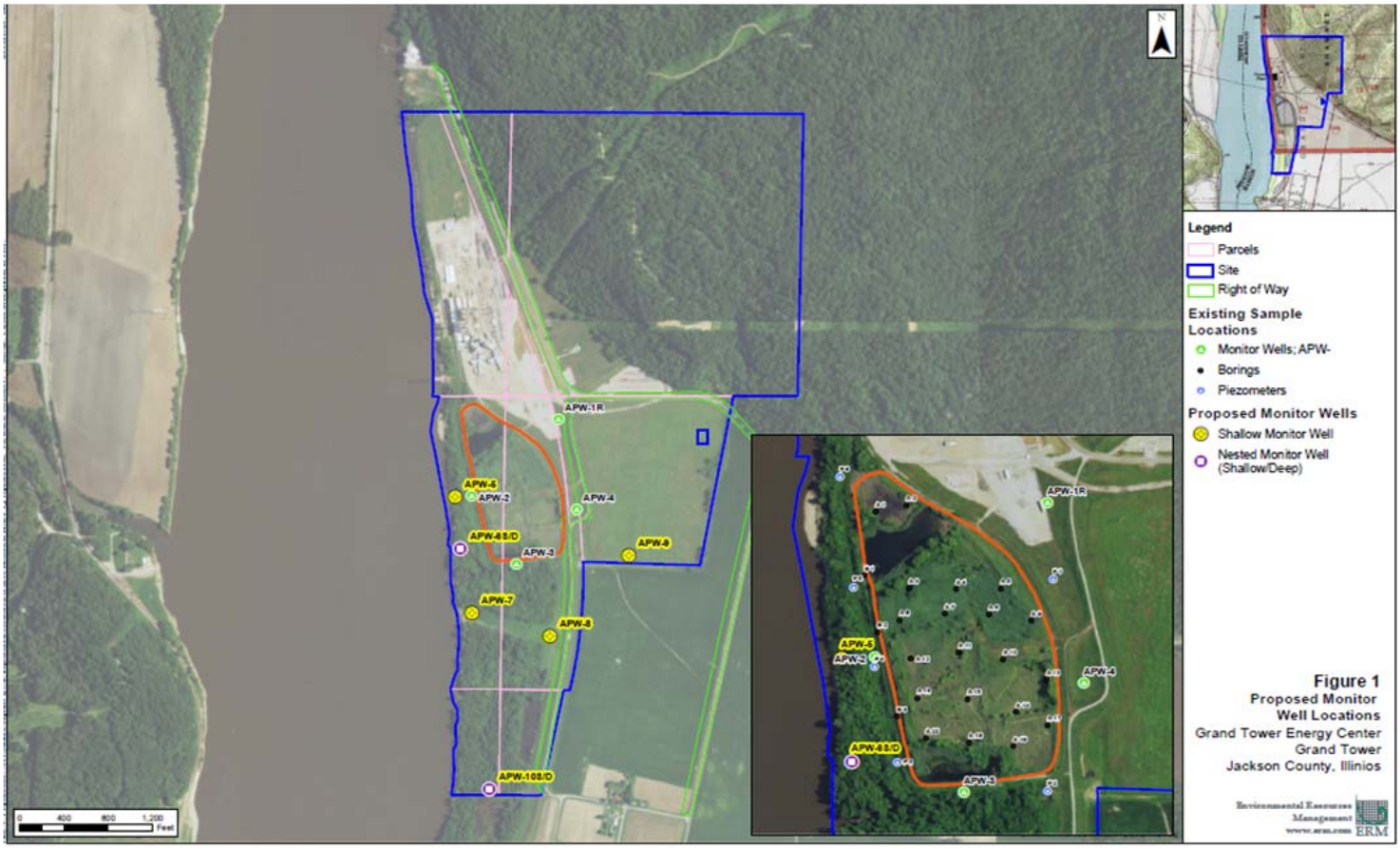
***PM review** is documented electronically in LIMS. When the Project Manager closes the SRF Review schedule in LIMS. The review is in the Status section of the Workorder Edit Screen.

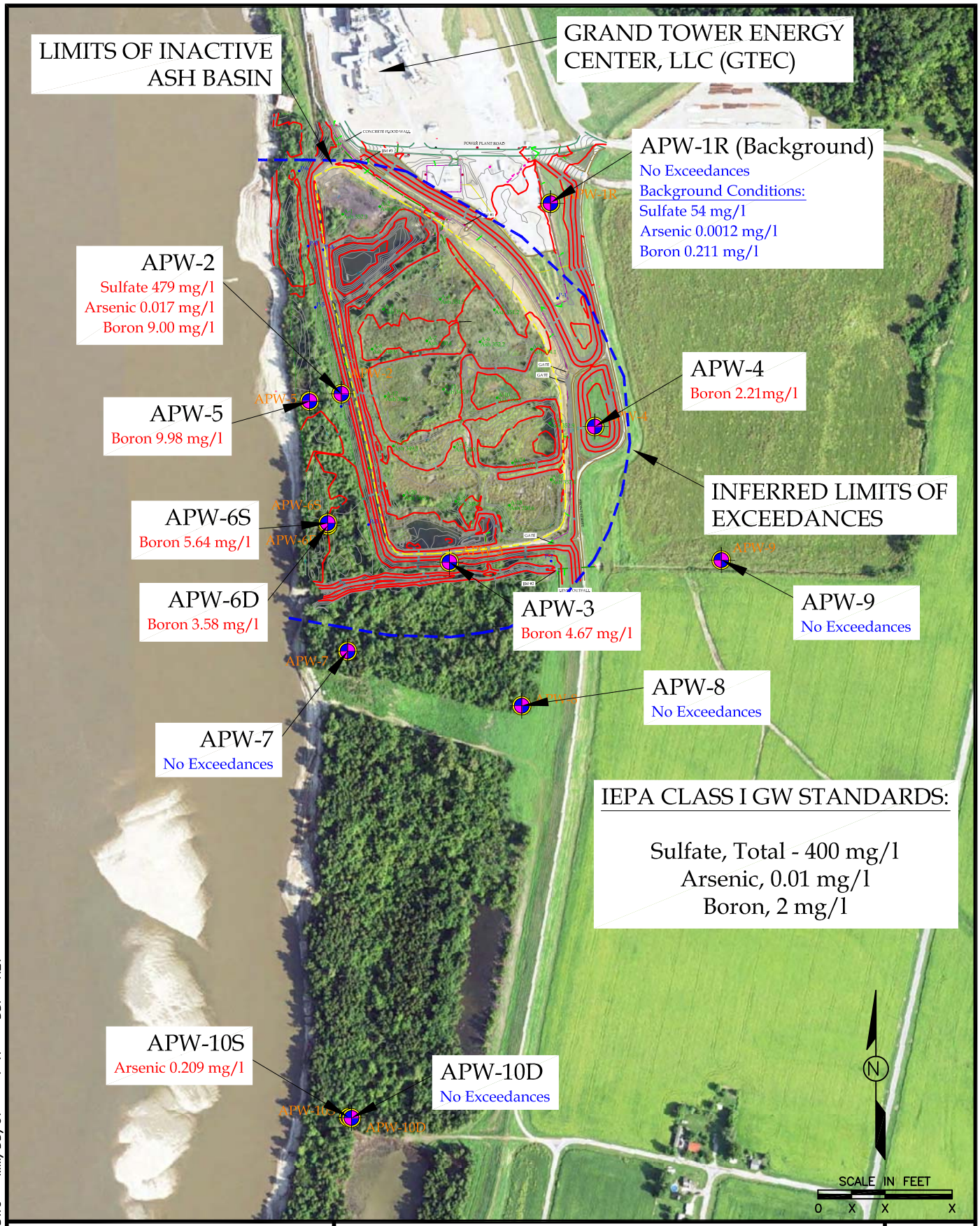
Event 4

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 4 **Date Samples Collected:** **From** 11/8/17 **To** 11/9/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	<5	11	22	11	14	27	16	15	10	13	6	15
Sulfate, Total	mg/L	400	54	**479**	207	120	**413**	151	222	50	40	65	<10	42
Fluoride, Total	mg/L	4	0.12	0.24	0.31	0.17	0.32	0.26	0.22	0.2	0.29	0.2	0.16	<0.1
Lab pH		6.5 - 9.0	6.8	7.07	7.93	7.42	7.3	7.23	7.19	6.87	7.12	7.39	6.98	7.11
Total Dissolved Solids	mg/L	1200	358	916	450	472	826	528	564	730	446	366	708	468
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.0012	**0.017**	0.0018	0.0018	0.0016	0.002	0.0074	<0.001	<0.001	0.0022	**0.209**	<0.001
Barium	mg/L	2	0.176	0.44	0.0814	0.13	0.216	0.226	0.153	0.401	0.24	0.133	0.668	0.325
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.211	**9**	**4.67**	**2.21**	**9.98**	**5.64**	**3.58**	0.3	0.138	0.792	0.595	0.0713
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		88.2	157	74.9	97.5	131	96.8	100	187	101	81.9	152	121
Chromium	mg/L	0.1	<0.001	0.0235	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0059	<0.001	0.0016	0.0011
Cobalt	mg/L	1	<0.001	0.0041	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0012	<0.001	<0.001	0.0032
Lead	mg/L	0.0075	<0.001	**0.0096**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.0175	0.0521	0.0245	0.0406	0.0405	0.0415	0.0163	0.0176	0.0216	0.018	0.0289	0.0146
Molybdenum	No Standard		<0.001	0.175	0.0713	0.0812	0.168	0.243	0.0589	0.0023	0.0011	0.0303	<0.001	<0.001
Nickel	mg/L	0.1	0.004	0.0202	<0.001	0.002	<0.001	0.0012	0.002	<0.001	0.0062	0.001	0.0015	0.0057
Selenium	mg/L	0.05	0.0044	<0.001	<0.001	0.0161	<0.001	<0.001	<0.001	<0.001	0.0149	0.0186	<0.001	0.0013
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	0.13	1.47	0.18	0.15	0.48	0.22	0.39	0.11	0.11	0.14	0.16	0.19
Radium-228	pCi/l	20	0.57	0.91	0.72	0.64	1.17	0.9	0.86	1.13	0.37	0.49	0.71	0.98
Radium-226/228 Comb.	pCi/l	-----	0.7	2.38	0.9	0.79	1.65	1.12	1.25	1.24	0.48	0.63	0.87	1.17





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 4 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
4

December 21, 2017

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17110731

Dear Brett Carney:

TEKLAB, INC received 12 samples on 11/10/2017 3:10:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

This reporting package includes the following:

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Dates Report	19
Quality Control Results	24
Receiving Check List	32
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 17110731

Client Project: Grand Tower CCR GW **Report Date:** 21-Dec-17

Abbr Definition

*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon
E -	Value above quantitation range
I -	Associated internal standard was outside method criteria
ND -	Not Detected at the Reporting Limit
S -	Spike Recovery outside recovery limits
X -	Value exceeds Maximum Contaminant Level
B -	Analyte detected in associated Method Blank
H -	Holding times exceeded
M -	Manual Integration used to determine area response
R -	RPD outside accepted recovery limits
T -	TIC(Tentatively identified compound)

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Cooler Receipt Temp: 1.42 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2017	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2017	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 11/08/2017 12:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20	R	**358**	mg/L	1	11/14/2017 17:46	R240135
RPD for DUP was outside of QC limit due to sample composition.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**54**	mg/L	2	11/15/2017 15:10	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.80**		1	11/10/2017 19:33	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.12**	mg/L	1	11/15/2017 17:24	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	11/15/2017 14:40	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	11/13/2017 22:20	136149
Barium	NELAP	0.0010		**0.176**	mg/L	5	11/13/2017 22:20	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Boron	NELAP	0.0250		**0.211**	mg/L	5	11/13/2017 22:20	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Calcium	NELAP	0.125		**88.2**	mg/L	5	11/13/2017 22:20	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Lithium	*	0.0010		**0.0175**	mg/L	5	11/15/2017 19:12	136149
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:20	136149
Nickel	NELAP	0.0010		**0.0040**	mg/L	5	11/15/2017 19:12	136149
Selenium	NELAP	0.0010		**0.0044**	mg/L	5	11/13/2017 22:20	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:12	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:18	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-002
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 11/08/2017 13:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**472**	mg/L	1	11/14/2017 17:47	R240135
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**120**	mg/L	5	11/15/2017 15:37	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.42**		1	11/10/2017 19:36	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	11/15/2017 17:27	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	11/15/2017 15:29	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	11/13/2017 22:28	136149
Barium	NELAP	0.0010		**0.130**	mg/L	5	11/13/2017 22:28	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Boron	NELAP	0.0250		**2.21**	mg/L	5	11/13/2017 22:28	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Calcium	NELAP	0.125		**97.5**	mg/L	5	11/13/2017 22:28	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:28	136149
Lithium	*	0.0010		**0.0406**	mg/L	5	11/15/2017 19:20	136149
Molybdenum	NELAP	0.0010		**0.0812**	mg/L	5	11/13/2017 22:28	136149
Nickel	NELAP	0.0010		**0.0020**	mg/L	5	11/15/2017 19:20	136149
Selenium	NELAP	0.0010		**0.0161**	mg/L	5	11/13/2017 22:28	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:20	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:20	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-003
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 11/08/2017 14:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**366**	mg/L	1	11/14/2017 17:47	R240135
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**65**	mg/L	2	11/15/2017 15:58	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.39**		1	11/10/2017 19:38	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	11/15/2017 17:30	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	11/15/2017 15:37	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Arsenic	NELAP	0.0010		**0.0022**	mg/L	5	11/13/2017 22:36	136149
Barium	NELAP	0.0010		**0.133**	mg/L	5	11/13/2017 22:36	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Boron	NELAP	0.0250		**0.792**	mg/L	5	11/13/2017 22:36	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Calcium	NELAP	0.125		**81.9**	mg/L	5	11/13/2017 22:36	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:36	136149
Lithium	*	0.0010		**0.0180**	mg/L	5	11/15/2017 19:28	136149
Molybdenum	NELAP	0.0010		**0.0303**	mg/L	5	11/13/2017 22:36	136149
Nickel	NELAP	0.0010		**0.0010**	mg/L	5	11/15/2017 19:28	136149
Selenium	NELAP	0.0010		**0.0186**	mg/L	5	11/13/2017 22:36	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:28	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:23	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-004
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 11/08/2017 15:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**446**	mg/L	1	11/14/2017 17:47	R240135
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**40**	mg/L	1	11/15/2017 16:01	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.12**		1	11/10/2017 19:40	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	11/15/2017 17:34	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	11/15/2017 15:58	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:45	136149
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:45	136149
Barium	NELAP	0.0010		**0.240**	mg/L	5	11/13/2017 22:45	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:45	136149
Boron	NELAP	0.0250		**0.138**	mg/L	5	11/13/2017 22:45	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:45	136149
Calcium	NELAP	0.125		**101**	mg/L	5	11/13/2017 22:45	136149
Chromium	NELAP	0.0010		**0.0059**	mg/L	5	11/13/2017 22:45	136149
Cobalt	NELAP	0.0010		**0.0012**	mg/L	5	11/13/2017 22:45	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:45	136149
Lithium	*	0.0010		**0.0216**	mg/L	5	11/15/2017 19:36	136149
Molybdenum	NELAP	0.0010		**0.0011**	mg/L	5	11/13/2017 22:45	136149
Nickel	NELAP	0.0010		**0.0062**	mg/L	5	11/15/2017 19:36	136149
Selenium	NELAP	0.0010		**0.0149**	mg/L	5	11/13/2017 22:45	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:36	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:25	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-005
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 11/09/2017 9:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**730**	mg/L	1	11/15/2017 16:06	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**50**	mg/L	2	11/15/2017 16:12	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.87**		1	11/10/2017 19:44	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	11/15/2017 17:37	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	11/15/2017 16:04	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Barium	NELAP	0.0010		**0.401**	mg/L	5	11/13/2017 22:53	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Boron	NELAP	0.0250		**0.300**	mg/L	5	11/13/2017 22:53	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Calcium	NELAP	0.125		**187**	mg/L	5	11/13/2017 22:53	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Lithium	*	0.0010		**0.0176**	mg/L	5	11/15/2017 19:45	136149
Molybdenum	NELAP	0.0010		**0.0023**	mg/L	5	11/13/2017 22:53	136149
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:45	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 22:53	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:45	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:31	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-006
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 11/09/2017 10:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**708**	mg/L	1	11/15/2017 16:07	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	11/15/2017 16:14	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.98**		1	11/10/2017 19:47	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	11/15/2017 17:39	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	11/15/2017 16:12	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Arsenic	NELAP	0.0010		**0.209**	mg/L	5	11/13/2017 23:01	136149
Barium	NELAP	0.0010		**0.668**	mg/L	5	11/13/2017 23:01	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Boron	NELAP	0.0250		**0.595**	mg/L	5	11/13/2017 23:01	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Calcium	NELAP	0.125		**152**	mg/L	5	11/13/2017 23:01	136149
Chromium	NELAP	0.0010		**0.0016**	mg/L	5	11/13/2017 23:01	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Lithium	*	0.0010		**0.0289**	mg/L	5	11/15/2017 19:53	136149
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Nickel	NELAP	0.0010		**0.0015**	mg/L	5	11/15/2017 19:53	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:01	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 19:53	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:38	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-007
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 11/09/2017 10:06

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**468**	mg/L	1	11/15/2017 16:07	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**42**	mg/L	1	11/15/2017 16:20	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.11**		1	11/10/2017 19:48	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	11/15/2017 17:41	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	11/15/2017 16:17	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Barium	NELAP	0.0010		**0.325**	mg/L	5	11/13/2017 23:09	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Boron	NELAP	0.0250		**0.0713**	mg/L	5	11/13/2017 23:09	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Calcium	NELAP	0.125		**121**	mg/L	5	11/13/2017 23:09	136149
Chromium	NELAP	0.0010		**0.0011**	mg/L	5	11/13/2017 23:09	136149
Cobalt	NELAP	0.0010		**0.0032**	mg/L	5	11/13/2017 23:09	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Lithium	*	0.0010		**0.0146**	mg/L	5	11/15/2017 20:01	136149
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:09	136149
Nickel	NELAP	0.0010		**0.0057**	mg/L	5	11/15/2017 20:01	136149
Selenium	NELAP	0.0010		**0.0013**	mg/L	5	11/15/2017 20:01	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:01	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:41	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-008
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 11/09/2017 12:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**826**	mg/L	1	11/15/2017 16:07	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**413**	mg/L	10	11/15/2017 16:36	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.30**		1	11/10/2017 19:50	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.32**	mg/L	1	11/15/2017 17:47	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**14**	mg/L	1	11/15/2017 16:28	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	11/13/2017 23:18	136149
Barium	NELAP	0.0010		**0.216**	mg/L	5	11/13/2017 23:18	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Boron	NELAP	0.0250		**9.98**	mg/L	5	11/13/2017 23:18	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Calcium	NELAP	0.125		**131**	mg/L	5	11/13/2017 23:18	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Lithium	*	0.0010		**0.0405**	mg/L	5	11/15/2017 20:26	136149
Molybdenum	NELAP	0.0010		**0.168**	mg/L	5	11/13/2017 23:18	136149
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:26	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:18	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:26	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:43	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-009
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 11/09/2017 13:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**916**	mg/L	1	11/15/2017 16:08	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**479**	mg/L	20	11/15/2017 17:00	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.07**		1	11/10/2017 19:53	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	11/15/2017 17:48	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	11/15/2017 16:52	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:26	136149
Arsenic	NELAP	0.0010		**0.0170**	mg/L	5	11/13/2017 23:26	136149
Barium	NELAP	0.0010		**0.440**	mg/L	5	11/13/2017 23:26	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:26	136149
Boron	NELAP	0.0250		**9.00**	mg/L	5	11/13/2017 23:26	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:26	136149
Calcium	NELAP	0.125		**157**	mg/L	5	11/13/2017 23:26	136149
Chromium	NELAP	0.0010		**0.0235**	mg/L	5	11/13/2017 23:26	136149
Cobalt	NELAP	0.0010		**0.0041**	mg/L	5	11/13/2017 23:26	136149
Lead	NELAP	0.0010		**0.0096**	mg/L	5	11/13/2017 23:26	136149
Lithium	*	0.0010		**0.0521**	mg/L	5	11/15/2017 20:34	136149
Molybdenum	NELAP	0.0010		**0.175**	mg/L	5	11/13/2017 23:26	136149
Nickel	NELAP	0.0010		**0.0202**	mg/L	5	11/15/2017 20:34	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:26	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:34	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:45	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-010
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 11/09/2017 15:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**528**	mg/L	1	11/15/2017 16:08	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**151**	mg/L	5	11/15/2017 17:08	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.23**		1	11/10/2017 19:57	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.26**	mg/L	1	11/15/2017 17:50	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**27**	mg/L	1	11/15/2017 17:00	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Arsenic	NELAP	0.0010		**0.0020**	mg/L	5	11/13/2017 23:34	136149
Barium	NELAP	0.0010		**0.226**	mg/L	5	11/13/2017 23:34	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Boron	NELAP	0.0250	S	**5.64**	mg/L	5	11/15/2017 20:43	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Calcium	NELAP	0.125	S	**96.8**	mg/L	5	11/16/2017 13:06	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Lithium	*	0.0010		**0.0415**	mg/L	5	11/15/2017 20:43	136149
Molybdenum	NELAP	0.0010		**0.243**	mg/L	5	11/13/2017 23:34	136149
Nickel	NELAP	0.0010		**0.0012**	mg/L	5	11/15/2017 20:43	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:34	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:43	136149

MS QC limits for Ca are not applicable due to high sample/spike ratio.
MS QC limits for B are not applicable due to high sample/spike ratio.

SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:47	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-011
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 11/09/2017 14:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**564**	mg/L	1	11/15/2017 16:08	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**222**	mg/L	10	11/15/2017 17:17	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.19**		1	11/10/2017 20:05	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	11/15/2017 17:54	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	11/15/2017 17:09	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Arsenic	NELAP	0.0010		**0.0074**	mg/L	5	11/13/2017 23:59	136149
Barium	NELAP	0.0010		**0.153**	mg/L	5	11/13/2017 23:59	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Boron	NELAP	0.0250		**3.58**	mg/L	5	11/13/2017 23:59	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Calcium	NELAP	0.125		**100**	mg/L	5	11/13/2017 23:59	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Lithium	*	0.0010		**0.0163**	mg/L	5	11/15/2017 20:51	136149
Molybdenum	NELAP	0.0010		**0.0589**	mg/L	5	11/13/2017 23:59	136149
Nickel	NELAP	0.0010		**0.0020**	mg/L	5	11/15/2017 20:51	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/13/2017 23:59	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:51	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:50	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Laboratory Results

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Client: ERM
Work Order: 17110731
Client Project: Grand Tower CCR GW
Report Date: 21-Dec-17
Lab ID: 17110731-012
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 11/10/2017 10:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**450**	mg/L	1	11/15/2017 16:08	R240196
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**207**	mg/L	5	11/15/2017 17:25	R240187
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.93**		1	11/10/2017 20:07	R239941
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.31**	mg/L	1	11/15/2017 17:56	R240163
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**22**	mg/L	1	11/15/2017 17:17	R240209
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	11/15/2017 20:59	136149
Barium	NELAP	0.0010		**0.0814**	mg/L	5	11/14/2017 0:08	136149
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Boron	NELAP	0.0250		**4.67**	mg/L	5	11/14/2017 0:08	136149
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Calcium	NELAP	0.125		**74.9**	mg/L	5	11/14/2017 0:08	136149
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Lithium	*	0.0010		**0.0245**	mg/L	5	11/15/2017 20:59	136149
Molybdenum	NELAP	0.0010		**0.0713**	mg/L	5	11/14/2017 0:08	136149
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:59	136149
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/14/2017 0:08	136149
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	11/15/2017 20:59	136149
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	11/13/2017 11:52	136136
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493
Radium-228	*	0		**See attached**	pci/L	1	12/05/2017 0:00	R241493

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17110731-001	APW-1R	Groundwater	3	11/08/2017 12:15
17110731-002	APW-4	Groundwater	3	11/08/2017 13:30
17110731-003	APW-9	Groundwater	3	11/08/2017 14:30
17110731-004	APW-8	Groundwater	3	11/08/2017 15:20
17110731-005	APW-7	Groundwater	3	11/09/2017 9:05
17110731-006	APW-10S	Groundwater	3	11/09/2017 10:50
17110731-007	APW-10D	Groundwater	3	11/09/2017 10:06
17110731-008	APW-5	Groundwater	3	11/09/2017 12:15
17110731-009	APW-2	Groundwater	3	11/09/2017 13:30
17110731-010	APW-6S	Groundwater	3	11/09/2017 15:15
17110731-011	APW-6D	Groundwater	3	11/09/2017 14:25
17110731-012	APW-3	Groundwater	3	11/10/2017 10:15

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17110731-001A	APW-1R	11/08/2017 12:15	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/14/2017 17:46
	SW-846 9036 (Total)				11/15/2017 15:10
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:33
	SW-846 9214 (Total)				11/15/2017 17:24
	SW-846 9251 (Total)				11/15/2017 14:40
17110731-001B	APW-1R	11/08/2017 12:15	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-001C	APW-1R	11/08/2017 12:15	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 22:20
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:12
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:18
17110731-002A	APW-4	11/08/2017 13:30	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/14/2017 17:47
	SW-846 9036 (Total)				11/15/2017 15:37
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:36
	SW-846 9214 (Total)				11/15/2017 17:27
	SW-846 9251 (Total)				11/15/2017 15:29
17110731-002B	APW-4	11/08/2017 13:30	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-002C	APW-4	11/08/2017 13:30	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 22:28
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:20
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:20
17110731-003A	APW-9	11/08/2017 14:30	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/14/2017 17:47
	SW-846 9036 (Total)				11/15/2017 15:58
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:38
	SW-846 9214 (Total)				11/15/2017 17:30
	SW-846 9251 (Total)				11/15/2017 15:37
17110731-003B	APW-9	11/08/2017 14:30	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-003C	APW-9	11/08/2017 14:30	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 22:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:28
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:23

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17110731-004A	APW-8	11/08/2017 15:20	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/14/2017 17:47
	SW-846 9036 (Total)				11/15/2017 16:01
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:40
	SW-846 9214 (Total)				11/15/2017 17:34
	SW-846 9251 (Total)				11/15/2017 15:58
17110731-004B	APW-8	11/08/2017 15:20	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-004C	APW-8	11/08/2017 15:20	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 22:45
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:36
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:25
17110731-005A	APW-7	11/09/2017 9:05	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:06
	SW-846 9036 (Total)				11/15/2017 16:12
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:44
	SW-846 9214 (Total)				11/15/2017 17:37
	SW-846 9251 (Total)				11/15/2017 16:04
17110731-005B	APW-7	11/09/2017 9:05	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-005C	APW-7	11/09/2017 9:05	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 22:53
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:45
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:31
17110731-006A	APW-10S	11/09/2017 10:50	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:07
	SW-846 9036 (Total)				11/15/2017 16:14
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:47
	SW-846 9214 (Total)				11/15/2017 17:39
	SW-846 9251 (Total)				11/15/2017 16:12
17110731-006B	APW-10S	11/09/2017 10:50	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-006C	APW-10S	11/09/2017 10:50	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:01
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 19:53
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:38

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17110731-007A	APW-10D	11/09/2017 10:06	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:07
	SW-846 9036 (Total)				11/15/2017 16:20
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:48
	SW-846 9214 (Total)				11/15/2017 17:41
	SW-846 9251 (Total)				11/15/2017 16:17
17110731-007B	APW-10D	11/09/2017 10:06	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-007C	APW-10D	11/09/2017 10:06	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:01
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:41
17110731-008A	APW-5	11/09/2017 12:15	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:07
	SW-846 9036 (Total)				11/15/2017 16:36
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:50
	SW-846 9214 (Total)				11/15/2017 17:47
	SW-846 9251 (Total)				11/15/2017 16:28
17110731-008B	APW-5	11/09/2017 12:15	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-008C	APW-5	11/09/2017 12:15	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:18
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:26
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:43
17110731-009A	APW-2	11/09/2017 13:30	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:08
	SW-846 9036 (Total)				11/15/2017 17:00
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:53
	SW-846 9214 (Total)				11/15/2017 17:48
	SW-846 9251 (Total)				11/15/2017 16:52
17110731-009B	APW-2	11/09/2017 13:30	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-009C	APW-2	11/09/2017 13:30	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:26
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:34
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:45

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
17110731-010A	APW-6S	11/09/2017 15:15	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:08
	SW-846 9036 (Total)				11/15/2017 17:08
	SW-846 9040B, Laboratory Analyzed				11/10/2017 19:57
	SW-846 9214 (Total)				11/15/2017 17:50
	SW-846 9251 (Total)				11/15/2017 17:00
17110731-010B	APW-6S	11/09/2017 15:15	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-010C	APW-6S	11/09/2017 15:15	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:34
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:43
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/16/2017 13:06
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:47
17110731-011A	APW-6D	11/09/2017 14:25	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:08
	SW-846 9036 (Total)				11/15/2017 17:17
	SW-846 9040B, Laboratory Analyzed				11/10/2017 20:05
	SW-846 9214 (Total)				11/15/2017 17:54
	SW-846 9251 (Total)				11/15/2017 17:09
17110731-011B	APW-6D	11/09/2017 14:25	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-011C	APW-6D	11/09/2017 14:25	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/13/2017 23:59
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:51
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:50
17110731-012A	APW-3	11/10/2017 10:15	11/10/2017 15:10		
	Standard Methods 2540 C (Total) 1997				11/15/2017 16:08
	SW-846 9036 (Total)				11/15/2017 17:25
	SW-846 9040B, Laboratory Analyzed				11/10/2017 20:07
	SW-846 9214 (Total)				11/15/2017 17:56
	SW-846 9251 (Total)				11/15/2017 17:17
17110731-012B	APW-3	11/10/2017 10:15	11/10/2017 15:10		
	EPA 903.0/904.0, Radium 226/228				12/05/2017 0:00
17110731-012C	APW-3	11/10/2017 10:15	11/10/2017 15:10		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/14/2017 0:08
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			11/10/2017 16:39	11/15/2017 20:59

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 7470A (Total)			11/10/2017 16:42	11/13/2017 11:52

Client: ERM **Work Order:** 17110731

Client Project: Grand Tower CCR GW **Report Date:** 21-Dec-17

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R240135 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						11/14/2017
Total Dissolved Solids	20		**< 20**						11/14/2017
Total Dissolved Solids	20		**< 20**						11/14/2017
Total Dissolved Solids	20		**< 20**						11/14/2017

Batch R240135 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	11/14/2017

Batch R240135 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**968**	1000	0	96.8	90	110	11/14/2017
Total Dissolved Solids	20		**970**	1000	0	97.0	90	110	11/14/2017
Total Dissolved Solids	20		**964**	1000	0	96.4	90	110	11/14/2017

Batch R240135 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17110731-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	R	**408**				358.0	13.05	11/14/2017

Batch R240196 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						11/15/2017
Total Dissolved Solids	20		**< 20**						11/15/2017

Batch R240196 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**960**	1000	0	96.0	90	110	11/15/2017

Batch R240196 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**962**	1000	0	96.2	90	110	11/15/2017

Batch R240196 **SampType:** MS Units **mg/L**

SampID: 17110731-005AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1250**	500.0	730.0	103.2	85	115	11/15/2017

Client: ERM **Work Order:** 17110731

Client Project: Grand Tower CCR GW **Report Date:** 21-Dec-17

STANDARD METHODS 2540 C (TOTAL) 1997

Batch **R240196** **SampType:** **MSD** Units **mg/L** RPD Limit **5**

SampID: 17110731-005AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1260**	500.0	730.0	106.4	1246	1.28	11/15/2017

SW-846 9036 (TOTAL)

Batch **R240101** **SampType:** **MBLK** Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						11/13/2017

Batch **R240101** **SampType:** **LCS** Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.9	90	110	11/13/2017

Batch **R240187** **SampType:** **MBLK** Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						11/15/2017

Batch **R240187** **SampType:** **LCS** Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.3	90	110	11/15/2017

Batch **R240187** **SampType:** **MS** Units **mg/L**

SampID: 17110731-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**71**	20.00	53.56	89.4	85	115	11/15/2017

Batch **R240187** **SampType:** **MSD** Units **mg/L** RPD Limit **10**

SampID: 17110731-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**72**	20.00	53.56	93.3	71.44	1.07	11/15/2017

Batch **R240187** **SampType:** **MS** Units **mg/L**

SampID: 17110731-007AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10	E	**51**	10.00	42.25	87.4	85	115	11/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17110731
Report Date: 21-Dec-17

SW-846 9036 (TOTAL)

Batch R240187 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17110731-007AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	10	E	**51**	10.00	42.25	90.3	50.99	0.57	11/15/2017

SW-846 9040B, LABORATORY ANALYZED

Batch R239941 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**7.00**	7.000	0	100.0	99.1	100.8	11/09/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.71**				6.800	1.33	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.38**				7.420	0.54	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.38**				7.390	0.14	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.17**				7.120	0.70	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.92**				6.870	0.73	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**
SampID: 17110731-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.03**				6.980	0.71	11/10/2017

Client: ERM **Work Order:** 17110731

Client Project: Grand Tower CCR GW **Report Date:** 21-Dec-17

SW-846 9040B, LABORATORY ANALYZED

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.07**				7.110	0.56	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.27**				7.300	0.41	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.10**				7.070	0.42	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.18**				7.230	0.69	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.23**				7.190	0.55	11/10/2017

Batch R239941 **SampType:** DUP Units RPD Limit **10**

SampID: 17110731-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.95**				7.930	0.25	11/10/2017

SW-846 9214 (TOTAL)

Batch R240163 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						11/15/2017

Batch R240163 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.97**	1.000	0	96.9	90	110	11/15/2017

Client: ERM **Work Order:** 17110731

Client Project: Grand Tower CCR GW **Report Date:** 21-Dec-17

SW-846 9214 (TOTAL)

Batch R240163 **SampType:** MS Units **mg/L**
SampID: 17110731-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.30**	2.000	0.1970	105.2	85	115	11/15/2017

Batch R240163 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17110731-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.33**	2.000	0.1970	106.5	2.300	1.17	11/15/2017

Batch R240163 **SampType:** MS Units **mg/L**
SampID: 17110731-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.41**	2.000	0.2580	107.6	85	115	11/15/2017

Batch R240163 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17110731-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.42**	2.000	0.2580	108.1	2.410	0.41	11/15/2017

SW-846 9251 (TOTAL)

Batch R240085 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						11/13/2017

Batch R240085 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.6	90	110	11/13/2017

Batch R240209 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						11/15/2017

Batch R240209 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	105.3	90	110	11/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Work Order: 17110731

Client Project: Grand Tower CCR GW

Report Date: 21-Dec-17

SW-846 9251 (TOTAL)

Batch **R240209** **SampType:** **MS** Units **mg/L**

SampID: 17110731-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**22**	20.00	2.910	95.7	85	115	11/15/2017

Batch **R240209** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17110731-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**22**	20.00	2.910	97.4	22.05	1.53	11/15/2017

Batch **R240209** **SampType:** **MS** Units **mg/L**

SampID: 17110731-007AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**33**	20.00	15.02	89.6	85	115	11/15/2017

Batch **R240209** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17110731-007AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**33**	20.00	15.02	89.7	32.93	0.09	11/15/2017

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **136149** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-136149

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	11/13/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	11/13/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	54.4	-100	100	11/15/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	31.1	-100	100	11/13/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/15/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/13/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	11/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Work Order: 17110731

Client Project: Grand Tower CCR GW

Report Date: 21-Dec-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **136149** **SampType:** **LCS** Units **mg/L**

SampID: LCS-136149

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.493**	0.5000	0	98.6	80	120	11/14/2017
Arsenic	0.0010		**0.497**	0.5000	0	99.4	80	120	11/14/2017
Barium	0.0010		**1.98**	2.000	0	98.9	80	120	11/14/2017
Beryllium	0.0010		**0.0482**	0.05000	0	96.3	80	120	11/14/2017
Boron	0.0250		**0.492**	0.5000	0	98.5	80	120	11/15/2017
Cadmium	0.0010		**0.0478**	0.05000	0	95.5	80	120	11/14/2017
Calcium	0.125		**2.49**	2.500	0	99.6	80	120	11/16/2017
Chromium	0.0010		**0.192**	0.2000	0	95.9	80	120	11/14/2017
Cobalt	0.0010		**0.469**	0.5000	0	93.8	80	120	11/14/2017
Lead	0.0010		**0.515**	0.5000	0	103.1	80	120	11/14/2017
Lithium	0.0010		**0.509**	0.5000	0	101.7	80	120	11/15/2017
Lithium	0.0010		**0.474**	0.5000	0	94.8	80	120	11/14/2017
Molybdenum	0.0010		**0.476**	0.5000	0	95.2	80	120	11/14/2017
Nickel	0.0010		**0.512**	0.5000	0	102.3	80	120	11/15/2017
Selenium	0.0010		**0.513**	0.5000	0	102.7	80	120	11/14/2017
Thallium	0.0010		**0.239**	0.2500	0	95.6	80	120	11/15/2017

Batch **136149** **SampType:** **MS** Units **mg/L**

SampID: 17110731-010CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.503**	0.5000	0	100.5	75	125	11/14/2017
Arsenic	0.0010		**0.509**	0.5000	0.001952	101.5	75	125	11/14/2017
Barium	0.0010		**2.19**	2.000	0.2256	98.5	75	125	11/14/2017
Beryllium	0.0010		**0.0492**	0.05000	0	98.3	75	125	11/14/2017
Boron	0.0250	S	**5.93**	0.5000	5.639	57.5	75	125	11/15/2017
Cadmium	0.0010		**0.0486**	0.05000	0	97.1	75	125	11/14/2017
Calcium	0.125	S	**96.0**	2.500	96.79	-32.8	75	125	11/16/2017
Chromium	0.0010		**0.193**	0.2000	0.0004138	96.2	75	125	11/14/2017
Cobalt	0.0010		**0.466**	0.5000	0	93.1	75	125	11/14/2017
Lead	0.0010		**0.518**	0.5000	0	103.7	75	125	11/14/2017
Lithium	0.0010		**0.549**	0.5000	0.04153	101.4	75	125	11/15/2017
Molybdenum	0.0010		**0.731**	0.5000	0.2429	97.6	75	125	11/14/2017
Nickel	0.0010		**0.507**	0.5000	0.001164	101.1	75	125	11/15/2017
Selenium	0.0010		**0.510**	0.5000	0	102.0	75	125	11/14/2017
Thallium	0.0010		**0.247**	0.2500	0	98.7	75	125	11/15/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17110731
Report Date: 21-Dec-17

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 136149 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17110731-010CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.487**	0.5000	0	97.4	0.5026	3.19	11/14/2017
Arsenic	0.0010		**0.499**	0.5000	0.001952	99.4	0.5092	2.05	11/14/2017
Barium	0.0010		**2.14**	2.000	0.2256	95.7	2.195	2.57	11/14/2017
Beryllium	0.0010		**0.0496**	0.05000	0	99.3	0.04917	0.93	11/14/2017
Boron	0.0250		**6.06**	0.5000	5.639	83.8	5.926	2.20	11/15/2017
Cadmium	0.0010		**0.0467**	0.05000	0	93.4	0.04857	3.93	11/14/2017
Calcium	0.125	S	**94.4**	2.500	96.79	-96.2	95.97	1.66	11/16/2017
Chromium	0.0010		**0.192**	0.2000	0.0004138	95.6	0.1929	0.64	11/14/2017
Cobalt	0.0010		**0.465**	0.5000	0	93.0	0.4657	0.19	11/14/2017
Lead	0.0010		**0.513**	0.5000	0	102.5	0.5183	1.09	11/14/2017
Lithium	0.0010		**0.551**	0.5000	0.04153	102.0	0.5487	0.49	11/15/2017
Molybdenum	0.0010		**0.724**	0.5000	0.2429	96.2	0.7311	0.98	11/14/2017
Nickel	0.0010		**0.500**	0.5000	0.001164	99.8	0.5068	1.34	11/15/2017
Selenium	0.0010		**0.501**	0.5000	0	100.2	0.5102	1.81	11/14/2017
Thallium	0.0010		**0.245**	0.2500	0	97.9	0.2468	0.84	11/15/2017

SW-846 7470A (TOTAL)

Batch 136136 **SampType:** MBLK Units **mg/L**

SampID: MBLK-136136

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	11/13/2017

Batch 136136 **SampType:** LCS Units **mg/L**

SampID: LCS-136136

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00562**	0.00500	0	112.4	85	115	11/13/2017

Batch 136136 **SampType:** MS Units **mg/L**

SampID: 17110731-005CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00535**	0.00500	0	107.0	75	125	11/13/2017

Batch 136136 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17110731-005CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00539**	0.00500	0	107.8	0.005352	0.75	11/13/2017

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17110731

Report Date: 21-Dec-17

Carrier: Employee

Received By: KF

Completed by: Kalyn Foecke
On: 10-Nov-17

Reviewed by: Marvin L. Darling II
On: 10-Nov-17

Pages to follow: Chain of custody 2 Extra pages included 26

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **1.42**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 1711073I

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Craney **Phone:** (217) 971-0917
E-Mail: **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 1.42 °C
Preserved in: [X] LAB [ ] FIELD
Lab Notes *Added HNO3 to metals cont. 65J/KF 11/10/17

FOR LAB USE ONLY

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [ ] No
Are these samples known to be hazardous? [ ] Yes [ ] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [ ] No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M Halley / E. Shovers

Results Requested
[ ] Standard [ ] 1-2 Day (100% Surcharge)
[ ] Other ____ [ ] 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1711073I-001	APW-1R	11/8/17 1215	1	3							X						X	X	X	X	X	X	X
002	APW-4	1230																					
003	APW-9 *	1430																					
004	APW-8 *	1520																					
005	APW-7	11/9/17 0905																					
006	APW-10S *	1050																					
007	APW-10D *	1006																					
008	APW-5 *	1215																					
009	APW-2 *	1230																					
010	APW-65	1515																					

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11/10/17 1510	[signature]	11/10/17 1510

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40608

11/10/17

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 1711073I

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Craney **Phone:** (217) 971-0917
E-Mail: **Fax:**

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE _____ °C
Preserved in: ☐ LAB ☐ FIELD

FOR LAB USE ONLY

Lab Notes

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1711073I-011	APW-6D	11/9/17 1425	3	3							X					X	X	X	X	X	X	X	X
012	APW-3	11/10/17 1015	3	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11/10/17 1510	[signature]	11/10/17 1510

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40608

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

December 19, 2017

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE:

Dear Mike Austin:

Order No.: 17110775

Summit Environmental Technologies, Inc. received 12 sample(s) on 11/15/2017 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

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Case Narrative

WO#: **17110775**
Date: **12/19/2017**

CLIENT: TEKLAB Inc,
Project:

WorkOrder Narrative:
17110775: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

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Qualifiers and Acronyms

WO#: **17110775**
Date: **12/19/2017**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **17110775**

19-Dec-17

CLIENT: TEKLAB Inc,

Project:

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17110775-001	17110731-001		11/8/2017 12:15:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-002	17110731-002		11/8/2017 1:30:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-003	17110731-003		11/8/2017 2:30:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-004	17110731-004		11/8/2017 3:20:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-005	17110731-005		11/9/2017 9:05:00 AM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-006	17110731-006		11/9/2017 10:50:00 AM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-007	17110731-007		11/9/2017 10:06:00 AM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-008	17110731-008		11/9/2017 12:15:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-009	17110731-009		11/9/2017 1:30:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-010	17110731-010		11/9/2017 3:15:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-011	17110731-011		11/9/2017 2:25:00 PM	11/15/2017 1:40:00 PM	Non-Potable Water
17110775-012	17110731-012		11/10/2017 10:15:00 AM	11/15/2017 1:40:00 PM	Non-Potable Water

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DATES REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17110775-001A	17110731-001	11/8/2017 12:15:00 PM	Non-Potable Water	Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:14:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:44:00 PM
17110775-002A	17110731-002	11/8/2017 1:30:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:14:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:45:00 PM
17110775-003A	17110731-003	11/8/2017 2:30:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:14:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:45:00 PM
17110775-004A	17110731-004	11/8/2017 3:20:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:14:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:45:00 PM
17110775-005A	17110731-005	11/9/2017 9:05:00 AM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:15:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:45:00 PM
17110775-006A	17110731-006	11/9/2017 10:50:00 AM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 12:15:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 3:45:00 PM
17110775-007A	17110731-007	11/9/2017 10:06:00 AM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 1:27:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM
17110775-008A	17110731-008	11/9/2017 12:15:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 1:28:00 PM

Original

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DATES REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17110775-008A	17110731-008	11/9/2017 12:15:00 PM	Non-Potable Water	Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM
17110775-009A	17110731-009	11/9/2017 1:30:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 1:28:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM
17110775-010A	17110731-010	11/9/2017 3:15:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 2:00:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM
17110775-011A	17110731-011	11/9/2017 2:25:00 PM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 2:00:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM
17110775-012A	17110731-012	11/10/2017 10:15:00 AM		Combined Radium (EPA903+904)			12/6/2017 1:16:43 PM
				Radium-226 (EPA 903.0)		12/1/2017 7:54:17 AM	12/6/2017 2:01:00 PM
				Radium-228 (EPA 904.0)		12/1/2017 7:54:17 AM	12/5/2017 4:24:00 PM

Original

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/8/2017 12:15:00 PM

Project:

Lab ID: 17110775-001

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.7	2.00	U	pCi/L	± 0.76	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.13	1.00	U	pCi/L	± 0.43	1	12/6/2017 12:14:00 PM
Yield	1					1	12/6/2017 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.57	1.00	U	pCi/L	± 0.33	1	12/5/2017 3:44:00 PM
Yield	1					1	12/5/2017 3:44:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc, **Collection Date:** 11/8/2017 1:30:00 PM

Project:

Lab ID: 17110775-002 **Matrix:** NON-POTABLE WATER

Client Sample ID 17110731-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.79	2.00	U	pCi/L	± 0.4	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.15	1.00	U	pCi/L	± 0.09	1	12/6/2017 12:14:00 PM
Yield	1					1	12/6/2017 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.64	1.00	U	pCi/L	± 0.31	1	12/5/2017 3:45:00 PM
Yield	1					1	12/5/2017 3:45:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc, **Collection Date:** 11/8/2017 2:30:00 PM

Project:

Lab ID: 17110775-003 **Matrix:** NON-POTABLE WATER

Client Sample ID 17110731-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.63	2.00	U	pCi/L	± 0.38	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.14	1.00	U	pCi/L	± 0.09	1	12/6/2017 12:14:00 PM
Yield	1					1	12/6/2017 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.49	1.00	U	pCi/L	± 0.29	1	12/5/2017 3:45:00 PM
Yield	1					1	12/5/2017 3:45:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc, **Collection Date:** 11/8/2017 3:20:00 PM

Project:

Lab ID: 17110775-004 **Matrix:** NON-POTABLE WATER

Client Sample ID 17110731-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.48	2.00	U	pCi/L	± 0.35	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.11	1.00	U	pCi/L	± 0.1	1	12/6/2017 12:14:00 PM
Yield	1					1	12/6/2017 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.37	1.00	U	pCi/L	± 0.25	1	12/5/2017 3:45:00 PM
Yield	1					1	12/5/2017 3:45:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc, **Collection Date:** 11/9/2017 9:05:00 AM

Project:

Lab ID: 17110775-005 **Matrix:** NON-POTABLE WATER

Client Sample ID 17110731-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.24	2.00	U	pCi/L	± 0.47	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.11	1.00	U	pCi/L	± 0.08	1	12/6/2017 12:15:00 PM
Yield	1					1	12/6/2017 12:15:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.13	1.00		pCi/L	± 0.39	1	12/5/2017 3:45:00 PM
Yield	1					1	12/5/2017 3:45:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 10:50:00 AM

Project:

Lab ID: 17110775-006

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.87	2.00	U	pCi/L	± 0.44	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.16	1.00	U	pCi/L	± 0.11	1	12/6/2017 12:15:00 PM
Yield	1					1	12/6/2017 12:15:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.71	1.00	J	pCi/L	± 0.33	1	12/5/2017 3:45:00 PM
Yield	1					1	12/5/2017 3:45:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 10:06:00 AM

Project:

Lab ID: 17110775-007

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.17	2.00	U	pCi/L	± 0.45	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.19	1.00	U	pCi/L	± 0.12	1	12/6/2017 1:27:00 PM
Yield	1					1	12/6/2017 1:27:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.98	1.00	J	pCi/L	± 0.33	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 12:15:00 PM

Project:

Lab ID: 17110775-008

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.65	2.00	U	pCi/L	± 0.48	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.48	1.00	U	pCi/L	± 0.15	1	12/6/2017 1:28:00 PM
Yield	1					1	12/6/2017 1:28:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.17	1.00		pCi/L	± 0.33	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 1:30:00 PM

Project:

Lab ID: 17110775-009

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	2.38	2.00		pCi/L	± 0.62	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	1.47	1.00		pCi/L	± 0.26	1	12/6/2017 1:28:00 PM
Yield	1					1	12/6/2017 1:28:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.91	1.00	J	pCi/L	± 0.36	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 3:15:00 PM

Project:

Lab ID: 17110775-010

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-010

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.12	2.00	U	pCi/L	± 0.51	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.22	1.00	U	pCi/L	± 0.11	1	12/6/2017 2:00:00 PM
Yield	1					1	12/6/2017 2:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.9	1.00	J	pCi/L	± 0.4	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc,

Collection Date: 11/9/2017 2:25:00 PM

Project:

Lab ID: 17110775-011

Matrix: NON-POTABLE WATER

Client Sample ID 17110731-011

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.25	2.00	U	pCi/L	± 0.52	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.39	1.00	U	pCi/L	± 0.15	1	12/6/2017 2:00:00 PM
Yield	1					1	12/6/2017 2:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.86	1.00	J	pCi/L	± 0.37	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17110775**

Date Reported: **12/19/2017**

CLIENT: TEKLAB Inc, **Collection Date:** 11/10/2017 10:15:00 AM

Project:

Lab ID: 17110775-012 **Matrix:** NON-POTABLE WATER

Client Sample ID 17110731-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.9	2.00	U	pCi/L	± 0.48	1	12/6/2017 1:16:43 PM
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.18	1.00	U	pCi/L	± 0.11	1	12/6/2017 2:01:00 PM
Yield	1					1	12/6/2017 2:01:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.72	1.00	J	pCi/L	± 0.37	1	12/5/2017 4:24:00 PM
Yield	1					1	12/5/2017 4:24:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

BatchID: **29919**

Sample ID **lcs-29919** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/1/2017** RunNo: **78065**
Client ID: **LCSW** Batch ID: **29919** TestNo: **E904.0** **E903-904** Analysis Date: **12/5/2017** SeqNo: **1340066**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.14	1.00	5.000	0	82.8	70	130				
Yield	1.00			0	0						

Sample ID **lcsd-29919** SampType: **LCSD** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/1/2017** RunNo: **78065**
Client ID: **LCSS02** Batch ID: **29919** TestNo: **E904.0** **E903-904** Analysis Date: **12/5/2017** SeqNo: **1340067**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.52	1.00	5.000	0	70.4	70	130	4.140	16.2	20	
Yield	1.00			0	0			1.000	0		

Sample ID **17110768-001aMS** SampType: **MS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/1/2017** RunNo: **78065**
Client ID: **BatchQC** Batch ID: **29919** TestNo: **E904.0** **E903-904** Analysis Date: **12/5/2017** SeqNo: **1340070**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.29	1.00	5.000	0	85.8	70	130				
Yield	1.00			1.000	0						

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

BatchID: **29919**

Sample ID	**17110775-002adup**	SampType:	**DUP**	TestCode:	**Radium-226_**	Units:	**pCi/L**	Prep Date:	**12/1/2017**	RunNo:	**78065**		
Client ID:	**17110731-002**	Batch ID:	**29919**	TestNo:	**E903.0**		**E903-904**	Analysis Date:	**12/6/2017**	SeqNo:	**1339986**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	0.03	1.00						0	0	30	U
Yield	1							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

BatchID: **29919**

Sample ID	mb-29919	SampType:	MBLK	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	12/1/2017	RunNo:	78065
Client ID:	PBW	Batch ID:	29919	TestNo:	E903.0	E903-904		Analysis Date:	12/6/2017	SeqNo:	1339949

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID	lcs-29919	SampType:	LCS	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	12/1/2017	RunNo:	78065
Client ID:	LCSW	Batch ID:	29919	TestNo:	E903.0	E903-904		Analysis Date:	12/6/2017	SeqNo:	1339950

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.29	1.00	5.000	0	106	70	130				

Sample ID	lcsd-29919	SampType:	LCSD	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	12/1/2017	RunNo:	78065
Client ID:	LCSS02	Batch ID:	29919	TestNo:	E903.0	E903-904		Analysis Date:	12/6/2017	SeqNo:	1339951

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.73	1.00	5.000	0	94.6	70	130	5.290	11.2	20	

Sample ID	17110768-001aMS	SampType:	MS	TestCode:	Radium-226_	Units:	pCi/L	Prep Date:	12/1/2017	RunNo:	78065
Client ID:	BatchQC	Batch ID:	29919	TestNo:	E903.0	E903-904		Analysis Date:	12/6/2017	SeqNo:	1339954

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17110775**

19-Dec-17

Client: TEKLAB Inc,

Project:

BatchID: **29919**

Sample ID	**17110768-001aMS**	SampType:	**MS**	TestCode:	**Radium-226_**	Units:	**pCi/L**	Prep Date:	**12/1/2017**	RunNo:	**78065**		
Client ID:	**BatchQC**	Batch ID:	**29919**	TestNo:	**E903.0**	**E903-904**		Analysis Date:	**12/6/2017**	SeqNo:	**1339954**		

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.82	1.00	5.000	0	96.4	70	130				

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested. Please analyze for Radium 226, 228 and Combined by method EPA 903.3/904.0 on standard TAT. Please include negative values where applicable. NO ND

Project# 17110731

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: Std. TAT Billing/PO: 25436 Phone: 618-344-1004 x16

AMB

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226/228	Combined Radium										
	17110731-001	11/8/17 1215	HNO3	Groundwater	✓	✓										
	17110731-002	11/8/17 1330	HNO3	Groundwater	✓	✓										
	17110731-003	11/8/17 1430	HNO3	Groundwater	✓	✓										
	17110731-004	11/8/17 1520	HNO3	Groundwater	✓	✓										
	17110731-005	11/9/17 0905	HNO3	Groundwater	✓	✓										
	17110731-006	11/9/17 1050	HNO3	Groundwater	✓	✓										
	17110731-007	11/9/17 1006	HNO3	Groundwater	✓	✓										
	17110731-008	11/9/17 1215	HNO3	Groundwater	✓	✓										
	17110731-009	11/9/17 1330	HNO3	Groundwater	✓	✓										
	17110731-010	11/9/17 1515	HNO3	Groundwater	✓	✓										
	17110731-011	11/9/17 1425	HNO3	Groundwater	✓	✓										

17107 31-001 -012

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	11/13/17	[illegible]	11-15-17 1340

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☐ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Batch QC is required for all analyses requested. Please analyze for Radium 226, 228 and Combined by method EPA 903.3/904.0 on standard TAT. Please include negative values where applicable. NO ND

Project# 17110731

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: Std. TAT Billing/PO: 25436 Phone: 618-344-1004 x16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226/228	Combined Radium										
	17110731-012	11/10/17 1015	HNO3	Groundwater	✓	✓										
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												
			Unpres	Groundwater												

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	11/13/17		

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

Figure 1 – Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 1

Client: TekLab

Initials of person inspecting cooler and samples: ANB

Order Number: 17110775

Date Received: 11-15-17 Time Received: 1340 Date cooler(s) opened and samples inspected: 11-15-17

Number of Coolers/Boxes: 1

N/A

Shipper: (Fed Ex) UPS DHL Airborne US Postal Walk-in Pickup Other:_____

Packaging: Peanuts Bubble Wrap (Paper) Foam None Other:_____

Tape on cooler/box:	(Y)	N	N/A
Custody Seals intact	Y	N	(N/A)
C-O-C in plastic	(Y)	N	N/A
Ice_____ Blue ice _____	present	absent	melted (N/A)
Cooler Temperature IR Gun #16020459 CF 0.0°C Temp: 8.7 °C			N/A
Radiological Testing Instrument serial #35127	(Y)	N	N/A (see page 2 for scan results)

Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly	(Y)	N	N/A
Samples in separate bags	(Y)	N	N/A
Sample containers intact*	(Y)	N	N/A

*If no, list broken sample(s):_____

Sample label(s) complete (ID, date, etc.)	(Y)	N	N/A
Label(s) agree with C-O-C	(Y)	N	N/A
Correct containers used	(Y)	N	N/A
Sufficient sample received	(Y)	N	N/A
Sufficient sample for QC	Y	(N)	N/A
Samples received within holding time	(Y)	N	N/A
Do any 40 mL vials contain bubbles**	Y	N	(N/A)

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: _____

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact:_____

Date/Time:_____

Logged in by:_____

Comments:_____

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

**Figure 2 – Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 2**

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	**pH Strip (2.8-4.6) SET#:** OES-01-0250
Total DPD packet SET#: OES-02-0239	**Free DPD packet SET#:** OES-01-0290
Disp. Pipette SET#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1		2		38	
2		2		36	
3		2		21	
4		2		29	
5		2		16	
6		2		11	
7		2		35	
8		2		16	
9		2		19	
10		2		48	
11		2		37	
12		2		25	

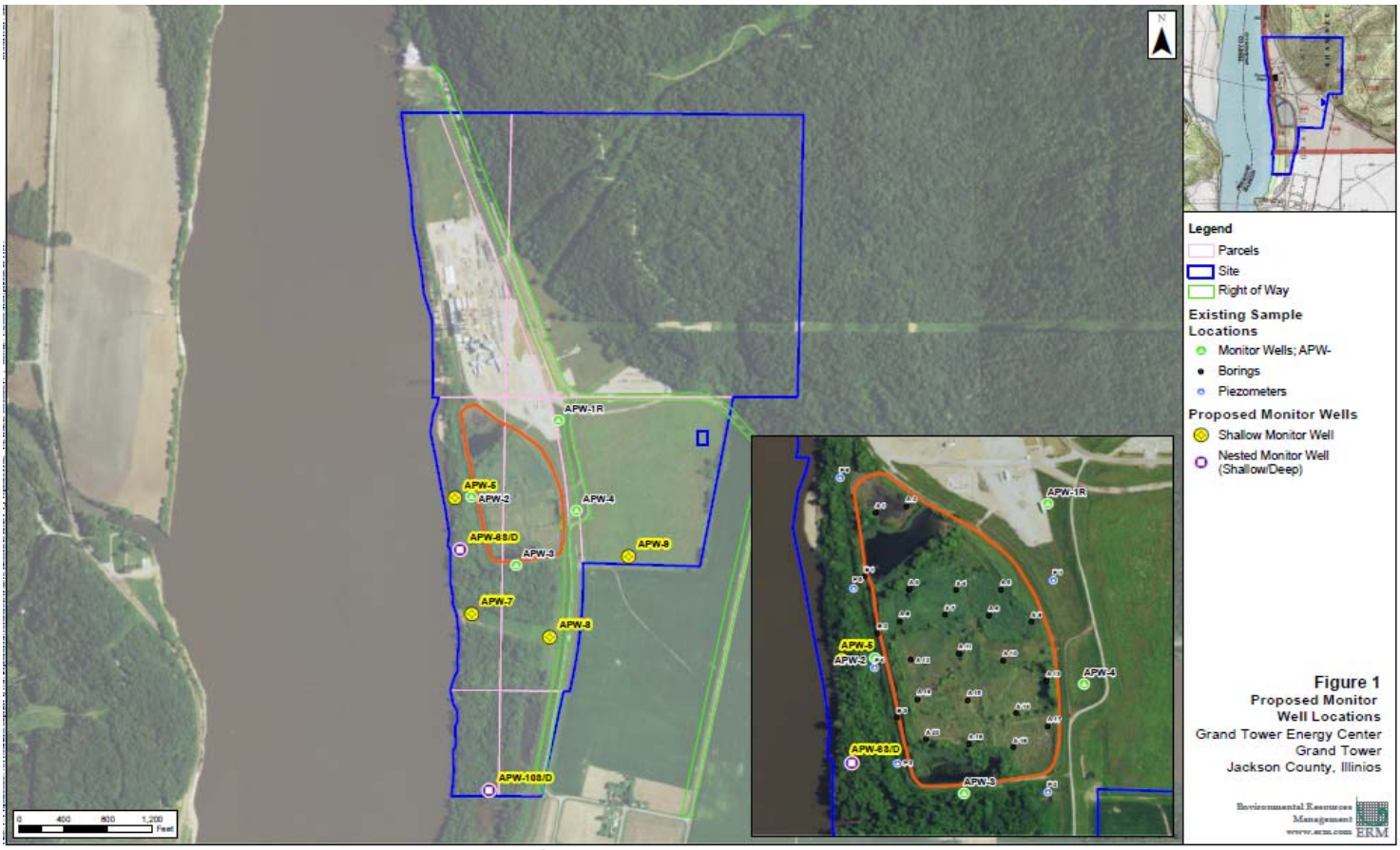
P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst

Event 5

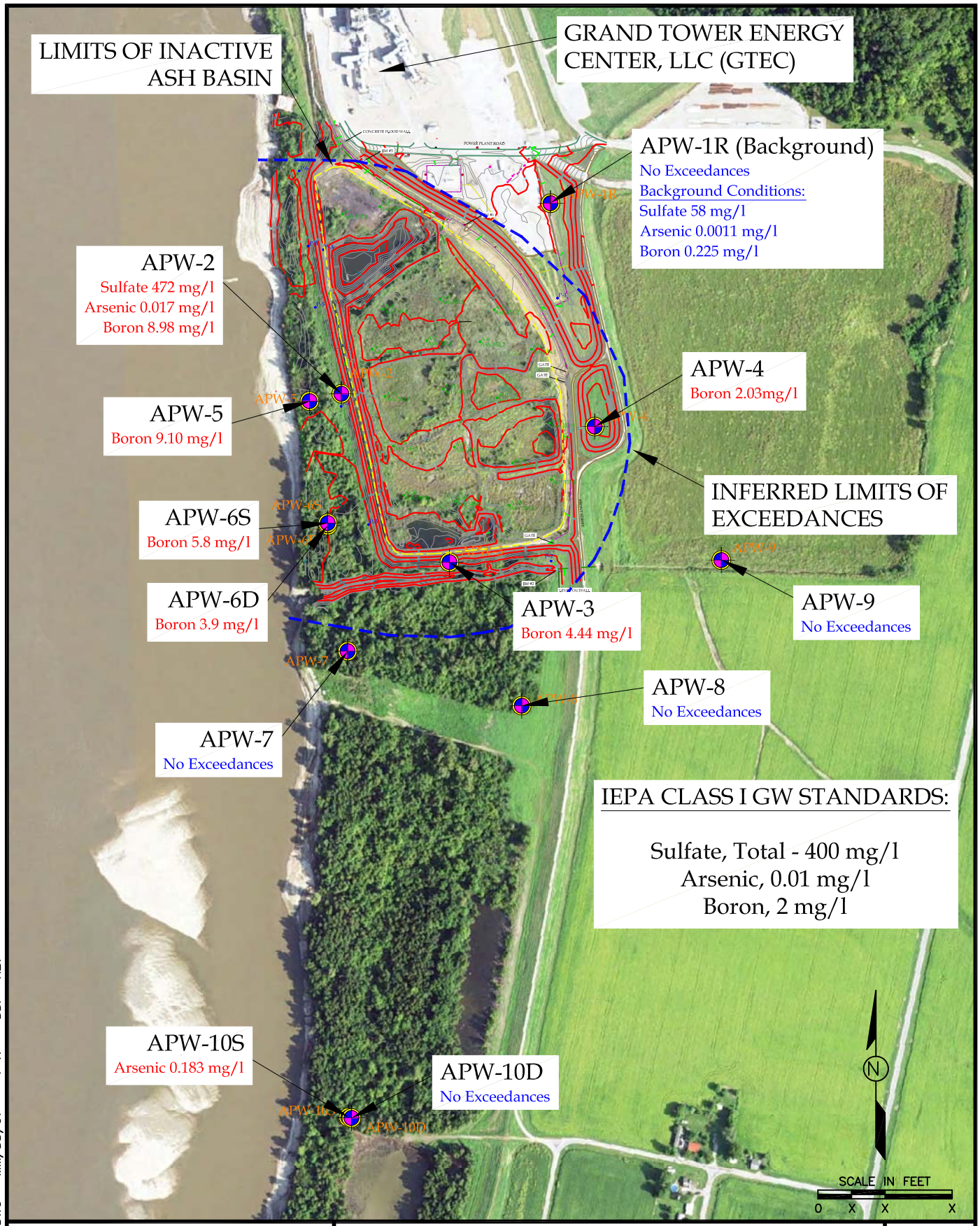
Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 5 **Date Samples Collected:** **From** 11/27/17 **To** 11/29/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	<5	12	19	11	16	26	16	16	10	13	6	17
Sulfate, Total	mg/L	400	58	**472**	204	107	381	189	230	61	39	50	<10	42
Fluoride, Total	mg/L	4	0.14	0.24	0.27	0.18	0.32	0.25	0.21	0.2	0.28	0.2	0.16	0.11
Lab pH		6.5 - 9.0	7.11	7.05	7.5	7.32	7.26	7.09	7.2	6.83	7.25	7.52	6.97	7.12
Total Dissolved Solids	mg/L	1200	412	870	554	492	790	566	590	742	466	392	734	482
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.0011	**0.0169**	0.0023	0.0016	0.0016	0.0013	0.009	<0.001	<0.001	0.002	**0.183**	<0.001
Barium	mg/L	2	0.165	0.427	0.121	0.128	0.193	0.214	0.155	0.37	0.217	0.121	0.565	0.284
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.225	**8.98**	**4.44**	**2.03**	**9.1**	**5.8**	**3.9**	0.278	0.141	0.506	0.545	0.0885
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		91.2	158	116	107	123	99.5	110	196	102	85.6	150	125
Chromium	mg/L	0.1	<0.001	0.014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	1	<0.001	0.0038	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0017
Lead	mg/L	0.0075	<0.001	**0.0075**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.018	0.0542	0.0308	0.0424	0.0415	0.042	0.0178	0.0185	0.0223	0.0167	0.0293	0.0153
Molybdenum	No Standard		<0.001	0.165	0.0684	0.0748	0.193	0.274	0.06	0.003	<0.001	0.0247	<0.001	<0.001
Nickel	mg/L	0.1	0.0038	0.0135	<0.001	0.002	<0.001	<0.001	0.0017	<0.001	0.0026	<0.001	<0.001	0.0035
Selenium	mg/L	0.05	0.0041	<0.001	<0.001	0.014	<0.001	<0.001	<0.001	<0.001	0.0135	0.0138	<0.001	<0.001
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	-0.07		0.33	0.09		0.18	0.38	0.16	0.35	-0.06	0.18	0.16
Radium-228	pCi/l	20	0.47		0.31	0.88		0.92	1.4	0.61	0.77	1.07	0.66	0.47
Radium-226/228 Comb.	pCi/l	-----	0.4		0.64	0.97		1.1	1.78	0.77	1.12	1.01	0.84	0.63



Note: Radium samples for APW-2 & APW-5 damaged during transport to laboratory.



PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 5 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
5

January 08, 2018

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17111702

Dear Brett Carney:

TEKLAB, INC received 12 samples on 11/29/2017 3:53:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

This reporting package includes the following:

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Sample Summary	18
Dates Report	19
Quality Control Results	24
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Chain of Custody	Appended

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

Abbr Definition

*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Cooler Receipt Temp: 1.62 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

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Phone (217) 698-1004
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Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2018	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 11/27/2017 13:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**412**	mg/L	1	12/01/2017 13:56	R240788
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**58**	mg/L	2	11/30/2017 23:09	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.11**		1	12/01/2017 15:14	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.14**	mg/L	1	12/01/2017 18:05	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**< 5**	mg/L	1	11/30/2017 23:02	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	12/05/2017 19:20	136794
Barium	NELAP	0.0010		**0.165**	mg/L	5	12/05/2017 19:20	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Boron	NELAP	0.0250		**0.225**	mg/L	5	12/05/2017 19:20	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Calcium	NELAP	0.125	S	**91.2**	mg/L	5	12/08/2017 12:38	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Lithium	*	0.0010		**0.0180**	mg/L	5	12/05/2017 19:20	136794
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
Nickel	NELAP	0.0010		**0.0038**	mg/L	5	12/05/2017 19:20	136794
Selenium	NELAP	0.0010		**0.0041**	mg/L	5	12/05/2017 19:20	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:20	136794
MS QC limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:23	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-002
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 11/27/2017 14:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**392**	mg/L	1	12/01/2017 13:57	R240788
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**50**	mg/L	1	11/30/2017 23:12	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.52**		1	12/01/2017 15:16	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	12/01/2017 18:07	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	11/30/2017 23:10	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Arsenic	NELAP	0.0010		**0.0020**	mg/L	5	12/05/2017 19:28	136794
Barium	NELAP	0.0010		**0.121**	mg/L	5	12/05/2017 19:28	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Boron	NELAP	0.0250		**0.506**	mg/L	5	12/05/2017 19:28	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Calcium	NELAP	0.125		**85.6**	mg/L	5	12/08/2017 12:47	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Lithium	*	0.0010		**0.0167**	mg/L	5	12/05/2017 19:28	136794
Molybdenum	NELAP	0.0010		**0.0247**	mg/L	5	12/05/2017 19:28	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
Selenium	NELAP	0.0010		**0.0138**	mg/L	5	12/05/2017 19:28	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:28	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:25	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-003
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 11/27/2017 16:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**466**	mg/L	1	12/01/2017 13:58	R240788
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**39**	mg/L	1	11/30/2017 23:20	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.25**		1	12/01/2017 15:18	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.28**	mg/L	1	12/01/2017 18:09	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	11/30/2017 23:18	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Barium	NELAP	0.0010		**0.217**	mg/L	5	12/05/2017 19:37	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Boron	NELAP	0.0250		**0.141**	mg/L	5	12/05/2017 19:37	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Calcium	NELAP	0.125		**102**	mg/L	5	12/08/2017 12:55	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Lithium	*	0.0010		**0.0223**	mg/L	5	12/05/2017 19:37	136794
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
Nickel	NELAP	0.0010		**0.0026**	mg/L	5	12/05/2017 19:37	136794
Selenium	NELAP	0.0010		**0.0135**	mg/L	5	12/05/2017 19:37	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:37	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:28	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-004
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 11/28/2017 9:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**742**	mg/L	1	12/04/2017 14:41	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**61**	mg/L	2	11/30/2017 23:42	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.83**		1	12/01/2017 15:20	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	12/01/2017 18:11	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	11/30/2017 23:21	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Barium	NELAP	0.0010		**0.370**	mg/L	5	12/05/2017 19:45	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Boron	NELAP	0.0250		**0.278**	mg/L	5	12/05/2017 19:45	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Calcium	NELAP	0.125		**196**	mg/L	5	12/08/2017 13:03	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Lithium	*	0.0010		**0.0185**	mg/L	5	12/05/2017 19:45	136794
Molybdenum	NELAP	0.0010		**0.0030**	mg/L	5	12/07/2017 4:19	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:45	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:30	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-005
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 11/28/2017 11:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**482**	mg/L	1	12/04/2017 14:41	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**42**	mg/L	2	11/30/2017 23:55	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.12**		1	12/01/2017 15:23	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.11**	mg/L	1	12/01/2017 18:12	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	11/30/2017 23:42	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Barium	NELAP	0.0010		**0.284**	mg/L	5	12/05/2017 19:53	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Boron	NELAP	0.0250		**0.0885**	mg/L	5	12/05/2017 19:53	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Calcium	NELAP	0.125		**125**	mg/L	5	12/08/2017 14:09	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Cobalt	NELAP	0.0010		**0.0017**	mg/L	5	12/05/2017 19:53	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Lithium	*	0.0010		**0.0153**	mg/L	5	12/05/2017 19:53	136794
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Nickel	NELAP	0.0010		**0.0035**	mg/L	5	12/05/2017 19:53	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 19:53	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:41	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-006
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 11/28/2017 12:25

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**734**	mg/L	1	12/04/2017 14:42	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	12/01/2017 0:06	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.97**		1	12/01/2017 15:25	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	12/01/2017 18:14	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	12/01/2017 0:04	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Arsenic	NELAP	0.0010		**0.183**	mg/L	5	12/05/2017 20:01	136794
Barium	NELAP	0.0010		**0.565**	mg/L	5	12/05/2017 20:01	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Boron	NELAP	0.0250		**0.545**	mg/L	5	12/05/2017 20:01	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Calcium	NELAP	0.125		**150**	mg/L	5	12/08/2017 14:17	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Lithium	*	0.0010		**0.0293**	mg/L	5	12/05/2017 20:01	136794
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:01	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:44	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-007
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 11/28/2017 14:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**492**	mg/L	1	12/04/2017 14:42	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**107**	mg/L	5	12/01/2017 0:14	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.32**		1	12/01/2017 15:28	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.18**	mg/L	1	12/01/2017 18:20	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	12/01/2017 0:07	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	12/05/2017 20:09	136794
Barium	NELAP	0.0010		**0.128**	mg/L	5	12/05/2017 20:09	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Boron	NELAP	0.0250		**2.03**	mg/L	5	12/05/2017 20:09	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Calcium	NELAP	0.125		**107**	mg/L	5	12/08/2017 14:25	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
Lithium	*	0.0010		**0.0424**	mg/L	5	12/05/2017 20:09	136794
Molybdenum	NELAP	0.0010		**0.0748**	mg/L	5	12/05/2017 20:09	136794
Nickel	NELAP	0.0010		**0.0020**	mg/L	5	12/05/2017 20:09	136794
Selenium	NELAP	0.0010		**0.0140**	mg/L	5	12/05/2017 20:09	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:09	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:46	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-008
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 11/28/2017 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**566**	mg/L	1	12/04/2017 14:42	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**189**	mg/L	5	12/01/2017 0:38	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.09**		1	12/01/2017 15:30	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.25**	mg/L	1	12/01/2017 18:24	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**26**	mg/L	1	12/01/2017 0:31	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Arsenic	NELAP	0.0010		**0.0013**	mg/L	5	12/05/2017 20:18	136794
Barium	NELAP	0.0010		**0.214**	mg/L	5	12/05/2017 20:18	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Boron	NELAP	0.0250		**5.80**	mg/L	5	12/05/2017 20:18	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Calcium	NELAP	0.125		**99.5**	mg/L	5	12/08/2017 14:33	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Lithium	*	0.0010		**0.0420**	mg/L	5	12/05/2017 20:18	136794
Molybdenum	NELAP	0.0010		**0.274**	mg/L	5	12/05/2017 20:18	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:18	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:48	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-009
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 11/28/2017 16:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**590**	mg/L	1	12/04/2017 14:42	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**230**	mg/L	10	12/01/2017 0:47	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.20**		1	12/01/2017 15:32	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	12/01/2017 18:25	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	12/01/2017 0:39	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Arsenic	NELAP	0.0010		**0.0090**	mg/L	5	12/05/2017 20:26	136794
Barium	NELAP	0.0010		**0.155**	mg/L	5	12/05/2017 20:26	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Boron	NELAP	0.0250		**3.90**	mg/L	5	12/05/2017 20:26	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Calcium	NELAP	0.125		**110**	mg/L	5	12/08/2017 14:42	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Lithium	*	0.0010		**0.0178**	mg/L	5	12/05/2017 20:26	136794
Molybdenum	NELAP	0.0010		**0.0600**	mg/L	5	12/05/2017 20:26	136794
Nickel	NELAP	0.0010		**0.0017**	mg/L	5	12/05/2017 20:26	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:26	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:50	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-010
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 11/29/2017 9:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**790**	mg/L	1	12/04/2017 14:43	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**381**	mg/L	20	12/01/2017 0:55	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.26**		1	12/01/2017 15:35	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.32**	mg/L	1	12/01/2017 18:27	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	12/01/2017 0:47	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	12/05/2017 20:50	136794
Barium	NELAP	0.0010		**0.193**	mg/L	5	12/05/2017 20:50	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Boron	NELAP	0.0250		**9.10**	mg/L	5	12/05/2017 20:50	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Calcium	NELAP	0.125		**123**	mg/L	5	12/08/2017 14:50	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Lithium	*	0.0010		**0.0415**	mg/L	5	12/05/2017 20:50	136794
Molybdenum	NELAP	0.0010		**0.193**	mg/L	5	12/05/2017 20:50	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:50	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:55	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

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Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-011
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 11/29/2017 10:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**870**	mg/L	1	12/04/2017 14:43	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**472**	mg/L	20	12/01/2017 1:03	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.05**		1	12/01/2017 15:40	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	12/01/2017 18:29	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	12/01/2017 0:55	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:59	136794
Arsenic	NELAP	0.0010		**0.0169**	mg/L	5	12/05/2017 20:59	136794
Barium	NELAP	0.0010		**0.427**	mg/L	5	12/05/2017 20:59	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:59	136794
Boron	NELAP	0.0250		**8.98**	mg/L	5	12/05/2017 20:59	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:59	136794
Calcium	NELAP	0.125		**158**	mg/L	5	12/08/2017 14:58	136794
Chromium	NELAP	0.0010		**0.0140**	mg/L	5	12/05/2017 20:59	136794
Cobalt	NELAP	0.0010		**0.0038**	mg/L	5	12/05/2017 20:59	136794
Lead	NELAP	0.0010		**0.0075**	mg/L	5	12/05/2017 20:59	136794
Lithium	*	0.0010		**0.0542**	mg/L	5	12/05/2017 20:59	136794
Molybdenum	NELAP	0.0010		**0.165**	mg/L	5	12/05/2017 20:59	136794
Nickel	NELAP	0.0010		**0.0135**	mg/L	5	12/05/2017 20:59	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:59	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 20:59	136794
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 8:57	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17111702
Client Project: Grand Tower CCR GW
Report Date: 08-Jan-18
Lab ID: 17111702-012
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 11/29/2017 12:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**554**	mg/L	1	12/04/2017 14:43	R240847
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**204**	mg/L	10	12/01/2017 1:11	R240741
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.50**		1	12/01/2017 15:42	R240745
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.27**	mg/L	1	12/01/2017 18:35	R240751
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**19**	mg/L	1	12/01/2017 1:03	R240805
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Arsenic	NELAP	0.0010		**0.0023**	mg/L	5	12/05/2017 21:07	136794
Barium	NELAP	0.0010		**0.121**	mg/L	5	12/05/2017 21:07	136794
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Boron	NELAP	0.0250	S	**4.44**	mg/L	5	12/05/2017 21:07	136794
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Calcium	NELAP	0.125	S	**116**	mg/L	5	12/08/2017 15:06	136794
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Lithium	*	0.0010		**0.0308**	mg/L	5	12/05/2017 21:07	136794
Molybdenum	NELAP	0.0010		**0.0684**	mg/L	5	12/05/2017 21:07	136794
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	12/05/2017 21:07	136794

MS QC limits for Ca are not applicable due to high sample/spike ratio.
MS QC limits for B are not applicable due to high sample/spike ratio.

SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	12/01/2017 9:08	136772
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054
Radium-228	*	0		**See attached**	pci/L	1	12/27/2017 0:00	R242054

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17111702-001	APW-1R	Groundwater	3	11/27/2017 13:10
17111702-002	APW-9	Groundwater	3	11/27/2017 14:40
17111702-003	APW-8	Groundwater	3	11/27/2017 16:00
17111702-004	APW-7	Groundwater	3	11/28/2017 9:30
17111702-005	APW-10D	Groundwater	3	11/28/2017 11:15
17111702-006	APW-10S	Groundwater	3	11/28/2017 12:25
17111702-007	APW-4	Groundwater	3	11/28/2017 14:15
17111702-008	APW-6S	Groundwater	3	11/28/2017 15:30
17111702-009	APW-6D	Groundwater	3	11/28/2017 16:30
17111702-010	APW-5	Groundwater	3	11/29/2017 9:20
17111702-011	APW-2	Groundwater	3	11/29/2017 10:45
17111702-012	APW-3	Groundwater	3	11/29/2017 12:45

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
17111702-001A	APW-1R	11/27/2017 13:10	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/01/2017 13:56
	SW-846 9036 (Total)				11/30/2017 23:09
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:14
	SW-846 9214 (Total)				12/01/2017 18:05
	SW-846 9251 (Total)				11/30/2017 23:02
17111702-001B	APW-1R	11/27/2017 13:10	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-001C	APW-1R	11/27/2017 13:10	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 19:20
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 12:38
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:23
17111702-002A	APW-9	11/27/2017 14:40	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/01/2017 13:57
	SW-846 9036 (Total)				11/30/2017 23:12
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:16
	SW-846 9214 (Total)				12/01/2017 18:07
	SW-846 9251 (Total)				11/30/2017 23:10
17111702-002B	APW-9	11/27/2017 14:40	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-002C	APW-9	11/27/2017 14:40	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 19:28
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 12:47
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:25
17111702-003A	APW-8	11/27/2017 16:00	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/01/2017 13:58
	SW-846 9036 (Total)				11/30/2017 23:20
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:18
	SW-846 9214 (Total)				12/01/2017 18:09
	SW-846 9251 (Total)				11/30/2017 23:18
17111702-003B	APW-8	11/27/2017 16:00	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-003C	APW-8	11/27/2017 16:00	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 19:37
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 12:55
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:28

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
17111702-004A	APW-7	11/28/2017 9:30	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:41
	SW-846 9036 (Total)				11/30/2017 23:42
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:20
	SW-846 9214 (Total)				12/01/2017 18:11
	SW-846 9251 (Total)				11/30/2017 23:21
17111702-004B	APW-7	11/28/2017 9:30	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-004C	APW-7	11/28/2017 9:30	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 19:45
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/07/2017 4:19
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 13:03
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:30
17111702-005A	APW-10D	11/28/2017 11:15	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:41
	SW-846 9036 (Total)				11/30/2017 23:55
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:23
	SW-846 9214 (Total)				12/01/2017 18:12
	SW-846 9251 (Total)				11/30/2017 23:42
17111702-005B	APW-10D	11/28/2017 11:15	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-005C	APW-10D	11/28/2017 11:15	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 19:53
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:09
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:41
17111702-006A	APW-10S	11/28/2017 12:25	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:42
	SW-846 9036 (Total)				12/01/2017 0:06
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:25
	SW-846 9214 (Total)				12/01/2017 18:14
	SW-846 9251 (Total)				12/01/2017 0:04
17111702-006B	APW-10S	11/28/2017 12:25	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-006C	APW-10S	11/28/2017 12:25	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:01
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:17

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:44
17111702-007A	APW-4	11/28/2017 14:15	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:42
	SW-846 9036 (Total)				12/01/2017 0:14
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:28
	SW-846 9214 (Total)				12/01/2017 18:20
	SW-846 9251 (Total)				12/01/2017 0:07
17111702-007B	APW-4	11/28/2017 14:15	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-007C	APW-4	11/28/2017 14:15	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:25
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:46
17111702-008A	APW-6S	11/28/2017 15:30	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:42
	SW-846 9036 (Total)				12/01/2017 0:38
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:30
	SW-846 9214 (Total)				12/01/2017 18:24
	SW-846 9251 (Total)				12/01/2017 0:31
17111702-008B	APW-6S	11/28/2017 15:30	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-008C	APW-6S	11/28/2017 15:30	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:18
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:33
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:48
17111702-009A	APW-6D	11/28/2017 16:30	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:42
	SW-846 9036 (Total)				12/01/2017 0:47
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:32
	SW-846 9214 (Total)				12/01/2017 18:25
	SW-846 9251 (Total)				12/01/2017 0:39
17111702-009B	APW-6D	11/28/2017 16:30	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-009C	APW-6D	11/28/2017 16:30	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:26
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:42

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:50
17111702-010A	APW-5	11/29/2017 9:20	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:43
	SW-846 9036 (Total)				12/01/2017 0:55
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:35
	SW-846 9214 (Total)				12/01/2017 18:27
	SW-846 9251 (Total)				12/01/2017 0:47
17111702-010B	APW-5	11/29/2017 9:20	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-010C	APW-5	11/29/2017 9:20	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:50
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:50
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:55
17111702-011A	APW-2	11/29/2017 10:45	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:43
	SW-846 9036 (Total)				12/01/2017 1:03
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:40
	SW-846 9214 (Total)				12/01/2017 18:29
	SW-846 9251 (Total)				12/01/2017 0:55
17111702-011B	APW-2	11/29/2017 10:45	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-011C	APW-2	11/29/2017 10:45	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 20:59
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 14:58
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 8:57
17111702-012A	APW-3	11/29/2017 12:45	11/29/2017 15:53		
	Standard Methods 2540 C (Total) 1997				12/04/2017 14:43
	SW-846 9036 (Total)				12/01/2017 1:11
	SW-846 9040B, Laboratory Analyzed				12/01/2017 15:42
	SW-846 9214 (Total)				12/01/2017 18:35
	SW-846 9251 (Total)				12/01/2017 1:03
17111702-012B	APW-3	11/29/2017 12:45	11/29/2017 15:53		
	EPA 903.0/904.0, Radium 226/228				12/27/2017 0:00
17111702-012C	APW-3	11/29/2017 12:45	11/29/2017 15:53		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/05/2017 21:07
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/01/2017 10:40	12/08/2017 15:06

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 7470A (Total)			11/30/2017 18:16	12/01/2017 9:08

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17111702
Report Date: 08-Jan-18

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R240788 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						12/01/2017
Total Dissolved Solids	20		**< 20**						12/01/2017
Total Dissolved Solids	20		**< 20**						12/01/2017
Total Dissolved Solids	20		**< 20**						12/01/2017

Batch R240788 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**922**	1000	0	92.2	90	110	12/01/2017

Batch R240788 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**992**	1000	0	99.2	90	110	12/01/2017
Total Dissolved Solids	20		**972**	1000	0	97.2	90	110	12/01/2017
Total Dissolved Solids	20		**988**	1000	0	98.8	90	110	12/01/2017

Batch R240788 **SampType:** MS Units **mg/L**
SampID: 17111702-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**930**	500.0	412.0	103.6	85	115	12/01/2017

Batch R240788 **SampType:** MSD Units **mg/L** RPD Limit **5**
SampID: 17111702-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**916**	500.0	412.0	100.8	930.0	1.52	12/01/2017

Batch R240847 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						12/04/2017
Total Dissolved Solids	20		**< 20**						12/04/2017

Batch R240847 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**980**	1000	0	98.0	90	110	12/04/2017

Batch R240847 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**988**	1000	0	98.8	90	110	12/04/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17111702
Report Date: 08-Jan-18

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R240847 **SampType:** MS Units **mg/L**
SampID: 17111702-004AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1250**	500.0	742.0	102.0	85	115	12/04/2017

Batch R240847 **SampType:** MSD Units **mg/L** RPD Limit **5**
SampID: 17111702-004AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1250**	500.0	742.0	101.6	1252	0.16	12/04/2017

SW-846 9036 (TOTAL)

Batch R240741 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						11/30/2017

Batch R240741 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	102.3	90	110	11/30/2017

Batch R240741 **SampType:** MS Units **mg/L**
SampID: 17111702-005AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**61**	20.00	41.78	94.1	85	115	11/30/2017

Batch R240741 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17111702-005AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**63**	20.00	41.78	104.5	60.60	3.37	12/01/2017

SW-846 9040B, LABORATORY ANALYZED

Batch R240745 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.96**	7.000	0	99.4	99.1	100.8	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**
SampID: 17111702-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.09**				7.110	0.28	12/01/2017

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

SW-846 9040B, LABORATORY ANALYZED

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.51**				7.520	0.13	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.26**				7.250	0.14	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.83**				6.830	0.00	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.12**				7.120	0.00	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.98**				6.970	0.14	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.32**				7.320	0.00	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.09**				7.090	0.00	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.19**				7.200	0.14	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.26**				7.260	0.00	12/01/2017

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

SW-846 9040B, LABORATORY ANALYZED

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.01**				7.050	0.57	12/01/2017

Batch R240745 **SampType:** DUP Units RPD Limit **10**

SampID: 17111702-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.50**				7.500	0.00	12/01/2017

SW-846 9214 (TOTAL)

Batch R240751 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						12/01/2017

Batch R240751 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.02**	1.000	0	101.8	90	110	12/01/2017

Batch R240751 **SampType:** MS Units **mg/L**

SampID: 17111702-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.38**	2.000	0.2840	104.6	85	115	12/01/2017

Batch R240751 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17111702-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.39**	2.000	0.2840	105.2	2.375	0.59	12/01/2017

Batch R240751 **SampType:** MS Units **mg/L**

SampID: 17111702-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.30**	2.000	0.2350	103.4	85	115	12/01/2017

Batch R240751 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17111702-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.35**	2.000	0.2350	105.8	2.304	2.06	12/01/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17111702
Report Date: 08-Jan-18

SW-846 9251 (TOTAL)

Batch R240805 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						11/30/2017

Batch R240805 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	101.5	90	110	11/30/2017

Batch R240805 **SampType:** MS Units **mg/L**
SampID: 17111702-005AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**37**	20.00	16.53	102.5	85	115	11/30/2017

Batch R240805 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17111702-005AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**36**	20.00	16.53	98.6	37.03	2.16	11/30/2017

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 136794 **SampType:** MBLK Units **mg/L**
SampID: MBLK-136794

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	12/05/2017
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	12/08/2017
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Lithium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	12/05/2017

Client: ERM **Work Order:** 17111702

Client Project: Grand Tower CCR GW **Report Date:** 08-Jan-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **136794** **SampType:** **LCS** Units **mg/L**

SampID: LCS-136794

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.474**	0.5000	0	94.9	80	120	12/05/2017
Arsenic	0.0010		**0.482**	0.5000	0	96.4	80	120	12/05/2017
Barium	0.0010		**2.13**	2.000	0	106.5	80	120	12/07/2017
Beryllium	0.0010		**0.0534**	0.05000	0	106.7	80	120	12/05/2017
Boron	0.0250		**0.512**	0.5000	0	102.3	80	120	12/05/2017
Cadmium	0.0010		**0.0471**	0.05000	0	94.2	80	120	12/05/2017
Calcium	0.125		**2.53**	2.500	0	101.1	80	120	12/07/2017
Chromium	0.0010		**0.196**	0.2000	0	98.1	80	120	12/05/2017
Cobalt	0.0010		**0.465**	0.5000	0	93.0	80	120	12/05/2017
Lead	0.0010		**0.479**	0.5000	0	95.7	80	120	12/05/2017
Lithium	0.0010		**0.540**	0.5000	0	107.9	80	120	12/05/2017
Molybdenum	0.0010		**0.466**	0.5000	0	93.3	80	120	12/05/2017
Nickel	0.0010		**0.468**	0.5000	0	93.7	80	120	12/05/2017
Selenium	0.0010		**0.479**	0.5000	0	95.8	80	120	12/05/2017
Thallium	0.0010		**0.224**	0.2500	0	89.5	80	120	12/05/2017

Batch **136794** **SampType:** **MS** Units **mg/L**

SampID: 17111702-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.492**	0.5000	0	98.3	75	125	12/05/2017
Arsenic	0.0010		**0.486**	0.5000	0.001090	97.0	75	125	12/05/2017
Barium	0.0010		**2.06**	2.000	0.1653	94.7	75	125	12/05/2017
Beryllium	0.0010		**0.0548**	0.05000	0	109.6	75	125	12/05/2017
Boron	0.0250		**0.818**	0.5000	0.2254	118.6	75	125	12/05/2017
Cadmium	0.0010		**0.0485**	0.05000	0	97.0	75	125	12/05/2017
Calcium	0.125	S	**92.9**	2.500	91.21	68.2	75	125	12/08/2017
Chromium	0.0010		**0.193**	0.2000	0	96.5	75	125	12/05/2017
Cobalt	0.0010		**0.454**	0.5000	0	90.9	75	125	12/05/2017
Lead	0.0010		**0.486**	0.5000	0	97.1	75	125	12/05/2017
Lithium	0.0010		**0.573**	0.5000	0.01796	111.0	75	125	12/05/2017
Molybdenum	0.0010		**0.486**	0.5000	0	97.2	75	125	12/05/2017
Nickel	0.0010		**0.459**	0.5000	0.003820	91.1	75	125	12/05/2017
Selenium	0.0010		**0.494**	0.5000	0.004139	98.0	75	125	12/05/2017
Thallium	0.0010		**0.234**	0.2500	0	93.8	75	125	12/05/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 136794 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17111702-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.477**	0.5000	0	95.3	0.4917	3.10	12/05/2017
Arsenic	0.0010		**0.484**	0.5000	0.001090	96.6	0.4860	0.34	12/05/2017
Barium	0.0010		**2.01**	2.000	0.1653	92.2	2.059	2.43	12/05/2017
Beryllium	0.0010		**0.0559**	0.05000	0	111.8	0.05482	1.93	12/05/2017
Boron	0.0250		**0.793**	0.5000	0.2254	113.5	0.8182	3.13	12/05/2017
Cadmium	0.0010		**0.0472**	0.05000	0	94.4	0.04850	2.71	12/05/2017
Calcium	0.125	S	**90.8**	2.500	91.21	-16.4	92.91	2.30	12/08/2017
Chromium	0.0010		**0.196**	0.2000	0	98.2	0.1929	1.79	12/05/2017
Cobalt	0.0010		**0.459**	0.5000	0	91.8	0.4544	1.05	12/05/2017
Lead	0.0010		**0.474**	0.5000	0	94.8	0.4855	2.35	12/05/2017
Lithium	0.0010		**0.570**	0.5000	0.01796	110.3	0.5732	0.63	12/05/2017
Molybdenum	0.0010		**0.474**	0.5000	0	94.8	0.4860	2.52	12/05/2017
Nickel	0.0010		**0.461**	0.5000	0.003820	91.5	0.4595	0.40	12/05/2017
Selenium	0.0010		**0.490**	0.5000	0.004139	97.2	0.4941	0.80	12/05/2017
Thallium	0.0010		**0.229**	0.2500	0	91.7	0.2344	2.24	12/05/2017

Batch 136794 **SampType:** MS Units **mg/L**

SampID: 17111702-012CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.481**	0.5000	0	96.2	75	125	12/05/2017
Arsenic	0.0010		**0.489**	0.5000	0.002265	97.4	75	125	12/05/2017
Barium	0.0010		**1.97**	2.000	0.1212	92.4	75	125	12/05/2017
Beryllium	0.0010		**0.0544**	0.05000	0	108.8	75	125	12/05/2017
Boron	0.0250	S	**4.80**	0.5000	4.444	70.5	75	125	12/05/2017
Cadmium	0.0010		**0.0475**	0.05000	0	95.1	75	125	12/05/2017
Calcium	0.125	S	**113**	2.500	115.6	-84.6	75	125	12/08/2017
Chromium	0.0010		**0.194**	0.2000	0	97.1	75	125	12/05/2017
Cobalt	0.0010		**0.457**	0.5000	0	91.5	75	125	12/05/2017
Lead	0.0010		**0.482**	0.5000	0	96.4	75	125	12/05/2017
Lithium	0.0010		**0.580**	0.5000	0.03076	109.9	75	125	12/05/2017
Molybdenum	0.0010		**0.543**	0.5000	0.06842	95.0	75	125	12/05/2017
Nickel	0.0010		**0.456**	0.5000	0.0009730	91.0	75	125	12/05/2017
Selenium	0.0010		**0.483**	0.5000	0	96.6	75	125	12/05/2017
Thallium	0.0010		**0.224**	0.2500	0	89.7	75	125	12/05/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17111702
Report Date: 08-Jan-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 136794 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17111702-012CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.492**	0.5000	0	98.4	0.4808	2.28	12/05/2017
Arsenic	0.0010		**0.488**	0.5000	0.002265	97.2	0.4890	0.16	12/05/2017
Barium	0.0010		**2.01**	2.000	0.1212	94.4	1.968	2.08	12/05/2017
Beryllium	0.0010		**0.0558**	0.05000	0	111.7	0.05440	2.63	12/05/2017
Boron	0.0250		**4.87**	0.5000	4.444	84.9	4.797	1.49	12/05/2017
Cadmium	0.0010		**0.0482**	0.05000	0	96.4	0.04753	1.40	12/05/2017
Calcium	0.125	S	**112**	2.500	115.6	-140.3	113.4	1.23	12/08/2017
Chromium	0.0010		**0.195**	0.2000	0	97.4	0.1941	0.33	12/05/2017
Cobalt	0.0010		**0.460**	0.5000	0	91.9	0.4574	0.48	12/05/2017
Lead	0.0010		**0.488**	0.5000	0	97.6	0.4820	1.26	12/05/2017
Lithium	0.0010		**0.575**	0.5000	0.03076	108.8	0.5804	0.93	12/05/2017
Molybdenum	0.0010		**0.553**	0.5000	0.06842	97.0	0.5434	1.79	12/05/2017
Nickel	0.0010		**0.462**	0.5000	0.0009730	92.2	0.4559	1.36	12/05/2017
Selenium	0.0010		**0.490**	0.5000	0	98.0	0.4832	1.37	12/05/2017
Thallium	0.0010		**0.232**	0.2500	0	92.7	0.2243	3.29	12/05/2017

SW-846 7470A (TOTAL)

Batch 136772 **SampType:** MBLK Units **mg/L**

SampID: MBLK-136772

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	12/01/2017

Batch 136772 **SampType:** LCS Units **mg/L**

SampID: LCS-136772

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00490**	0.00500	0	98.0	85	115	12/01/2017

Batch 136772 **SampType:** MS Units **mg/L**

SampID: 17111702-004CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00506**	0.00500	0	101.3	75	125	12/01/2017

Batch 136772 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 17111702-004CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00533**	0.00500	0	106.6	0.005064	5.12	12/01/2017

Batch 136772 **SampType:** MS Units **mg/L**

SampID: 17111702-011CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00507**	0.00500	0	101.4	75	125	12/01/2017

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

SW-846 7470A (TOTAL)

Batch **136772** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17111702-011CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00520**	0.005000	0	104.0	0.005069	2.57	12/01/2017

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17111702

Report Date: 08-Jan-18

Carrier: Employee

Received By: AMD

Completed by: Amber Dilallo
On: 30-Nov-17

Reviewed by: Elizabeth A. Hurley
On: 30-Nov-17

Pages to follow: Chain of custody 2 Extra pages included 24

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 1.62
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

Additional Nitric Acid was needed in APW-6D, APW-5, and APW-2 upon arrival at the laboratory. - adilallo - 11/30/2017 8:30:23 AM

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 1711708

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☑ ICE ☐ BLUE ICE ☐ NO ICE 1.02 °C
Preserved in: ☑ LAB ☐ FIELD
FOR LAB USE ONLY
Lab Notes 2 HNO3 to 1 radium cont. each. amo 11/30/17

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg
Subcontract to Summit, Ohio
NOTE: Sample containers leaking acid upon receipt
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1711708 001	APW-11R	11/27/17 1310	1	3												X	X	X	X	X	X	X	X
002	APW-9	1440																					
003	APW-8	1600																					
004	APW-7	11/28/17 0930																					
005	APW-10D	1115																					
006	APW-10S	1225																					
007	APW-4	1415																					
008	APW-6S	1530																					
009	APW-6D	1630																					
010	APW-5	11/29/17 0920																					

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11/29/17 1555	Amber Quella	11/29/17 1553

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40950

amo

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 1711702

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE _____ °C
Preserved in: ☒ LAB ☒ FIELD
FOR LAB USE ONLY
Lab Notes

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg
Subcontract to Summit, Ohio NOTE: Sample Containers leaked acid upon receipt.
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
1711702 011	APW-2	11/29/17 1045	1	3												X	X	X	X	X	X	X	X
012	APW-3	1245	1	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	11/29/17 1555	[signature]	11/29/17 1555

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40950

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

January 05, 2018

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 17111702

Dear Mike Austin:

Order No.: 17120131

Summit Environmental Technologies, Inc. received 12 sample(s) on 12/4/2017 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia 00440 and 1581, Washington C891

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Case Narrative

WO#: **17120131**
Date: **1/5/2018**

CLIENT: TEKLAB Inc,
Project: 17111702

WorkOrder Narrative:
17120131: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

WorkOrder Comments:
17120131: Cancel 10,and11 per Mike Austin. 12/5/17 CSL

Sample Fraction:
17120131-010A: Very Limited sample amount received - Cancel per client
17120131-011A: Very Limited sample amount received - Cancel per client

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
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Qualifiers and Acronyms

WO#: **17120131**
Date: **1/5/2018**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **17120131**

05-Jan-18

CLIENT: TEKLAB Inc,
Project: 17111702

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
17120131-001	17111702-001		11/27/2017 1:10:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-002	17111702-002		11/27/2017 2:10:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-003	17111702-003		11/27/2017 4:00:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-004	17111702-004		11/28/2017 9:30:00 AM	12/4/2017 3:30:00 PM	Groundwater
17120131-005	17111702-005		11/28/2017 11:15:00 AM	12/4/2017 3:30:00 PM	Groundwater
17120131-006	17111702-006		11/28/2017 12:25:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-007	17111702-007		11/28/2017 2:15:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-008	17111702-008		11/28/2017 3:30:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-009	17111702-009		11/28/2017 4:30:00 PM	12/4/2017 3:30:00 PM	Groundwater
17120131-010	17111702-010		11/29/2017 9:20:00 AM	12/4/2017 3:30:00 PM	Groundwater
17120131-011	17111702-011		11/29/2017 10:45:00 AM	12/4/2017 3:30:00 PM	Groundwater
17120131-012	17111702-012		11/29/2017 12:45:00 PM	12/4/2017 3:30:00 PM	Groundwater

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DATES REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,

Project: 17111702

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17120131-001A	17111702-001	11/27/2017 1:10:00 PM	Groundwater	Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:31:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-002A	17111702-002	11/27/2017 2:10:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:27:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:47:00 PM
17120131-003A	17111702-003	11/27/2017 4:00:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:27:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:47:00 PM
17120131-004A	17111702-004	11/28/2017 9:30:00 AM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:27:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:47:00 PM
17120131-005A	17111702-005	11/28/2017 11:15:00 AM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:29:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-006A	17111702-006	11/28/2017 12:25:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:29:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-007A	17111702-007	11/28/2017 2:15:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:29:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-008A	17111702-008	11/28/2017 3:30:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:29:00 PM

Original

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DATES REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,

Project: 17111702

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
17120131-008A	17111702-008	11/28/2017 3:30:00 PM	Groundwater	Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-009A	17111702-009	11/28/2017 4:30:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 12:29:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 2:48:00 PM
17120131-012A	17111702-012	11/29/2017 12:45:00 PM		Combined Radium (EPA903+904)			12/28/2017
				Radium-226 (EPA 903.0)		12/22/2017 7:24:06 AM	12/28/2017 1:04:00 PM
				Radium-228 (EPA 904.0)		12/22/2017 7:24:06 AM	12/27/2017 3:54:00 PM

Original

Summit Environmental Technologies, Inc.
3310 Win St.
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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/27/2017 1:10:00 PM
Project: 17111702
Lab ID: 17120131-001
Matrix: GROUNDWATER
Client Sample ID 17111702-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.47	2.00	U	pCi/L	± 0.7	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	-0.07	1.00	U	pCi/L	± 0.16	1	12/28/2017 12:31:00 F
Yield	1.00					1	12/28/2017 12:31:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.47	1.00	U	pCi/L	± 0.54	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/27/2017 2:10:00 PM
Project: 17111702
Lab ID: 17120131-002
Matrix: GROUNDWATER
Client Sample ID 17111702-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.07	2.00	U	pCi/L	± 0.58	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	-0.06	1.00	U	pCi/L	± 0.1	1	12/28/2017 12:27:00 F
Yield	1.00					1	12/28/2017 12:27:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.07	1.00		pCi/L	± 0.48	1	12/27/2017 2:47:00 PM
Yield	1					1	12/27/2017 2:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/27/2017 4:00:00 PM
Project: 17111702
Lab ID: 17120131-003
Matrix: GROUNDWATER
Client Sample ID 17111702-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.12	2.00	U	pCi/L	± 0.71	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.35	1.00	U	pCi/L	± 0.16	1	12/28/2017 12:27:00 F
Yield	1.00					1	12/28/2017 12:27:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.77	1.00	J	pCi/L	± 0.55	1	12/27/2017 2:47:00 PM
Yield	1					1	12/27/2017 2:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Cuyahoga Falls, Ohio 44223
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/28/2017 9:30:00 AM
Project: 17111702
Lab ID: 17120131-004
Matrix: GROUNDWATER
Client Sample ID 17111702-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.77	2.00	U	pCi/L	± 0.65	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.16	1.00	U	pCi/L	± 0.14	1	12/28/2017 12:27:00 F
Yield	1.00					1	12/28/2017 12:27:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.61	1.00	U	pCi/L	± 0.51	1	12/27/2017 2:47:00 PM
Yield	1					1	12/27/2017 2:47:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/28/2017 11:15:00 AM
Project: 17111702
Lab ID: 17120131-005
Matrix: GROUNDWATER
Client Sample ID 17111702-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.63	2.00	U	pCi/L	± 0.68	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.16	1.00	U	pCi/L	± 0.13	1	12/28/2017 12:29:00 F
Yield	1.00					1	12/28/2017 12:29:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.47	1.00	U	pCi/L	± 0.55	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/28/2017 12:25:00 PM
Project: 17111702
Lab ID: 17120131-006
Matrix: GROUNDWATER
Client Sample ID 17111702-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.84	2.00	U	pCi/L	± 0.73	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.18	1.00	U	pCi/L	± 0.16	1	12/28/2017 12:29:00 F
Yield	1.00					1	12/28/2017 12:29:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.66	1.00	U	pCi/L	± 0.57	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc, **Collection Date:** 11/28/2017 2:15:00 PM

Project: 17111702

Lab ID: 17120131-007 **Matrix:** GROUNDWATER

Client Sample ID 17111702-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.97	2.00	U	pCi/L	± 0.77	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.09	1.00	U	pCi/L	± 0.13	1	12/28/2017 12:29:00 F
Yield	1.00					1	12/28/2017 12:29:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.88	1.00	J	pCi/L	± 0.64	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/28/2017 3:30:00 PM
Project: 17111702
Lab ID: 17120131-008
Matrix: GROUNDWATER
Client Sample ID 17111702-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.1	2.00	U	pCi/L	± 0.73	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.18	1.00	U	pCi/L	± 0.13	1	12/28/2017 12:29:00 F
Yield	1.00					1	12/28/2017 12:29:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.92	1.00	J	pCi/L	± 0.6	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/28/2017 4:30:00 PM
Project: 17111702
Lab ID: 17120131-009
Matrix: GROUNDWATER
Client Sample ID 17111702-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.78	2.00	U	pCi/L	± 0.89	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.38	1.00	U	pCi/L	± 0.18	1	12/28/2017 12:29:00 F
Yield	1.00					1	12/28/2017 12:29:00 F
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.40	1.00		pCi/L	± 0.71	1	12/27/2017 2:48:00 PM
Yield	1					1	12/27/2017 2:48:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **17120131**

Date Reported: **1/5/2018**

CLIENT: TEKLAB Inc,
Collection Date: 11/29/2017 12:45:00 PM
Project: 17111702
Lab ID: 17120131-012
Matrix: GROUNDWATER
Client Sample ID 17111702-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.64	2.00	U	pCi/L	± 0.66	1	12/28/2017
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.33	1.00	U	pCi/L	± 0.17	1	12/28/2017 1:04:00 PM
Yield	1.00					1	12/28/2017 1:04:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.31	1.00	U	pCi/L	± 0.49	1	12/27/2017 3:54:00 PM
Yield	1					1	12/27/2017 3:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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QC SUMMARY REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,
Project: 17111702 **BatchID:** **30221**

Sample ID **mb-30221** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **78895**
Client ID: **PBW** Batch ID: **30221** TestNo: **E904.0** **E903-904** Analysis Date: **12/27/2017** SeqNo: **1363375**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Sample ID **LCS-30221** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **78895**
Client ID: **LCSW** Batch ID: **30221** TestNo: **E904.0** **E903-904** Analysis Date: **12/27/2017** SeqNo: **1363377**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.64	1.00	5.000	0	92.8	70	130				
Yield	1.00			0	0						

Sample ID **17120853-002adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **78895**
Client ID: **BatchQC** Batch ID: **30221** TestNo: **E904.0** **E903-904** Analysis Date: **12/27/2017** SeqNo: **1363397**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	0.786	1.00		0	0			0.8908	12.6	20	J
Yield	1.00			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

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3310 Win St.
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QC SUMMARY REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,
Project: 17111702 **BatchID:** **30221**

Sample ID **17120853-003adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **78895**
Client ID: **BatchQC** Batch ID: **30221** TestNo: **E904.0** **E903-904** Analysis Date: **12/27/2017** SeqNo: **1363399**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	0.765	1.00		0	0			0	200	20	JR
Yield	1.00			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

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QC SUMMARY REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,
Project: 17111702 **BatchID:** **30221**

Sample ID **mb-30221** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **PBW** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366829**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **lcs-30221** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **LCSW** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366830**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.53	1.00	5.000	0	111	70	130				

Sample ID **lcsd-30221** SampType: **LCSD** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **LCSS02** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366831**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.65	1.00	5.000	0	93.0	70	130	5.530	17.3	20	

Sample ID **17120853-002adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **BatchQC** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366851**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **17120131**

05-Jan-18

Client: TEKLAB Inc,
Project: 17111702 **BatchID:** **30221**

Sample ID **17120853-002adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **BatchQC** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366851**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Sample ID **17120853-003adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **12/22/2017** RunNo: **79000**
Client ID: **BatchQC** Batch ID: **30221** TestNo: **E903.0** **E903-904** Analysis Date: **12/28/2017** SeqNo: **1366853**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ Ice With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: **Please issue reports and invoices via email only**
Please analyze for Radium (~~2626~~ 228, and combined) by Method EPA 903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC

Project# 17111702

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25501 Phone: 618-344-1004 ext 16

17120131-001

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time			Radium 226/228	Radium 226	Radium 228									
	17111702-001	11/27/17 13:10	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-002	11/27/17 14:40	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-003	11/27/17 16:00	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-004	11/28/17 9:30	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-005	11/28/17 11:15	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-006	11/28/17 12:25	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-007	11/28/17 14:15	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-008	11/28/17 15:30	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-009	11/28/17 16:30	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-010	11/29/17 9:20	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
	17111702-011	11/29/17 10:45	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	11/30/17	[illegible]	12-4-17 3:30pm

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Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5.c)

SubCocRevA
3/2/2016

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ Ice ☐ Blue Ice ☐ Preserved in: Lab ☐ Field ☐

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: TE 11/30/17 **Please issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC

Project# 17111702

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25501 Phone: 618-344-1004 ext 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time				Radium 226/228	Radium 226	Radium 228								
	17111702-012	11/29/17 12:45	HNO3	Groundwater	☐	✓	✓	✓	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
			Unpres	Aqueous	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]	11/30/17	[illegible]	12-4-17 3:10pm

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SubCocRevA
3/2/2016

Page 2 of 4

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

Figure 1 – Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 1

Initials of person inspecting cooler and samples: CSL

Client: Teklab Order Number: 17120131

Date Received: 12-4 Time Received: 330pm Date cooler(s) opened and samples inspected: 12-4

Number of Coolers/Boxes: 3 N/A

Shipper: Fed Ex UPS DHL Airborne US Postal Walk-in Pickup Other:

Packaging Peanuts Bubble Wrap Paper Foam None Other:

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
C-O-C in plastic	Y	N	N/A
Ice ____ Blue ice ____	present	absent	melted N/A
Cooler Temperature IR Gun #16020459 CF 0.0 °C Temp: 14.2 °C			N/A
Radiological Testing Instrument serial #35127	Y	N	N/A (see page 2 for scan results)

Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.

C-O-C filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s): 010, and 011 1xL bottle each lid off sample all spilled out. 1xL left had v:lum spilled out but had some very limited

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with C-O-C	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Sufficient sample for QC	Y	N	N/A
Samples received within holding time	Y	N	N/A
Do any 40 mL vials contain bubbles**	Y	N	N/A

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: ____

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact: Mike Austin

Date/Time: 12-5-17 1000

Logged in by: Chris

Comments: Per Mike cancel -010, and 011 due to limited Volume he will try to resample

SOP: Sample Receipt
Revision: 13
Effective Date: 07/17/17

Figure 2 – Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip SET (0-14)#: WC-03-1174	**pH Strip (2.8-4.6) SET#:** OES-01-0250
Total DPD packet SET#: OES-02-0239	**Free DPD packet SET#:** OES-01-0290
Disp. Pipette SET#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1	/	2		16	
2		2		19	
3		2		15	
4		2		15	
5		2		26	
6		2		24	
7		2		21	
8		2		24	
9		2		24	
10		2		22	
11		2		21	
12		2		17	

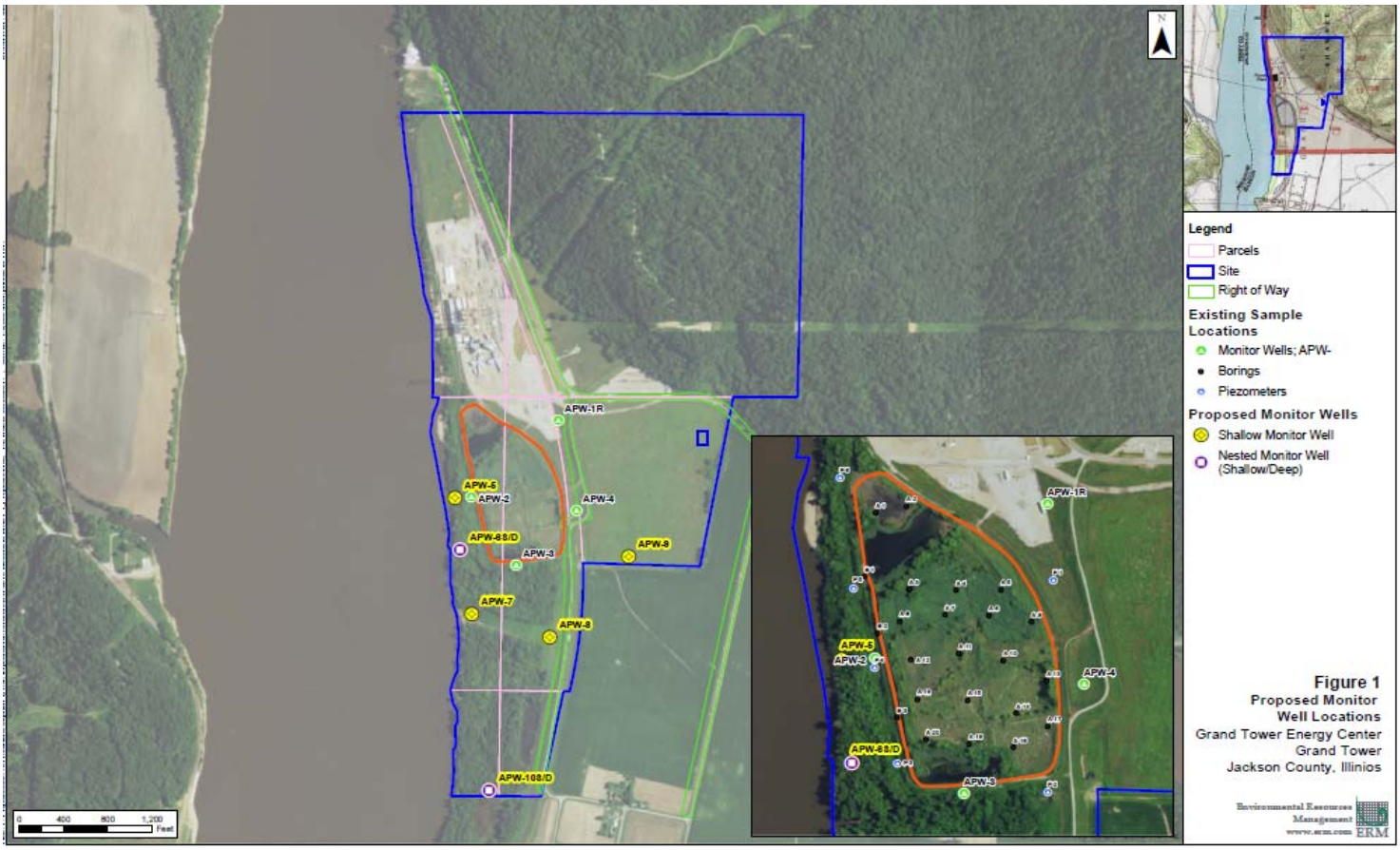
P = Permanganate Interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for Total chlorine
552.2 checked for Free chlorine
531.2 pH is checked for ~3.8 (SET# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst

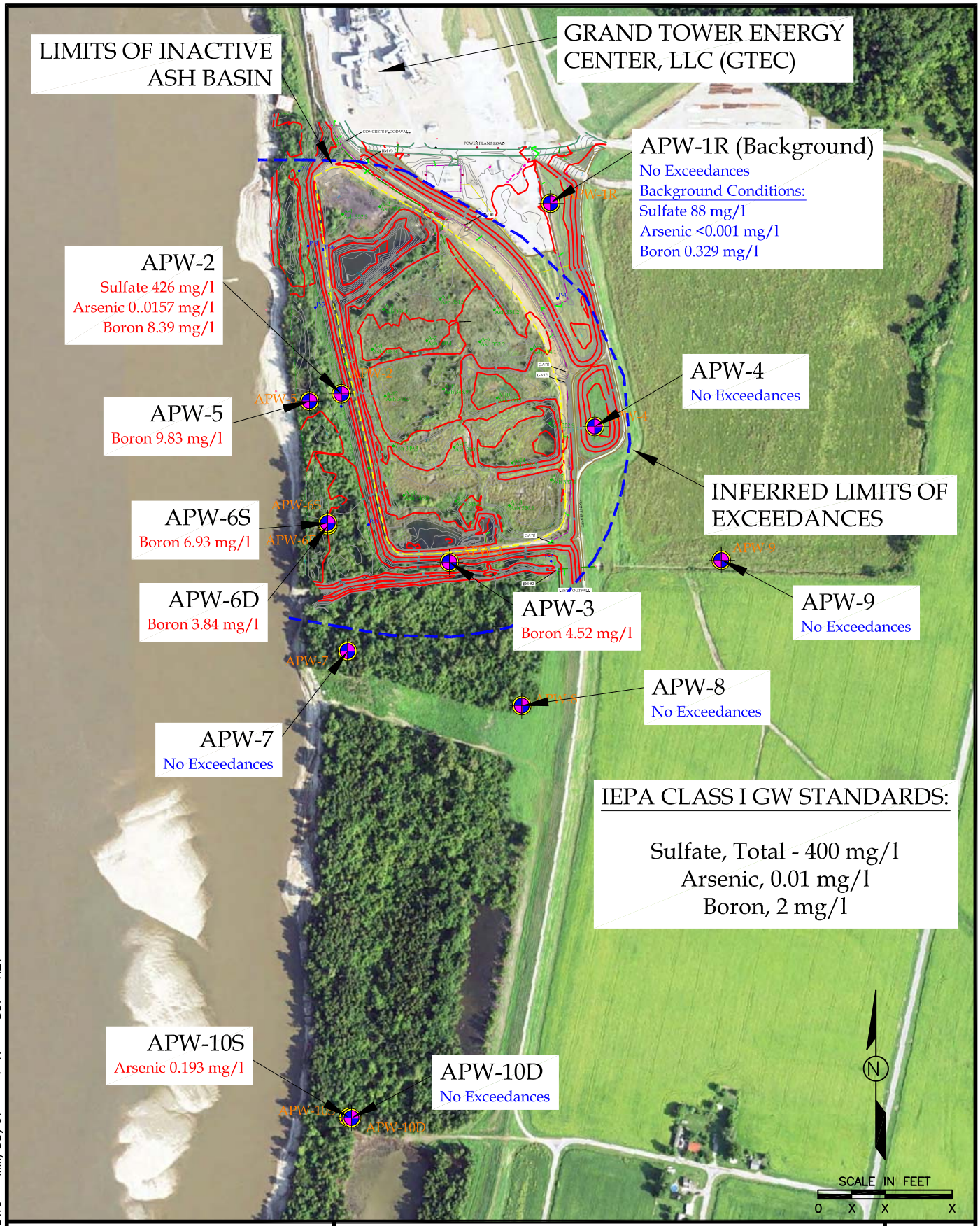
Event 6

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 6 **Date Samples Collected:** **From** 12/27/17 **To** 12/29/17

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	9	12	20	11	16	27	16	15	11	13	6	16
Sulfate, Total	mg/L	400	88	**426**	168	100	394	201	236	63	38	42	<10	44
Fluoride, Total	mg/L	4	0.15	0.25	0.29	0.17	0.33	0.25	0.22	0.19	0.28	0.2	0.17	0.1
Lab pH		6.5 - 9.0	6.96	7.14	7.48	7.33	7.31	7.13	7.22	6.96	7.11	7.42	6.98	7.15
Total Dissolved Solids	mg/L	1200	474	848	504	514	792	588	516	736	410	278	770	448
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	<0.001	**0.0157**	0.0024	0.0014	0.0019	0.0012	0.0095	<0.001	0.001	0.002	**0.193**	<0.001
Barium	mg/L	2	0.178	0.338	0.1	0.141	0.214	0.213	0.163	0.374	0.223	0.129	0.598	0.295
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.329	**8.39**	**4.52**	1.7	**9.83**	**6.93**	**3.84**	0.342	0.145	0.369	0.573	0.0922
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Calcium	No Standard		91	135	95	107	125	98.1	107	193	98.6	81.5	145	123
Chromium	mg/L	0.1	0.0018	0.0566	0.005	0.0027	0.0084	0.0048	0.0017	0.0329	0.0021	0.0011	0.0016	<0.001
Cobalt	mg/L	1	<0.001	0.0018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0013
Lead	mg/L	0.0075	<0.001	**0.0031**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.0179	0.0474	0.027	0.0416	0.0433	0.0458	0.0181	0.0191	0.0216	0.0173	0.0308	0.0155
Molybdenum	No Standard		<0.001	0.111	0.0748	0.0714	0.246	0.314	0.0584	0.0044	<0.001	0.0246	<0.001	<0.001
Nickel	mg/L	0.1	0.0046	0.0295	0.0026	0.0026	0.0043	0.0031	0.0022	0.015	0.0027	<0.001	<0.001	0.0025
Selenium	mg/L	0.05	0.004	<0.001	<0.001	0.013	<0.001	<0.001	<0.001	<0.001	0.0141	0.0143	<0.001	0.0014
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	0.23	0.33	0.2	0.17	0.35	0.11	0.3	0.25	0.14	0.14	0.23	0.23
Radium-228	pCi/l	20	0.04	0.95	0.37	0.73	0.49	0.44	0.78	0.14	1.31	1.06	0.56	0.34
Radium-226/228 Comb.	pCi/l	-----	0.27	1.28	0.57	0.9	0.84	0.55	1.08	0.39	1.45	1.2	0.79	0.57





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 6 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
6

February 02, 2018

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 17121641

Dear Brett Carney:

TEKLAB, INC received 12 samples on 12/29/2017 9:00:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

This reporting package includes the following:

Cover Letter	1
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Chain of Custody	Appended

Definitions

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

Cooler Receipt Temp: 7.42 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2018	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2018	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2018	Collinsville
Missouri	MDNR	00930		5/31/2017	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2018	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-001
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 12/27/2017 9:41

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20	R	**516**	mg/L	1	01/02/2018 13:54	R241969
RPD for DUP was outside control limits due to sample composition.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**236**	mg/L	5	01/02/2018 18:41	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.22**		1	12/29/2017 17:50	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	01/04/2018 15:38	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	01/02/2018 18:33	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Arsenic	NELAP	0.0010		**0.0095**	mg/L	5	01/02/2018 16:27	137718
Barium	NELAP	0.0010		**0.163**	mg/L	5	01/02/2018 16:27	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Boron	NELAP	0.0250		**3.84**	mg/L	5	01/02/2018 16:27	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Calcium	NELAP	0.125		**107**	mg/L	5	01/02/2018 16:27	137718
Chromium	NELAP	0.0010		**0.0017**	mg/L	5	01/02/2018 16:27	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Lithium	*	0.0010		**0.0181**	mg/L	5	01/02/2018 16:27	137718
Molybdenum	NELAP	0.0010		**0.0584**	mg/L	5	01/02/2018 16:27	137718
Nickel	NELAP	0.0010		**0.0022**	mg/L	5	01/02/2018 16:27	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:27	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:35	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-002
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 12/27/2017 11:01

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**588**	mg/L	1	01/02/2018 13:54	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**201**	mg/L	5	01/02/2018 19:10	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.13**		1	12/29/2017 17:53	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.25**	mg/L	1	01/04/2018 15:40	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**27**	mg/L	1	01/02/2018 18:44	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Arsenic	NELAP	0.0010		**0.0012**	mg/L	5	01/02/2018 16:35	137718
Barium	NELAP	0.0010		**0.213**	mg/L	5	01/02/2018 16:35	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Boron	NELAP	0.0250	S	**6.93**	mg/L	5	01/02/2018 16:35	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Calcium	NELAP	0.125		**98.1**	mg/L	5	01/02/2018 16:35	137718
Chromium	NELAP	0.0010		**0.0048**	mg/L	5	01/02/2018 16:35	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Lithium	*	0.0010		**0.0458**	mg/L	5	01/02/2018 16:35	137718
Molybdenum	NELAP	0.0010		**0.314**	mg/L	5	01/02/2018 16:35	137718
Nickel	NELAP	0.0010		**0.0031**	mg/L	5	01/02/2018 16:35	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:35	137718
Matrix spike control limits for B are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:42	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-003
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 12/27/2017 12:08

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**792**	mg/L	1	01/02/2018 13:55	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**394**	mg/L	10	01/02/2018 19:37	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.31**		1	12/29/2017 17:57	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.33**	mg/L	1	01/04/2018 15:41	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	01/02/2018 19:30	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Arsenic	NELAP	0.0010		**0.0019**	mg/L	5	01/02/2018 16:44	137718
Barium	NELAP	0.0010		**0.214**	mg/L	5	01/02/2018 16:44	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Boron	NELAP	0.0250		**9.83**	mg/L	5	01/02/2018 16:44	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Calcium	NELAP	0.125		**125**	mg/L	5	01/02/2018 16:44	137718
Chromium	NELAP	0.0010		**0.0084**	mg/L	5	01/02/2018 16:44	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Lithium	*	0.0010		**0.0433**	mg/L	5	01/02/2018 16:44	137718
Molybdenum	NELAP	0.0010		**0.246**	mg/L	5	01/02/2018 16:44	137718
Nickel	NELAP	0.0010		**0.0043**	mg/L	5	01/02/2018 16:44	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:44	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:45	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-004
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 12/27/2017 13:47

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**848**	mg/L	1	01/02/2018 13:55	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**426**	mg/L	10	01/02/2018 19:45	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.14**		1	12/29/2017 17:59	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.25**	mg/L	1	01/04/2018 15:44	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	01/02/2018 19:38	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:52	137718
Arsenic	NELAP	0.0010		**0.0157**	mg/L	5	01/02/2018 16:52	137718
Barium	NELAP	0.0010		**0.338**	mg/L	5	01/02/2018 16:52	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:52	137718
Boron	NELAP	0.0250		**8.39**	mg/L	5	01/02/2018 16:52	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:52	137718
Calcium	NELAP	0.125		**135**	mg/L	5	01/02/2018 16:52	137718
Chromium	NELAP	0.0010		**0.0566**	mg/L	5	01/02/2018 16:52	137718
Cobalt	NELAP	0.0010		**0.0018**	mg/L	5	01/02/2018 16:52	137718
Lead	NELAP	0.0010		**0.0031**	mg/L	5	01/02/2018 16:52	137718
Lithium	*	0.0010		**0.0474**	mg/L	5	01/02/2018 16:52	137718
Molybdenum	NELAP	0.0010		**0.111**	mg/L	5	01/02/2018 16:52	137718
Nickel	NELAP	0.0010		**0.0295**	mg/L	5	01/02/2018 16:52	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:52	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 16:52	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:47	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-005
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 12/27/2017 15:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**736**	mg/L	1	01/02/2018 13:55	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**63**	mg/L	2	01/02/2018 20:12	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.96**		1	12/29/2017 18:02	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	01/04/2018 15:46	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	01/02/2018 20:05	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Barium	NELAP	0.0010		**0.374**	mg/L	5	01/02/2018 17:00	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Boron	NELAP	0.0250		**0.342**	mg/L	5	01/02/2018 17:00	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Calcium	NELAP	0.125		**193**	mg/L	5	01/02/2018 17:00	137718
Chromium	NELAP	0.0010		**0.0329**	mg/L	5	01/02/2018 17:00	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Lithium	*	0.0010		**0.0191**	mg/L	5	01/02/2018 17:00	137718
Molybdenum	NELAP	0.0010		**0.0044**	mg/L	5	01/02/2018 17:00	137718
Nickel	NELAP	0.0010		**0.0150**	mg/L	5	01/02/2018 17:00	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:00	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:54	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-006
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 12/27/2017 16:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**410**	mg/L	1	01/02/2018 13:56	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**38**	mg/L	1	01/02/2018 20:15	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.11**		1	12/29/2017 18:06	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.28**	mg/L	1	01/04/2018 15:49	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	01/02/2018 20:13	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Arsenic	NELAP	0.0010		**0.0010**	mg/L	5	01/02/2018 17:08	137718
Barium	NELAP	0.0010		**0.223**	mg/L	5	01/02/2018 17:08	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Boron	NELAP	0.0250		**0.145**	mg/L	5	01/03/2018 10:20	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Calcium	NELAP	0.125		**98.6**	mg/L	5	01/02/2018 17:08	137718
Chromium	NELAP	0.0010		**0.0021**	mg/L	5	01/02/2018 17:08	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Lithium	*	0.0010		**0.0216**	mg/L	5	01/02/2018 17:08	137718
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
Nickel	NELAP	0.0010		**0.0027**	mg/L	5	01/02/2018 17:08	137718
Selenium	NELAP	0.0010		**0.0141**	mg/L	5	01/02/2018 17:08	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:08	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:56	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-007
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 12/28/2017 9:03

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**278**	mg/L	1	01/02/2018 13:56	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**42**	mg/L	1	01/02/2018 20:23	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.42**		1	12/29/2017 18:08	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	01/04/2018 15:51	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	01/02/2018 20:21	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Arsenic	NELAP	0.0010		**0.0020**	mg/L	5	01/02/2018 17:16	137718
Barium	NELAP	0.0010		**0.129**	mg/L	5	01/02/2018 17:16	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Boron	NELAP	0.0250		**0.369**	mg/L	5	01/02/2018 17:16	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Calcium	NELAP	0.125	S	**81.5**	mg/L	5	01/02/2018 17:16	137718
Chromium	NELAP	0.0010		**0.0011**	mg/L	5	01/02/2018 17:16	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Lithium	*	0.0010		**0.0173**	mg/L	5	01/02/2018 17:16	137718
Molybdenum	NELAP	0.0010		**0.0246**	mg/L	5	01/02/2018 17:16	137718
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Selenium	NELAP	0.0010		**0.0143**	mg/L	5	01/02/2018 17:16	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:16	137718
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 8:58	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-008
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 12/28/2017 10:07

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**474**	mg/L	1	01/02/2018 13:57	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**88**	mg/L	2	01/02/2018 20:37	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.96**		1	12/29/2017 18:17	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.15**	mg/L	1	01/04/2018 15:53	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**9**	mg/L	1	01/02/2018 20:29	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Barium	NELAP	0.0010		**0.178**	mg/L	5	01/02/2018 17:25	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Boron	NELAP	0.0250		**0.329**	mg/L	5	01/02/2018 17:25	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Calcium	NELAP	0.125		**91.0**	mg/L	5	01/02/2018 17:25	137718
Chromium	NELAP	0.0010		**0.0018**	mg/L	5	01/02/2018 17:25	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Lithium	*	0.0010		**0.0179**	mg/L	5	01/02/2018 17:25	137718
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
Nickel	NELAP	0.0010		**0.0046**	mg/L	5	01/02/2018 17:25	137718
Selenium	NELAP	0.0010		**0.0040**	mg/L	5	01/02/2018 17:25	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:25	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 9:00	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-009
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 12/28/2017 11:11

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**514**	mg/L	1	01/02/2018 13:57	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**100**	mg/L	5	01/02/2018 20:58	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.33**		1	12/29/2017 18:20	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	01/04/2018 16:00	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	01/02/2018 20:37	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
Arsenic	NELAP	0.0010		**0.0014**	mg/L	5	01/02/2018 17:33	137718
Barium	NELAP	0.0010		**0.141**	mg/L	5	01/02/2018 17:33	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
Boron	NELAP	0.0250		**1.70**	mg/L	5	01/02/2018 17:33	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
Calcium	NELAP	0.125		**107**	mg/L	5	01/02/2018 17:33	137718
Chromium	NELAP	0.0010		**0.0027**	mg/L	5	01/02/2018 17:33	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
Lithium	*	0.0010		**0.0416**	mg/L	5	01/02/2018 17:33	137718
Molybdenum	NELAP	0.0010		**0.0714**	mg/L	5	01/02/2018 17:33	137718
Nickel	NELAP	0.0010		**0.0026**	mg/L	5	01/02/2018 17:33	137718
Selenium	NELAP	0.0010		**0.0130**	mg/L	5	01/02/2018 17:33	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 17:33	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 9:03	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

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Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-010
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 12/28/2017 12:31

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**448**	mg/L	1	01/02/2018 13:58	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**44**	mg/L	2	01/02/2018 21:14	R241910
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.15**		1	12/29/2017 18:24	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.10**	mg/L	1	01/04/2018 16:01	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	01/02/2018 21:02	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Barium	NELAP	0.0010		**0.295**	mg/L	5	01/02/2018 18:14	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Boron	NELAP	0.0250		**0.0922**	mg/L	5	01/02/2018 18:14	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Calcium	NELAP	0.125		**123**	mg/L	5	01/02/2018 18:14	137718
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Cobalt	NELAP	0.0010		**0.0013**	mg/L	5	01/02/2018 18:14	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Lithium	*	0.0010		**0.0155**	mg/L	5	01/02/2018 18:14	137718
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
Nickel	NELAP	0.0010		**0.0025**	mg/L	5	01/02/2018 18:14	137718
Selenium	NELAP	0.0010		**0.0014**	mg/L	5	01/02/2018 18:14	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:14	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 9:05	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-011
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 12/28/2017 13:26

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**770**	mg/L	1	01/02/2018 13:58	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	01/04/2018 12:56	R241971
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.98**		1	12/29/2017 18:25	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	01/04/2018 16:06	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	01/02/2018 21:47	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Arsenic	NELAP	0.0010		**0.193**	mg/L	5	01/02/2018 18:22	137718
Barium	NELAP	0.0010		**0.598**	mg/L	5	01/02/2018 18:22	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Boron	NELAP	0.0250		**0.573**	mg/L	5	01/02/2018 18:22	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Calcium	NELAP	0.125		**145**	mg/L	5	01/02/2018 18:22	137718
Chromium	NELAP	0.0010		**0.0016**	mg/L	5	01/02/2018 18:22	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Lithium	*	0.0010		**0.0308**	mg/L	5	01/02/2018 18:22	137718
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:22	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 9:07	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 17121641
Client Project: Grand Tower CCR GW
Report Date: 02-Feb-18
Lab ID: 17121641-012
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 12/28/2017 16:23

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**504**	mg/L	1	01/02/2018 13:59	R241969
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**168**	mg/L	10	01/04/2018 12:59	R241971
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.48**		1	12/29/2017 18:27	R241798
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	01/04/2018 16:09	R241980
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**20**	mg/L	1	01/02/2018 21:50	R241917
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Arsenic	NELAP	0.0010		**0.0024**	mg/L	5	01/02/2018 18:30	137718
Barium	NELAP	0.0010		**0.100**	mg/L	5	01/02/2018 18:30	137718
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Boron	NELAP	0.0250		**4.52**	mg/L	5	01/02/2018 18:30	137718
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Calcium	NELAP	0.125		**95.0**	mg/L	5	01/02/2018 18:30	137718
Chromium	NELAP	0.0010		**0.0050**	mg/L	5	01/02/2018 18:30	137718
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Lithium	*	0.0010		**0.0270**	mg/L	5	01/02/2018 18:30	137718
Molybdenum	NELAP	0.0010		**0.0748**	mg/L	5	01/02/2018 18:30	137718
Nickel	NELAP	0.0010		**0.0026**	mg/L	5	01/02/2018 18:30	137718
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/02/2018 18:30	137718
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/03/2018 9:09	137744
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043
Radium-228	*	0		**See attached**	pci/L	1	01/19/2018 0:00	R243043

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
17121641-001	APW-6D	Groundwater	3	12/27/2017 9:41
17121641-002	APW-6S	Groundwater	3	12/27/2017 11:01
17121641-003	APW-5	Groundwater	3	12/27/2017 12:08
17121641-004	APW-2	Groundwater	3	12/27/2017 13:47
17121641-005	APW-7	Groundwater	3	12/27/2017 15:10
17121641-006	APW-8	Groundwater	3	12/27/2017 16:05
17121641-007	APW-9	Groundwater	3	12/28/2017 9:03
17121641-008	APW-1R	Groundwater	3	12/28/2017 10:07
17121641-009	APW-4	Groundwater	3	12/28/2017 11:11
17121641-010	APW-10D	Groundwater	3	12/28/2017 12:31
17121641-011	APW-10S	Groundwater	3	12/28/2017 13:26
17121641-012	APW-3	Groundwater	3	12/28/2017 16:23

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
17121641-001A	APW-6D	12/27/2017 9:41	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:54
	SW-846 9036 (Total)				01/02/2018 18:41
	SW-846 9040B, Laboratory Analyzed				12/29/2017 17:50
	SW-846 9214 (Total)				01/04/2018 15:38
	SW-846 9251 (Total)				01/02/2018 18:33
17121641-001B	APW-6D	12/27/2017 9:41	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-001C	APW-6D	12/27/2017 9:41	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 16:27
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:35
17121641-002A	APW-6S	12/27/2017 11:01	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:54
	SW-846 9036 (Total)				01/02/2018 19:10
	SW-846 9040B, Laboratory Analyzed				12/29/2017 17:53
	SW-846 9214 (Total)				01/04/2018 15:40
	SW-846 9251 (Total)				01/02/2018 18:44
17121641-002B	APW-6S	12/27/2017 11:01	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-002C	APW-6S	12/27/2017 11:01	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 16:35
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:42
17121641-003A	APW-5	12/27/2017 12:08	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:55
	SW-846 9036 (Total)				01/02/2018 19:37
	SW-846 9040B, Laboratory Analyzed				12/29/2017 17:57
	SW-846 9214 (Total)				01/04/2018 15:41
	SW-846 9251 (Total)				01/02/2018 19:30
17121641-003B	APW-5	12/27/2017 12:08	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-003C	APW-5	12/27/2017 12:08	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 16:44
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:45
17121641-004A	APW-2	12/27/2017 13:47	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:55
	SW-846 9036 (Total)				01/02/2018 19:45

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 9040B, Laboratory Analyzed				12/29/2017 17:59
	SW-846 9214 (Total)				01/04/2018 15:44
	SW-846 9251 (Total)				01/02/2018 19:38
17121641-004B	APW-2	12/27/2017 13:47	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-004C	APW-2	12/27/2017 13:47	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 16:52
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:47
17121641-005A	APW-7	12/27/2017 15:10	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:55
	SW-846 9036 (Total)				01/02/2018 20:12
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:02
	SW-846 9214 (Total)				01/04/2018 15:46
	SW-846 9251 (Total)				01/02/2018 20:05
17121641-005B	APW-7	12/27/2017 15:10	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-005C	APW-7	12/27/2017 15:10	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 17:00
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:54
17121641-006A	APW-8	12/27/2017 16:05	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:56
	SW-846 9036 (Total)				01/02/2018 20:15
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:06
	SW-846 9214 (Total)				01/04/2018 15:49
	SW-846 9251 (Total)				01/02/2018 20:13
17121641-006B	APW-8	12/27/2017 16:05	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-006C	APW-8	12/27/2017 16:05	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 17:08
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/03/2018 10:20
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:56
17121641-007A	APW-9	12/28/2017 9:03	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:56
	SW-846 9036 (Total)				01/02/2018 20:23
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:08
	SW-846 9214 (Total)				01/04/2018 15:51

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
	SW-846 9251 (Total)				01/02/2018 20:21
17121641-007B	APW-9	12/28/2017 9:03	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-007C	APW-9	12/28/2017 9:03	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 17:16
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 8:58
17121641-008A	APW-1R	12/28/2017 10:07	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:57
	SW-846 9036 (Total)				01/02/2018 20:37
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:17
	SW-846 9214 (Total)				01/04/2018 15:53
	SW-846 9251 (Total)				01/02/2018 20:29
17121641-008B	APW-1R	12/28/2017 10:07	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-008C	APW-1R	12/28/2017 10:07	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 17:25
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 9:00
17121641-009A	APW-4	12/28/2017 11:11	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:57
	SW-846 9036 (Total)				01/02/2018 20:58
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:20
	SW-846 9214 (Total)				01/04/2018 16:00
	SW-846 9251 (Total)				01/02/2018 20:37
17121641-009B	APW-4	12/28/2017 11:11	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-009C	APW-4	12/28/2017 11:11	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 17:33
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 9:03
17121641-010A	APW-10D	12/28/2017 12:31	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:58
	SW-846 9036 (Total)				01/02/2018 21:14
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:24
	SW-846 9214 (Total)				01/04/2018 16:01
	SW-846 9251 (Total)				01/02/2018 21:02
17121641-010B	APW-10D	12/28/2017 12:31	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
17121641-010C	APW-10D	12/28/2017 12:31	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 18:14
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 9:05
17121641-011A	APW-10S	12/28/2017 13:26	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:58
	SW-846 9036 (Total)				01/04/2018 12:56
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:25
	SW-846 9214 (Total)				01/04/2018 16:06
	SW-846 9251 (Total)				01/02/2018 21:47
17121641-011B	APW-10S	12/28/2017 13:26	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-011C	APW-10S	12/28/2017 13:26	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 18:22
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 9:07
17121641-012A	APW-3	12/28/2017 16:23	12/29/2017 9:00		
	Standard Methods 2540 C (Total) 1997				01/02/2018 13:59
	SW-846 9036 (Total)				01/04/2018 12:59
	SW-846 9040B, Laboratory Analyzed				12/29/2017 18:27
	SW-846 9214 (Total)				01/04/2018 16:09
	SW-846 9251 (Total)				01/02/2018 21:50
17121641-012B	APW-3	12/28/2017 16:23	12/29/2017 9:00		
	EPA 903.0/904.0, Radium 226/228				01/19/2018 0:00
17121641-012C	APW-3	12/28/2017 16:23	12/29/2017 9:00		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			12/29/2017 11:56	01/02/2018 18:30
	SW-846 7470A (Total)			01/02/2018 9:34	01/03/2018 9:09

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R241969 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						01/03/2018
Total Dissolved Solids	20		**< 20**						01/02/2018

Batch R241969 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**966**	1000	0	96.6	90	110	01/03/2018

Batch R241969 **SampType:** LCSQC Units **mg/L**

SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**916**	1000	0	91.6	90	110	01/02/2018

Batch R241969 **SampType:** MS Units **mg/L**

SampID: 17121641-011AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1260**	500.0	770.0	98.8	85	115	01/02/2018

Batch R241969 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 17121641-011AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1270**	500.0	770.0	100.8	1264	0.79	01/02/2018

Batch R241969 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 17121641-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	R	**598**				516.0	14.72	01/02/2018

SW-846 9036 (TOTAL)

Batch R241910 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/02/2018
Sulfate	10		**< 10**						01/02/2018

Batch R241910 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	97.7	90	110	01/02/2018
Sulfate	10		**20**	20.00	0	100.2	90	110	01/02/2018

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

SW-846 9036 (TOTAL)

Batch R241910 **SampType:** MS Units **mg/L**
SampID: 17121641-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**248**	50.00	200.5	94.4	85	115	01/02/2018

Batch R241910 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17121641-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**249**	50.00	200.5	96.9	247.7	0.52	01/02/2018

Batch R241910 **SampType:** MS Units **mg/L**
SampID: 17121641-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**64**	20.00	44.17	97.0	85	115	01/02/2018

Batch R241910 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 17121641-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**63**	20.00	44.17	94.1	63.57	0.92	01/02/2018

Batch R241971 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/04/2018

Batch R241971 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	94.8	90	110	01/04/2018

SW-846 9040B, LABORATORY ANALYZED

Batch R241798 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**7.00**	7.000	0	100.0	99.1	100.8	12/28/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**
SampID: 17121641-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.24**				7.220	0.28	12/29/2017

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

SW-846 9040B, LABORATORY ANALYZED

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.16**				7.130	0.42	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.32**				7.310	0.14	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.17**				7.140	0.42	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.00**				6.960	0.57	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.10**				7.110	0.14	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.42**				7.420	0.00	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.90**				6.960	0.87	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.40**				7.330	0.95	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.17**				7.150	0.28	12/29/2017

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

SW-846 9040B, LABORATORY ANALYZED

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.97**				6.980	0.14	12/29/2017

Batch R241798 **SampType:** DUP Units RPD Limit **10**

SampID: 17121641-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.50**				7.480	0.27	12/29/2017

SW-846 9214 (TOTAL)

Batch R241980 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						01/04/2018

Batch R241980 **SampType:** LCS Units **mg/L**

SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.01**	1.000	0	101.3	90	110	01/04/2018

Batch R241980 **SampType:** MS Units **mg/L**

SampID: 17121641-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.39**	2.000	0.3270	103.2	85	115	01/04/2018

Batch R241980 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17121641-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.39**	2.000	0.3270	103.2	2.390	0.08	01/04/2018

Batch R241980 **SampType:** MS Units **mg/L**

SampID: 17121641-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.18**	2.000	0.1010	103.7	85	115	01/04/2018

Batch R241980 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 17121641-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.20**	2.000	0.1010	104.7	2.175	0.92	01/04/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 17121641
Report Date: 02-Feb-18

SW-846 9251 (TOTAL)

Batch R241917 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						01/02/2018
Chloride	5		**< 5**						01/02/2018

Batch R241917 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**21**	20.00	0	103.2	90	110	01/02/2018
Chloride	5		**20**	20.00	0	100.9	90	110	01/02/2018

Batch R241917 **SampType:** MS Units **mg/L**
SampID: 17121641-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**45**	20.00	26.91	91.7	85	115	01/02/2018

Batch R241917 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17121641-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**45**	20.00	26.91	92.7	45.25	0.44	01/02/2018

Batch R241917 **SampType:** MS Units **mg/L**
SampID: 17121641-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**35**	20.00	16.05	93.1	85	115	01/02/2018

Batch R241917 **SampType:** MSD Units **mg/L** RPD Limit **15**
SampID: 17121641-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**35**	20.00	16.05	94.8	34.67	1.00	01/02/2018

Batch R241974 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						01/04/2018

Batch R241974 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	99.5	90	110	01/04/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **137718** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-137718

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Barium	0.0010		**< 0.0010**	0.00100	0	57.6	-100	100	01/02/2018
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	01/02/2018
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	01/02/2018
Chromium	0.0010		**< 0.0010**	0.00100	0	42.9	-100	100	01/03/2018
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Lithium	0.0010		**< 0.0010**	0.00100	0	94.0	-100	100	01/02/2018
Molybdenum	0.0010		**< 0.0010**	0.00100	0	32.6	-100	100	01/02/2018
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/02/2018
Thallium	0.0010		**< 0.0010**	0.00100	0	58.1	-100	100	01/02/2018

Batch **137718** **SampType:** **LCS** Units **mg/L**

SampID: LCS-137718

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.512**	0.5000	0	102.3	80	120	01/02/2018
Arsenic	0.0010		**0.494**	0.5000	0	98.9	80	120	01/02/2018
Barium	0.0010		**1.95**	2.000	0	97.4	80	120	01/02/2018
Beryllium	0.0010		**0.0540**	0.05000	0	108.1	80	120	01/02/2018
Boron	0.0250		**0.550**	0.5000	0	110.1	80	120	01/02/2018
Cadmium	0.0010		**0.0507**	0.05000	0	101.5	80	120	01/02/2018
Calcium	0.125		**2.50**	2.500	0	100.2	80	120	01/02/2018
Chromium	0.0010		**0.191**	0.2000	0	95.5	80	120	01/02/2018
Cobalt	0.0010		**0.482**	0.5000	0	96.4	80	120	01/02/2018
Lead	0.0010		**0.510**	0.5000	0	102.0	80	120	01/02/2018
Lithium	0.0010		**0.561**	0.5000	0	112.3	80	120	01/02/2018
Molybdenum	0.0010		**0.501**	0.5000	0	100.2	80	120	01/02/2018
Nickel	0.0010		**0.480**	0.5000	0	96.1	80	120	01/02/2018
Selenium	0.0010		**0.513**	0.5000	0	102.6	80	120	01/02/2018
Thallium	0.0010		**0.240**	0.2500	0	95.8	80	120	01/02/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 137718 **SampType:** MS Units **mg/L**

SampID: 17121641-002CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.521**	0.5000	0	104.2	75	125	01/02/2018
Arsenic	0.0010		**0.492**	0.5000	0.001154	98.2	75	125	01/02/2018
Barium	0.0010		**2.17**	2.000	0.2126	98.0	75	125	01/02/2018
Beryllium	0.0010		**0.0548**	0.05000	0	109.5	75	125	01/02/2018
Boron	0.0250		**7.52**	0.5000	6.929	119.2	75	125	01/02/2018
Cadmium	0.0010		**0.0514**	0.05000	0	102.9	75	125	01/02/2018
Calcium	0.125		**101**	2.500	98.13	97.9	75	125	01/02/2018
Chromium	0.0010		**0.194**	0.2000	0.004809	94.7	75	125	01/02/2018
Cobalt	0.0010		**0.463**	0.5000	0	92.6	75	125	01/02/2018
Lead	0.0010		**0.516**	0.5000	0	103.3	75	125	01/02/2018
Lithium	0.0010		**0.595**	0.5000	0.04583	109.9	75	125	01/02/2018
Molybdenum	0.0010		**0.822**	0.5000	0.3139	101.7	75	125	01/02/2018
Nickel	0.0010		**0.462**	0.5000	0.003090	91.8	75	125	01/02/2018
Selenium	0.0010		**0.505**	0.5000	0	100.9	75	125	01/02/2018
Thallium	0.0010		**0.244**	0.2500	0	97.6	75	125	01/02/2018

Batch 137718 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 17121641-002CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.520**	0.5000	0	104.0	0.5211	0.19	01/02/2018
Arsenic	0.0010		**0.497**	0.5000	0.001154	99.2	0.4923	0.95	01/02/2018
Barium	0.0010		**2.15**	2.000	0.2126	96.6	2.173	1.27	01/02/2018
Beryllium	0.0010		**0.0525**	0.05000	0	105.0	0.05476	4.25	01/02/2018
Boron	0.0250	S	**7.59**	0.5000	6.929	133.0	7.524	0.92	01/02/2018
Cadmium	0.0010		**0.0512**	0.05000	0	102.5	0.05144	0.42	01/02/2018
Calcium	0.125		**100**	2.500	98.13	90.9	100.6	0.17	01/02/2018
Chromium	0.0010		**0.195**	0.2000	0.004809	95.1	0.1943	0.37	01/02/2018
Cobalt	0.0010		**0.468**	0.5000	0	93.7	0.4628	1.19	01/02/2018
Lead	0.0010		**0.508**	0.5000	0	101.5	0.5164	1.73	01/02/2018
Lithium	0.0010		**0.593**	0.5000	0.04583	109.5	0.5954	0.31	01/02/2018
Molybdenum	0.0010		**0.832**	0.5000	0.3139	103.6	0.8223	1.14	01/02/2018
Nickel	0.0010		**0.468**	0.5000	0.003090	93.0	0.4621	1.31	01/02/2018
Selenium	0.0010		**0.507**	0.5000	0	101.3	0.5047	0.39	01/02/2018
Thallium	0.0010		**0.240**	0.2500	0	95.8	0.2440	1.80	01/02/2018

Client: ERM **Work Order:** 17121641

Client Project: Grand Tower CCR GW **Report Date:** 02-Feb-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **137718** **SampType:** **MS** Units **mg/L**

SampID: 17121641-007CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.510**	0.5000	0	101.9	75	125	01/02/2018
Arsenic	0.0010		**0.496**	0.5000	0.001968	98.8	75	125	01/02/2018
Barium	0.0010		**2.05**	2.000	0.1295	96.1	75	125	01/02/2018
Beryllium	0.0010		**0.0553**	0.05000	0	110.5	75	125	01/02/2018
Boron	0.0250		**0.983**	0.5000	0.3691	122.7	75	125	01/02/2018
Cadmium	0.0010		**0.0504**	0.05000	0	100.8	75	125	01/02/2018
Calcium	0.125	S	**85.7**	2.500	81.46	171.4	75	125	01/02/2018
Chromium	0.0010		**0.194**	0.2000	0.001078	96.6	75	125	01/02/2018
Cobalt	0.0010		**0.475**	0.5000	0	94.9	75	125	01/02/2018
Lead	0.0010		**0.517**	0.5000	0	103.4	75	125	01/02/2018
Lithium	0.0010		**0.585**	0.5000	0.01726	113.5	75	125	01/02/2018
Molybdenum	0.0010		**0.528**	0.5000	0.02457	100.8	75	125	01/02/2018
Nickel	0.0010		**0.474**	0.5000	0.0006446	94.6	75	125	01/02/2018
Selenium	0.0010		**0.521**	0.5000	0.01435	101.2	75	125	01/02/2018
Thallium	0.0010		**0.245**	0.2500	0	98.0	75	125	01/02/2018

Batch **137718** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 17121641-007CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.523**	0.5000	0	104.6	0.5095	2.63	01/02/2018
Arsenic	0.0010		**0.496**	0.5000	0.001968	98.8	0.4957	0.08	01/02/2018
Barium	0.0010		**2.10**	2.000	0.1295	98.3	2.052	2.08	01/02/2018
Beryllium	0.0010		**0.0551**	0.05000	0	110.2	0.05526	0.24	01/02/2018
Boron	0.0250		**0.962**	0.5000	0.3691	118.7	0.9827	2.08	01/02/2018
Cadmium	0.0010		**0.0519**	0.05000	0	103.7	0.05042	2.83	01/02/2018
Calcium	0.125		**84.1**	2.500	81.46	104.2	85.74	1.98	01/02/2018
Chromium	0.0010		**0.194**	0.2000	0.001078	96.4	0.1943	0.19	01/02/2018
Cobalt	0.0010		**0.472**	0.5000	0	94.4	0.4746	0.50	01/02/2018
Lead	0.0010		**0.515**	0.5000	0	102.9	0.5170	0.44	01/02/2018
Lithium	0.0010		**0.573**	0.5000	0.01726	111.0	0.5847	2.11	01/02/2018
Molybdenum	0.0010		**0.532**	0.5000	0.02457	101.5	0.5284	0.64	01/02/2018
Nickel	0.0010		**0.470**	0.5000	0.0006446	93.9	0.4737	0.73	01/02/2018
Selenium	0.0010		**0.523**	0.5000	0.01435	101.8	0.5205	0.51	01/02/2018
Thallium	0.0010		**0.244**	0.2500	0	97.6	0.2451	0.48	01/02/2018

SW-846 7470A (TOTAL)

Batch **137744** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-137744

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	01/03/2018

Quality Control Results

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Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

SW-846 7470A (TOTAL)

Batch **137744** **SampType:** **LCS** Units **mg/L**

SampID: LCS-137744

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00492**	0.00500	0	98.3	85	115	01/03/2018

Batch **137744** **SampType:** **MS** Units **mg/L**

SampID: 17121641-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00494**	0.00500	0	98.9	75	125	01/03/2018

Batch **137744** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17121641-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00428**	0.00500	0	85.7	0.004944	14.31	01/03/2018

Batch **137744** **SampType:** **MS** Units **mg/L**

SampID: 17121641-012CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00496**	0.00500	0	99.3	75	125	01/03/2018

Batch **137744** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 17121641-012CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00509**	0.00500	0	101.9	0.004964	2.58	01/03/2018

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 17121641

Report Date: 02-Feb-18

Carrier: Brett Carney

Received By: JHR

Completed by: Elizabeth A. Hurley
On: 29-Dec-17

Reviewed by: Michael L. Austin
On: 29-Dec-17

Pages to follow: Chain of custody 2 Extra pages included 26

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C **7.42**
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☐	No ☑		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☐	No ☑	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☑	No ☐	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

One APW-2 container is labeled as APW-5. The sample was identified by collection time. EAH 12/29/17

The samples were out of temperature compliance upon receipt. Per Brett Carney, proceed with analyses. - EHurley - 12/29/2017 9:46:46 AM

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 17121641

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 2 CityPlace Drive
City / State / Zip St. Louis, MO 63141
Contact: ~~Matt Halley~~ Brett Carney **Phone:** (314) 972-4266
E-Mail: brett.carney@erm.com **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 7.42°C
Preserved in: [ ] LAB [X] FIELD
FOR LAB USE ONLY
Lab Notes
Per Brett Carney, proceed out of temp. SAH 12/29/17

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [X] No
Are these samples known to be hazardous? [ ] Yes [X] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [X] Yes [ ] No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
Brett Carney

Results Requested
[X] Standard [ ] 1-2 Day (100% Surcharge)
[ ] Other _____ [ ] 3 Day (50% Surcharge)

Billing Instructions
Send to Brett Carney

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals								
17121641-001	APW-6D	12-27-17 / 941	1	3													X	X	X	X	X	X	X								
002	APW-6S	12-27-17 / 1101																													
003	APW-5	12-27-17 / 1208																													
004	APW-2	12-27-17 / 1347																													
005	APW-7	12-27-17 / 1510																													
006	APW-8	12-27-17 / 1605																													
007	APW-9	12-28-17 / 903																													
008	APW-1R	12-28-17 / 1007																													
009	APW-4	12-28-17 / 1111																													
010	APW-10D	12-28-17 / 1231																													

One APW-2 labeled as APW-5. Identified by collection time. SAH 12/29/17

Relinquished By	Date/Time	Received By	Date/Time
Brett Carney	12-~~28~~ 29-17 (BrtC) / 0900	[signature]	12/29/17 9:00

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40608

SAH 12/29/17

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 17121641

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 2 CityPlace Drive
City / State / Zip St. Louis, MO 63141
Contact: Matt Halley **Phone:** (314) 972-4266
E-Mail: **Fax:**

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE _____ °C
Preserved in: ☐ LAB ☐ FIELD

FOR LAB USE ONLY

Lab Notes
APW-10S collection time per containers. 12/29/17

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio

Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	INDICATE ANALYSIS REQUESTED: Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
17121641-011	APW-10S	12-28-17 / 1326	1	3							X						X	X	X	X	X	X	X
012	APW-3	12-28-17 / 1623	1	3							X						X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	12/29/17 / 0900	[signature]	12/29/17 9:00

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 40608

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

February 01, 2018

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 17121641

Dear Mike Austin:

Order No.: 18010079

Summit Environmental Technologies, Inc. received 12 sample(s) on 1/3/2018 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia VELAP 9456, Washington C891

Summit Environmental Technologies, Inc.
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Case Narrative

WO#: **18010079**
Date: **2/1/2018**

CLIENT: TEKLAB Inc,
Project: 17121641

WorkOrder Narrative:
18010079: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
TEL: (330) 253-8211 FAX: (330) 253-448
Website: http://www.settek.co

Qualifiers and Acronyms

WO#: **18010079**
Date: **2/1/2018**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

Summit Environmental Technologies, Inc.
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Workorder Sample Summary

WO#: **18010079**
01-Feb-18

CLIENT: TEKLAB Inc,
Project: 17121641

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
18010079-001	17121641-001		12/27/2017 9:41:00 AM	1/3/2018 3:15:00 PM	Groundwater
18010079-002	17121641-002		12/27/2017 11:01:00 AM	1/3/2018 3:15:00 PM	Groundwater
18010079-003	17121641-003		12/27/2017 12:08:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-004	17121641-004		12/27/2017 1:47:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-005	17121641-005		12/27/2017 3:10:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-006	17121641-006		12/27/2017 4:05:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-007	17121641-007		12/28/2017 9:03:00 AM	1/3/2018 3:15:00 PM	Groundwater
18010079-008	17121641-008		12/28/2017 10:07:00 AM	1/3/2018 3:15:00 PM	Groundwater
18010079-009	17121641-009		12/28/2017 11:11:00 AM	1/3/2018 3:15:00 PM	Groundwater
18010079-010	17121641-010		12/28/2017 12:31:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-011	17121641-011		12/28/2017 1:26:00 PM	1/3/2018 3:15:00 PM	Groundwater
18010079-012	17121641-012		12/28/2017 4:23:00 PM	1/3/2018 3:15:00 PM	Groundwater

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

DATES REPORT

WO#: **18010079**

01-Feb-18

Client: TEKLAB Inc,

Project: 17121641

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18010079-001A	17121641-001	12/27/2017 9:41:00 AM	Groundwater	Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 12:00:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-002A	17121641-002	12/27/2017 11:01:00 AM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 12:00:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-003A	17121641-003	12/27/2017 12:08:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 12:00:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-004A	17121641-004	12/27/2017 1:47:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 12:00:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-005A	17121641-005	12/27/2017 3:10:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 11:47:00 AM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-006A	17121641-006	12/27/2017 4:05:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 11:47:00 AM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-007A	17121641-007	12/28/2017 9:03:00 AM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 11:47:00 AM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:24:00 PM
18010079-008A	17121641-008	12/28/2017 10:07:00 AM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 11:47:00 AM

Original

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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

DATES REPORT

WO#: **18010079**

01-Feb-18

Client: TEKLAB Inc,

Project: 17121641

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18010079-008A	17121641-008	12/28/2017 10:07:00 AM	Groundwater	Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:25:00 PM
18010079-009A	17121641-009	12/28/2017 11:11:00 AM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 1:49:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:56:00 PM
18010079-010A	17121641-010	12/28/2017 12:31:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 1:49:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:56:00 PM
18010079-011A	17121641-011	12/28/2017 1:26:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 1:49:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:56:00 PM
18010079-012A	17121641-012	12/28/2017 4:23:00 PM		Combined Radium (EPA903+904)			1/24/2018
				Radium-226 (EPA 903.0)		1/17/2018 10:31:14 AM	1/22/2018 1:49:00 PM
				Radium-228 (EPA 904.0)		1/17/2018 10:31:14 AM	1/19/2018 3:56:00 PM

Original

Summit Environmental Technologies, Inc.
3310 Win St.
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TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 9:41:00 AM
Project: 17121641
Lab ID: 18010079-001
Matrix: GROUNDWATER
Client Sample ID 17121641-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.08	2.00	U	pCi/L	± 0.6	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.3	1.00	U	pCi/L	± 0.12	1	1/22/2018 12:00:00 PM
Yield	1					1	1/22/2018 12:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.78	1.00	J	pCi/L	± 0.48	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 11:01:00 AM
Project: 17121641
Lab ID: 18010079-002
Matrix: GROUNDWATER
Client Sample ID 17121641-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.55	2.00	U	pCi/L	± 0.53	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.11	1.00	U	pCi/L	± 0.09	1	1/22/2018 12:00:00 PM
Yield	1					1	1/22/2018 12:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.44	1.00	U	pCi/L	± 0.44	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 12:08:00 PM
Project: 17121641
Lab ID: 18010079-003
Matrix: GROUNDWATER
Client Sample ID 17121641-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.84	2.00	U	pCi/L	± 0.54	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.35	1.00	U	pCi/L	± 0.12	1	1/22/2018 12:00:00 PM
Yield	1					1	1/22/2018 12:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.49	1.00	U	pCi/L	± 0.42	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 1:47:00 PM
Project: 17121641
Lab ID: 18010079-004
Matrix: GROUNDWATER
Client Sample ID 17121641-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.28	2.00	U	pCi/L	± 0.64	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.33	1.00	U	pCi/L	± 0.12	1	1/22/2018 12:00:00 PM
Yield	1					1	1/22/2018 12:00:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.95	1.00	J	pCi/L	± 0.52	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 3:10:00 PM
Project: 17121641
Lab ID: 18010079-005
Matrix: GROUNDWATER
Client Sample ID 17121641-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.39	2.00	U	pCi/L	± 0.45	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.25	1.00	U	pCi/L	± 0.1	1	1/22/2018 11:47:00 AM
Yield	1					1	1/22/2018 11:47:00 AM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.14	1.00	U	pCi/L	± 0.35	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/27/2017 4:05:00 PM
Project: 17121641
Lab ID: 18010079-006
Matrix: GROUNDWATER
Client Sample ID 17121641-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.45	2.00	U	pCi/L	± 0.66	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.14	1.00	U	pCi/L	± 0.08	1	1/22/2018 11:47:00 AM
Yield	1					1	1/22/2018 11:47:00 AM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.31	1.00		pCi/L	± 0.58	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/28/2017 9:03:00 AM
Project: 17121641
Lab ID: 18010079-007
Matrix: GROUNDWATER
Client Sample ID 17121641-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.2	2.00	U	pCi/L	± 0.59	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.14	1.00	U	pCi/L	± 0.08	1	1/22/2018 11:47:00 AM
Yield	1					1	1/22/2018 11:47:00 AM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.06	1.00		pCi/L	± 0.51	1	1/19/2018 3:24:00 PM
Yield	1					1	1/19/2018 3:24:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

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WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/28/2017 10:07:00 AM
Project: 17121641
Lab ID: 18010079-008
Matrix: GROUNDWATER
Client Sample ID 17121641-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.27	2.00	U	pCi/L	± 0.44	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.23	1.00	U	pCi/L	± 0.1	1	1/22/2018 11:47:00 AM
Yield	1					1	1/22/2018 11:47:00 AM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.04	1.00	U	pCi/L	± 0.34	1	1/19/2018 3:25:00 PM
Yield	1.00					1	1/19/2018 3:25:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/28/2017 11:11:00 AM
Project: 17121641
Lab ID: 18010079-009
Matrix: GROUNDWATER
Client Sample ID 17121641-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.9	2.00	U	pCi/L	± 0.45	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.17	1.00	U	pCi/L	± 0.09	1	1/22/2018 1:49:00 PM
Yield	1					1	1/22/2018 1:49:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.73	1.00	J	pCi/L	± 0.36	1	1/19/2018 3:56:00 PM
Yield	1					1	1/19/2018 3:56:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/28/2017 12:31:00 PM
Project: 17121641
Lab ID: 18010079-010
Matrix: GROUNDWATER
Client Sample ID 17121641-010

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.57	2.00	U	pCi/L	± 0.47	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.23	1.00	U	pCi/L	± 0.1	1	1/22/2018 1:49:00 PM
Yield	1					1	1/22/2018 1:49:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.34	1.00	U	pCi/L	± 0.37	1	1/19/2018 3:56:00 PM
Yield	1					1	1/19/2018 3:56:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc,
Collection Date: 12/28/2017 1:26:00 PM
Project: 17121641
Lab ID: 18010079-011
Matrix: GROUNDWATER
Client Sample ID 17121641-011

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.79	2.00	U	pCi/L	± 0.54	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.23	1.00	U	pCi/L	± 0.11	1	1/22/2018 1:49:00 PM
Yield	1					1	1/22/2018 1:49:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.56	1.00	U	pCi/L	± 0.43	1	1/19/2018 3:56:00 PM
Yield	1					1	1/19/2018 3:56:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18010079**

Date Reported: **2/1/2018**

CLIENT: TEKLAB Inc, **Collection Date:** 12/28/2017 4:23:00 PM

Project: 17121641

Lab ID: 18010079-012 **Matrix:** GROUNDWATER

Client Sample ID 17121641-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.57	2.00		pCi/L	± 0.54	1	1/24/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.2	1.00	U	pCi/L	± 0.1	1	1/22/2018 1:49:00 PM
Yield	1					1	1/22/2018 1:49:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.37	1.00	U	pCi/L	± 0.44	1	1/19/2018 3:56:00 PM
Yield	1					1	1/19/2018 3:56:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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QC SUMMARY REPORT

WO#: **18010079**
01-Feb-18

Client: TEKLAB Inc,
Project: 17121641 **BatchID:** **30463**

Sample ID **mb-30463** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **PBW** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388572**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Sample ID **lcs-30463** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **LCSW** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388573**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.66	1.00	5.000	0	73.2	70	130				
Yield	1.00			0	0						

Sample ID **lcsd-30463** SampType: **LCSD** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **LCSS02** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388574**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.79	1.00	5.000	0	75.8	70	130	3.658	3.52	20	
Yield	1.00			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18010079**
01-Feb-18

Client: TEKLAB Inc,
Project: 17121641 **BatchID:** **30463**

Sample ID **18010279-001aMS** SampType: **MS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388577**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	3.88	1.00	5.000	0	77.6	70	130				
Yield	1.00			1.000	0						

Sample ID **18010259-002ADUP** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388594**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0.6915	200	20	RU
Yield	1.00			0	0			1.000	0		

Sample ID **18010259-001ADUP** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79749**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E904.0** **E903-904** Analysis Date: **1/19/2018** SeqNo: **1388596**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	1.14	1.00		0	0			1.107	3.20	20	
Yield	1.00			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
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Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18010079**
01-Feb-18

Client: TEKLAB Inc,
Project: 17121641 **BatchID:** **30463**

Sample ID **mb-30463** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **PBW** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388368**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **lcs-30463** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **LCSW** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388369**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.98	1.00	5.000	0	120	70	130				

Sample ID **lcsd-30463** SampType: **LCSD** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **LCSS02** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388370**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.26	1.00	5.000	0	105	70	130	5.980	12.8	20	

Sample ID **18010279-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388373**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

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Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18010079**
01-Feb-18

Client: TEKLAB Inc,
Project: 17121641 **BatchID:** **30463**

Sample ID **18010279-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388373**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.11	1.00	5.000	0	102	70	130				

Sample ID **18010259-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388390**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Sample ID **18010259-002adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **1/17/2018** RunNo: **79785**
Client ID: **BatchQC** Batch ID: **30463** TestNo: **E903.0** **E903-904** Analysis Date: **1/22/2018** SeqNo: **1388392**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: ~~A. Kimutis~~ Client TE 12/29/17 EAH QC Level: 3

Comments: **Please issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 17121641

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25619 Phone: (618) 344-1004 ext. 16

18010079-001
012 CR

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium									
	17121641-001	12/27/17 09:41	HNO3	Groundwater	✓	✓	✓									
	17121641-002	12/27/17 11:01	HNO3	Groundwater	✓	✓	✓									
	17121641-003	12/27/17 12:08	HNO3	Groundwater	✓	✓	✓									
	17121641-004	12/27/17 13:47	HNO3	Groundwater	✓	✓	✓									
	17121641-005	12/27/17 15:10	HNO3	Groundwater	✓	✓	✓									
	17121641-006	12/27/17 16:05	HNO3	Groundwater	✓	✓	✓									
	17121641-007	12/28/17 09:03	HNO3	Groundwater	✓	✓	✓									
	17121641-008	12/28/17 10:07	HNO3	Groundwater	✓	✓	✓									
	17121641-009	12/28/17 11:11	HNO3	Groundwater	✓	✓	✓									
	17121641-010	12/28/17 12:31	HNO3	Groundwater	✓	✓	✓									
	17121641-011	12/28/17 13:26	HNO3	Groundwater	✓	✓	✓									

*Relinquished By	Date/Time	Received By	Date/Time
E. Hurley (FedEx)		[signature]	1-3-18 3:15pm

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: ~~A. Kimutis~~ Client TE 12/29/17 QC Level: 3

Comments: **Please issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time. Please include negative values where applicable (no ND).
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 17121641

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25619 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium									
	12171641-012	12/28/17 16:23	HNO3	Groundwater	✓	✓	✓									
			HNO3	Groundwater												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												
			Unpres	Aqueous												

*Relinquished By	Date/Time	Received By	Date/Time
E. Hurley (FedEx)			1-3-18 3:15pm

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

SOP: Sample Receipt
Revision: 14
Effective Date: 10/09/17

Figure 1 – Summit Environmental Technologies, Inc.
Cooler Receipt Form, Page 1

Initials of person inspecting cooler and samples: CSL

Client: Tekks

Order Number: _____

Date Received: 1-3 Time Received: 315pm Date cooler(s) opened and samples inspected: 1-3

Number of Coolers/Boxes: _____ N/A

Shipper: ✓ Fed Ex ☐ UPS ☐ DHL ☐ Airborne ☐ US Postal ☐ Walk-in ☐ Pickup ☐ Other: _____

Packaging: ☐ Peanuts ☐ Bubble Wrap ☐ Paper ☐ Foam ☐ None ✓ Other: _____

Tape on cooler/box:	Y	N	N/A
Custody Seals intact	Y	N	N/A
Chain of Custody (COC) in plastic	Y	N	N/A

Ice_____ Blue ice _____ present absent melted N/A

Cooler Temperature: IR Gun #16020459 Corr. Fact. 0.0 °C Temp: 9.0 °C N/A

Radiological Testing Instrument serial #35127 Y N N/A (see page 2 for scan results)
Use 1 sheet per sample. If sample is > 100 cpm, the Radiological Safety Officer must be notified immediately.

Chain of Custody (COC) filled out properly	Y	N	N/A
Samples in separate bags	Y	N	N/A
Sample containers intact*	Y	N	N/A

*If no, list broken sample(s): _____

Sample label(s) complete (ID, date, etc.)	Y	N	N/A
Label(s) agree with Chain of Custody (COC)	Y	N	N/A
Correct containers used	Y	N	N/A
Sufficient sample received	Y	N	N/A
Sufficient sample for QC	Y	N	N/A
Samples received within holding time	Y	N	N/A
Do any 40 mL vials contain bubbles**	Y	N	N/A

**Samples with bubbles ≤6mm are acceptable. Indicate bubble size if >6mm: _____

Was client contacted about samples	Y	N
Will client send new samples	Y	N

Client contact: _____

Date/Time: _____

Logged in by: _____

Comments: _____

SOP: Sample Receipt
Revision: 14
Effective Date: 10/09/17

Figure 2 – Summit Environmental Technologies, Inc. Cooler Receipt Form, Page 2

Sample pH Check, Chlorine Check and/or Radiological Scan

pH Strip (0-14) ID#: WC-03-1174	**pH Strip (2.8-4.6) ID#:** OES-01-0250
Total DPD packet ID#: OES-02-0239	**Free DPD packet ID#:** OES-01-0290
Disp. Pipette ID#:	

Sample ID	Test Method	pH	Chlorine (+ or -)	CPM	Comments
1	✓	2		16	
2		2		19	
3		2		19	
4		2		21	
5		2		14	
6		2		12	
7		2		15	
8		2		14	
9		2		14	
10		2		13	
11		2		11	
12		2		19	

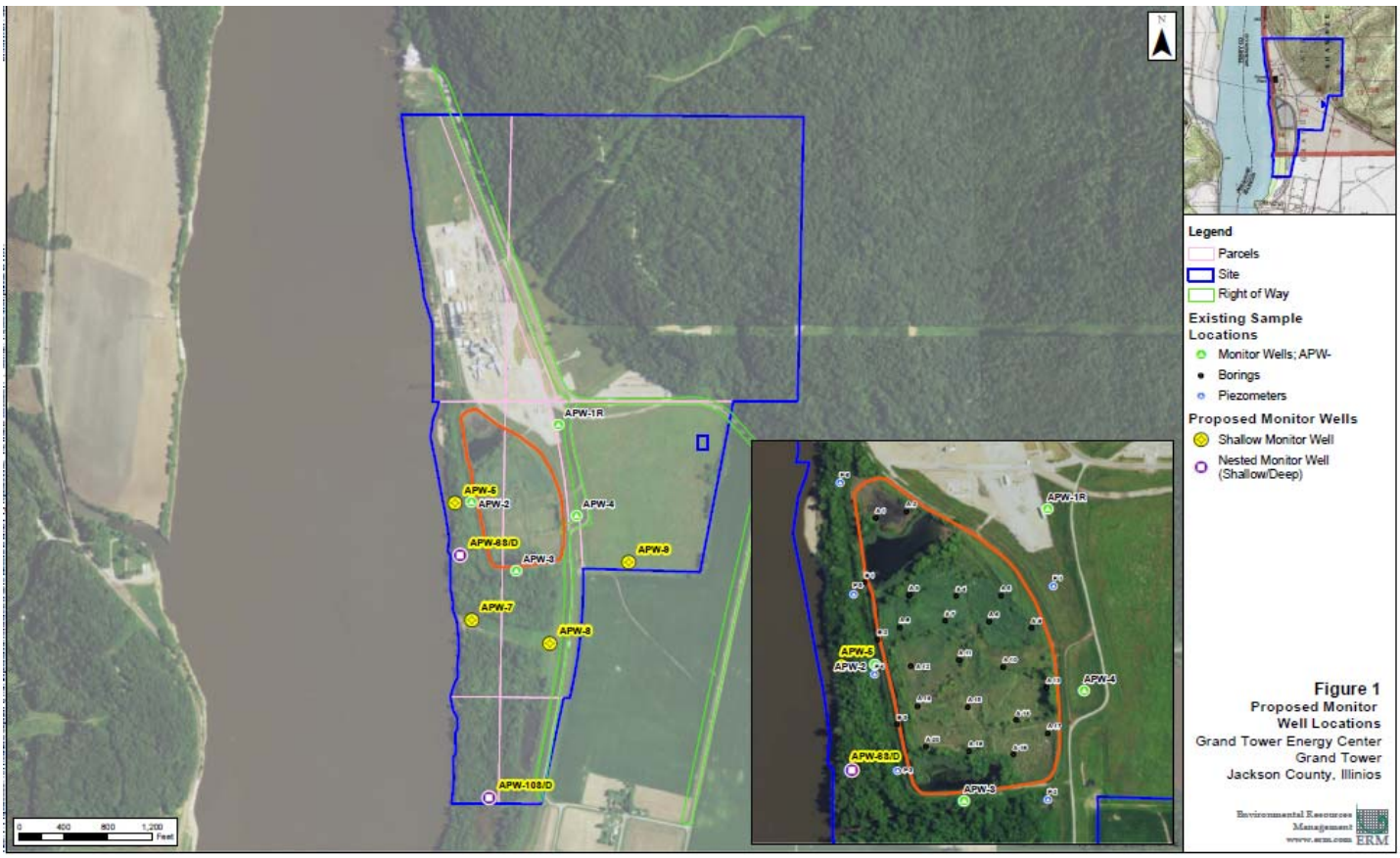
P = Permanganate interference
504.1, 508, 515.1, 525.2, 547, 548.1, 549.1, 531.2, 1613 methods checked for **Total** chlorine
552.2 checked for **Free** chlorine
531.2 pH is checked for ~3.8 (ID# OES-01-0149)
524.2 = pH and Chlorine checked by lab analyst

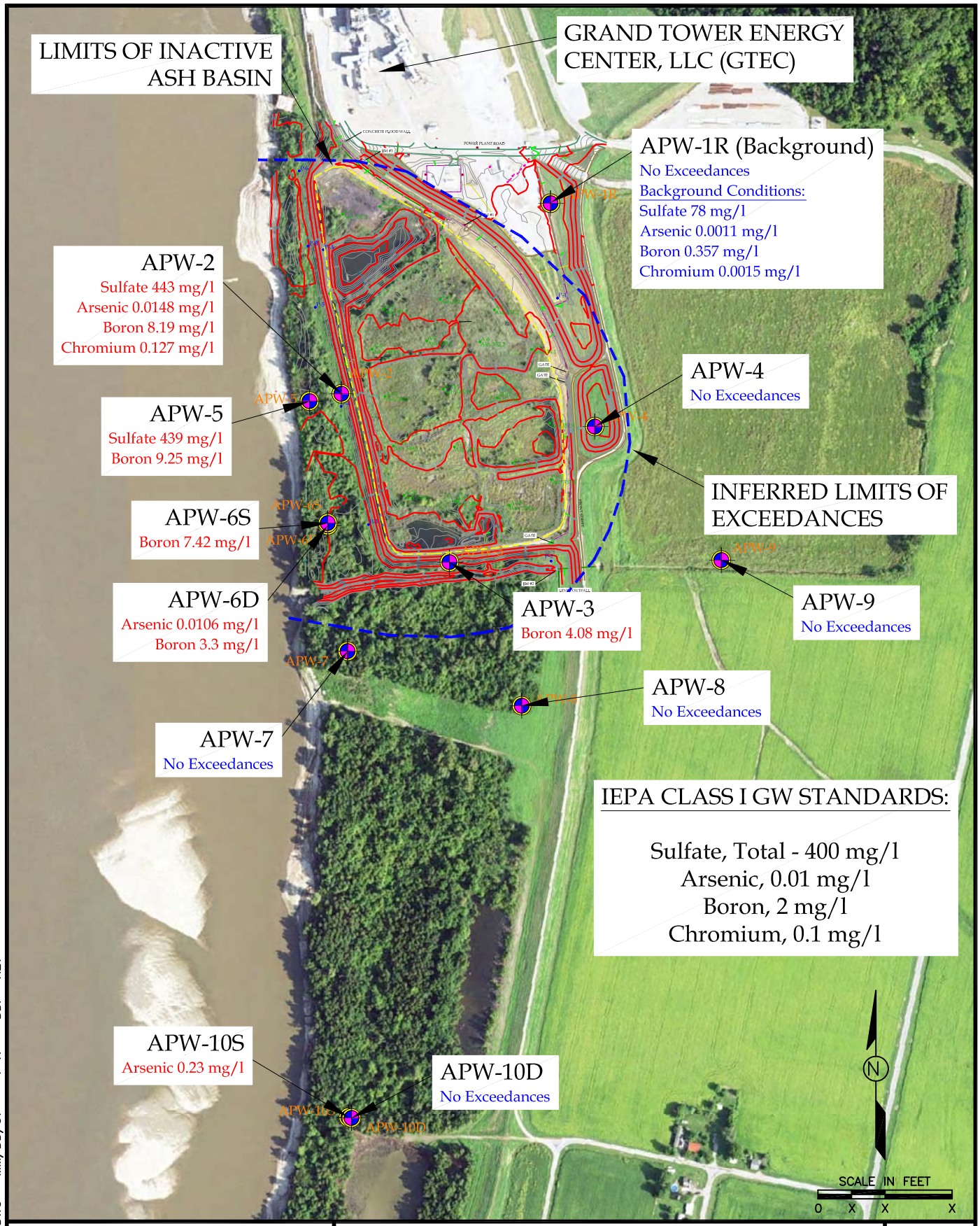
Event 7

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 7 **Date Samples Collected:** **From** 1/17/18 **To** 1/19/18

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	11	12	16	10	16	26	17	15	12	13	6	14
Sulfate, Total	mg/L	400	78	**443**	152	99	**439**	233	211	67	39	28	<10	44
Fluoride, Total	mg/L	4	0.18	0.26	0.29	0.17	0.36	0.27	0.23	0.2	0.3	0.22	0.17	0.11
Lab pH		6.5 - 9.0	7.09	7.06	7.26	7.25	7.23	7.09	7.21	6.97	7.04	7.57	7.06	7.03
Total Dissolved Solids	mg/L	1200	434	836	498	424	552	598	482	720	398	348	680	448
Antimony	mg/L	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.0011	**0.0148**	0.0028	0.0016	0.0021	0.0011	**0.0106**	<0.001	<0.001	0.0022	**0.23**	0.001
Barium	mg/L	2	0.182	0.351	0.15	0.155	0.214	0.224	0.166	0.38	0.226	0.133	0.703	0.391
Beryllium	mg/L	0.004	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.357	**8.19**	**4.08**	1.33	**9.25**	**7.42**	**3.3**	0.298	0.151	0.317	0.645	0.0923
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		97.1	134	101	113	121	98.7	105	191	95	80.3	140	148
Chromium	mg/L	0.1	0.0015	**0.127**	0.0025	0.0037	0.0033	0.0012	0.003	<0.001	<0.001	0.0016	0.0019	0.0042
Cobalt	mg/L	1	<0.001	0.0028	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026
Lead	mg/L	0.0075	<0.001	0.0048	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.0164	0.045	0.035	0.0411	0.0404	0.0451	0.0165	0.0181	0.0192	0.0155	0.0316	0.0142
Molybdenum	No Standard		<0.001	0.0951	0.0824	0.0592	0.244	0.324	0.0465	0.0037	<0.001	0.0223	<0.001	<0.001
Nickel	mg/L	0.1	0.005	0.0631	0.0025	0.0039	0.0021	0.0016	0.0032	<0.001	0.0026	0.0012	0.0014	0.0072
Selenium	mg/L	0.05	0.004	<0.001	0.0011	0.0101	<0.001	<0.001	<0.001	<0.001	0.0149	0.0147	<0.001	0.0016
Thallium	mg/L	0.002	0.0014	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	0.03	0.47	0.1	-0.05	0.13	0.09	0.03	0.14	0.21	0.05	0.29	0.08
Radium-228	pCi/l	20	0.98	1.08	1.32	0.34	1.04	0.71	0.74	1.19	0.64	0.46	2.71	0.98
Radium-226/228 Comb.	pCi/l	-----	1.01	1.55	1.42	0.29	1.17	0.8	0.77	1.33	0.85	0.51	3	1.06





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 7 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
7

March 01, 2018

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 18011138

Dear Brett Carney:

TEKLAB, INC received 12 samples on 1/19/2018 3:30:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Work Order: 18011138

Client Project: Grand Tower CCR GW

Report Date: 01-Mar-18

This reporting package includes the following:

Cover Letter	1
Report Contents	2
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Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	18
Dates Report	19
Quality Control Results	24
Receiving Check List	33
Chain of Custody	Appended

Definitions

http://www.teklabinc.com/

Client: ERM **Work Order:** 18011138

Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

Abbr Definition

*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

Cooler Receipt Temp: 3.62 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2018	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2019	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2019	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2019	Collinsville
Missouri	MDNR	00930		5/31/2019	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2019	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 01/17/2018 14:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**434**	mg/L	1	01/22/2018 14:27	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**78**	mg/L	2	01/22/2018 19:45	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.09**		1	01/19/2018 19:06	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.18**	mg/L	1	01/19/2018 18:54	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	01/22/2018 19:38	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	01/22/2018 13:36	138252
Barium	NELAP	0.0010		**0.182**	mg/L	5	01/22/2018 13:36	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Boron	NELAP	0.0250		**0.357**	mg/L	5	01/22/2018 13:36	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Calcium	NELAP	0.125		**97.1**	mg/L	5	01/25/2018 14:19	138252
Chromium	NELAP	0.0010		**0.0015**	mg/L	5	01/24/2018 20:14	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Lithium	*	0.0010		**0.0164**	mg/L	5	01/22/2018 13:36	138252
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:36	138252
Nickel	NELAP	0.0010		**0.0050**	mg/L	5	01/22/2018 13:36	138252
Selenium	NELAP	0.0010		**0.0040**	mg/L	5	01/22/2018 13:36	138252
Thallium	NELAP	0.0010		**0.0014**	mg/L	5	01/24/2018 20:14	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:01	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-002
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 01/17/2018 16:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**348**	mg/L	1	01/22/2018 14:27	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**28**	mg/L	2	01/22/2018 19:54	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.57**		1	01/19/2018 19:11	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.22**	mg/L	1	01/19/2018 18:56	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**13**	mg/L	1	01/22/2018 19:46	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:44	138252
Arsenic	NELAP	0.0010		**0.0022**	mg/L	5	01/22/2018 13:44	138252
Barium	NELAP	0.0010		**0.133**	mg/L	5	01/22/2018 13:44	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:44	138252
Boron	NELAP	0.0250		**0.317**	mg/L	5	01/22/2018 13:44	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:44	138252
Calcium	NELAP	0.125		**80.3**	mg/L	5	01/25/2018 14:27	138252
Chromium	NELAP	0.0010		**0.0016**	mg/L	5	01/24/2018 20:22	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:44	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:44	138252
Lithium	*	0.0010		**0.0155**	mg/L	5	01/22/2018 13:44	138252
Molybdenum	NELAP	0.0010		**0.0223**	mg/L	5	01/22/2018 13:44	138252
Nickel	NELAP	0.0010		**0.0012**	mg/L	5	01/22/2018 13:44	138252
Selenium	NELAP	0.0010		**0.0147**	mg/L	5	01/22/2018 13:44	138252
Thallium	NELAP	0.0010		**0.0010**	mg/L	5	01/22/2018 13:44	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:08	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-003
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 01/17/2018 17:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**398**	mg/L	1	01/22/2018 14:28	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**39**	mg/L	2	01/24/2018 12:03	R242717
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.04**		1	01/19/2018 19:14	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.30**	mg/L	1	01/19/2018 18:57	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	01/22/2018 19:54	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Barium	NELAP	0.0010		**0.226**	mg/L	5	01/22/2018 13:52	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Boron	NELAP	0.0250		**0.151**	mg/L	5	01/22/2018 13:52	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Calcium	NELAP	0.125		**95.0**	mg/L	5	01/25/2018 14:35	138252
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/24/2018 20:30	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Lithium	*	0.0010		**0.0192**	mg/L	5	01/22/2018 13:52	138252
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
Nickel	NELAP	0.0010		**0.0026**	mg/L	5	01/22/2018 13:52	138252
Selenium	NELAP	0.0010		**0.0149**	mg/L	5	01/22/2018 13:52	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 13:52	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:10	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-004
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 01/18/2018 10:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**720**	mg/L	1	01/22/2018 14:28	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**67**	mg/L	5	01/24/2018 15:58	R242717
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.97**		1	01/19/2018 19:20	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.20**	mg/L	1	01/19/2018 19:00	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	01/22/2018 20:32	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Barium	NELAP	0.0010		**0.380**	mg/L	5	01/22/2018 14:01	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Boron	NELAP	0.0250		**0.298**	mg/L	5	01/22/2018 14:01	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Calcium	NELAP	0.125		**191**	mg/L	5	01/25/2018 14:44	138252
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/24/2018 20:39	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Lithium	*	0.0010		**0.0181**	mg/L	5	01/22/2018 14:01	138252
Molybdenum	NELAP	0.0010		**0.0037**	mg/L	5	01/22/2018 14:01	138252
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:01	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:13	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-005
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 01/18/2018 12:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**448**	mg/L	1	01/22/2018 14:28	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**44**	mg/L	1	01/24/2018 12:33	R242717
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.03**		1	01/19/2018 19:21	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.11**	mg/L	1	01/19/2018 19:02	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**14**	mg/L	1	01/22/2018 20:40	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Arsenic	NELAP	0.0010		**0.0010**	mg/L	5	01/22/2018 14:09	138252
Barium	NELAP	0.0010		**0.391**	mg/L	5	01/22/2018 14:09	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Boron	NELAP	0.0250		**0.0923**	mg/L	5	01/22/2018 14:09	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Calcium	NELAP	0.125	S	**148**	mg/L	5	01/25/2018 14:52	138252
Chromium	NELAP	0.0010		**0.0042**	mg/L	5	01/24/2018 20:47	138252
Cobalt	NELAP	0.0010		**0.0026**	mg/L	5	01/22/2018 14:09	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Lithium	*	0.0010		**0.0142**	mg/L	5	01/22/2018 14:09	138252
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Nickel	NELAP	0.0010		**0.0072**	mg/L	5	01/22/2018 14:09	138252
Selenium	NELAP	0.0010		**0.0016**	mg/L	5	01/22/2018 14:09	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:09	138252
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:15	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-006
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 01/18/2018 13:10

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20	R	**680**	mg/L	1	01/22/2018 15:13	R242616
RPD for DUP was outside control limits due to sample composition.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	01/24/2018 15:53	R242717
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.06**		1	01/19/2018 19:26	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	01/19/2018 19:07	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	01/22/2018 20:45	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Arsenic	NELAP	0.0010		**0.230**	mg/L	5	01/22/2018 14:42	138252
Barium	NELAP	0.0010		**0.703**	mg/L	5	01/22/2018 14:42	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Boron	NELAP	0.0250		**0.645**	mg/L	5	01/22/2018 14:42	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Calcium	NELAP	0.125		**140**	mg/L	5	01/25/2018 15:00	138252
Chromium	NELAP	0.0010		**0.0019**	mg/L	5	01/24/2018 20:55	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Lithium	*	0.0010		**0.0316**	mg/L	5	01/22/2018 14:42	138252
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Nickel	NELAP	0.0010		**0.0014**	mg/L	5	01/22/2018 14:42	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:42	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:22	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-007
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 01/18/2018 14:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**552**	mg/L	1	01/22/2018 15:14	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**439**	mg/L	10	01/22/2018 20:56	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.23**		1	01/19/2018 19:28	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.36**	mg/L	1	01/19/2018 19:09	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	01/22/2018 20:48	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Arsenic	NELAP	0.0010		**0.0021**	mg/L	5	01/22/2018 14:50	138252
Barium	NELAP	0.0010		**0.214**	mg/L	5	01/22/2018 14:50	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Boron	NELAP	0.0250		**9.25**	mg/L	5	01/22/2018 14:50	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Calcium	NELAP	0.125		**121**	mg/L	5	01/25/2018 15:08	138252
Chromium	NELAP	0.0010		**0.0033**	mg/L	5	01/24/2018 21:03	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Lithium	*	0.0010		**0.0404**	mg/L	5	01/22/2018 14:50	138252
Molybdenum	NELAP	0.0010		**0.244**	mg/L	5	01/22/2018 14:50	138252
Nickel	NELAP	0.0010		**0.0021**	mg/L	5	01/22/2018 14:50	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:50	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:24	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

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Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-008
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 01/18/2018 15:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**598**	mg/L	1	01/22/2018 15:14	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**233**	mg/L	5	01/22/2018 21:20	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.09**		1	01/19/2018 19:30	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.27**	mg/L	1	01/19/2018 19:11	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**26**	mg/L	1	01/22/2018 21:12	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	01/22/2018 14:58	138252
Barium	NELAP	0.0010		**0.224**	mg/L	5	01/22/2018 14:58	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Boron	NELAP	0.0250		**7.42**	mg/L	5	01/22/2018 14:58	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Calcium	NELAP	0.125		**98.7**	mg/L	5	01/25/2018 15:16	138252
Chromium	NELAP	0.0010		**0.0012**	mg/L	5	01/24/2018 21:36	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Lithium	*	0.0010		**0.0451**	mg/L	5	01/22/2018 14:58	138252
Molybdenum	NELAP	0.0010		**0.324**	mg/L	5	01/22/2018 14:58	138252
Nickel	NELAP	0.0010		**0.0016**	mg/L	5	01/22/2018 14:58	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 14:58	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:26	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-009
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 01/18/2018 16:05

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**482**	mg/L	1	01/23/2018 13:05	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**211**	mg/L	10	01/22/2018 21:28	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.21**		1	01/19/2018 19:32	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.23**	mg/L	1	01/19/2018 19:13	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	01/22/2018 21:20	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Arsenic	NELAP	0.0010		**0.0106**	mg/L	5	01/22/2018 15:06	138252
Barium	NELAP	0.0010		**0.166**	mg/L	5	01/22/2018 15:06	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Boron	NELAP	0.0250		**3.30**	mg/L	5	01/22/2018 15:06	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Calcium	NELAP	0.125	S	**105**	mg/L	5	01/25/2018 15:25	138252
Chromium	NELAP	0.0010		**0.0030**	mg/L	5	01/24/2018 21:44	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Lithium	*	0.0010		**0.0165**	mg/L	5	01/22/2018 15:06	138252
Molybdenum	NELAP	0.0010		**0.0465**	mg/L	5	01/22/2018 15:06	138252
Nickel	NELAP	0.0010		**0.0032**	mg/L	5	01/22/2018 15:06	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:06	138252
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 12:28	138243
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-010
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 01/19/2018 9:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**424**	mg/L	1	01/23/2018 13:06	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**99**	mg/L	5	01/22/2018 21:36	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.25**		1	01/19/2018 19:33	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.17**	mg/L	1	01/19/2018 19:14	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	01/22/2018 21:28	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
Arsenic	NELAP	0.0010		**0.0016**	mg/L	5	01/22/2018 15:14	138252
Barium	NELAP	0.0010		**0.155**	mg/L	5	01/22/2018 15:14	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
Boron	NELAP	0.0250		**1.33**	mg/L	5	01/22/2018 15:14	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
Calcium	NELAP	0.125		**113**	mg/L	5	01/25/2018 15:58	138252
Chromium	NELAP	0.0010		**0.0037**	mg/L	5	01/24/2018 21:52	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
Lithium	*	0.0010		**0.0411**	mg/L	5	01/22/2018 15:14	138252
Molybdenum	NELAP	0.0010		**0.0592**	mg/L	5	01/22/2018 15:14	138252
Nickel	NELAP	0.0010		**0.0039**	mg/L	5	01/22/2018 15:14	138252
Selenium	NELAP	0.0010		**0.0101**	mg/L	5	01/22/2018 15:14	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:14	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 11:23	138226
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-011
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 01/19/2018 11:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**498**	mg/L	1	01/23/2018 13:06	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**152**	mg/L	10	01/22/2018 21:44	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.26**		1	01/19/2018 19:39	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.29**	mg/L	1	01/19/2018 19:18	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	01/22/2018 21:37	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
Arsenic	NELAP	0.0010		**0.0028**	mg/L	5	01/22/2018 15:23	138252
Barium	NELAP	0.0010		**0.150**	mg/L	5	01/22/2018 15:23	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
Boron	NELAP	0.0250		**4.08**	mg/L	5	01/22/2018 15:23	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
Calcium	NELAP	0.125		**101**	mg/L	5	01/25/2018 16:06	138252
Chromium	NELAP	0.0010		**0.0025**	mg/L	5	01/24/2018 22:01	138252
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
Lithium	*	0.0010		**0.0350**	mg/L	5	01/22/2018 15:23	138252
Molybdenum	NELAP	0.0010		**0.0824**	mg/L	5	01/22/2018 15:23	138252
Nickel	NELAP	0.0010		**0.0025**	mg/L	5	01/22/2018 15:23	138252
Selenium	NELAP	0.0010		**0.0011**	mg/L	5	01/22/2018 15:23	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:23	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 11:26	138226
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18011138
Client Project: Grand Tower CCR GW
Report Date: 01-Mar-18
Lab ID: 18011138-012
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 01/19/2018 12:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**836**	mg/L	1	01/23/2018 13:06	R242616
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**443**	mg/L	10	01/22/2018 21:52	R242575
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.06**		1	01/19/2018 19:41	R242484
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.26**	mg/L	1	01/19/2018 19:20	R242534
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	01/22/2018 21:45	R242576
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:31	138252
Arsenic	NELAP	0.0010		**0.0148**	mg/L	5	01/22/2018 15:31	138252
Barium	NELAP	0.0010		**0.351**	mg/L	5	01/22/2018 15:31	138252
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:31	138252
Boron	NELAP	0.0250		**8.19**	mg/L	5	01/22/2018 15:31	138252
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:31	138252
Calcium	NELAP	0.125		**134**	mg/L	5	01/25/2018 16:14	138252
Chromium	NELAP	0.0010		**0.127**	mg/L	5	01/24/2018 22:09	138252
Cobalt	NELAP	0.0010		**0.0028**	mg/L	5	01/22/2018 15:31	138252
Lead	NELAP	0.0010		**0.0048**	mg/L	5	01/22/2018 15:31	138252
Lithium	*	0.0010		**0.0450**	mg/L	5	01/22/2018 15:31	138252
Molybdenum	NELAP	0.0010		**0.0951**	mg/L	5	01/22/2018 15:31	138252
Nickel	NELAP	0.0010		**0.0631**	mg/L	5	01/22/2018 15:31	138252
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:31	138252
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	01/22/2018 15:31	138252
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	01/22/2018 11:28	138226
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102
Radium-228	*	0		**See attached**	pci/L	1	02/19/2018 0:00	R244102

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
18011138-001	APW-1R	Groundwater	3	01/17/2018 14:45
18011138-002	APW-9	Groundwater	3	01/17/2018 16:00
18011138-003	APW-8	Groundwater	3	01/17/2018 17:10
18011138-004	APW-7	Groundwater	3	01/18/2018 10:20
18011138-005	APW-10D	Groundwater	3	01/18/2018 12:20
18011138-006	APW-10S	Groundwater	3	01/18/2018 13:10
18011138-007	APW-5	Groundwater	3	01/18/2018 14:15
18011138-008	APW-6S	Groundwater	3	01/18/2018 15:15
18011138-009	APW-6D	Groundwater	3	01/18/2018 16:05
18011138-010	APW-4	Groundwater	3	01/19/2018 9:55
18011138-011	APW-3	Groundwater	3	01/19/2018 11:30
18011138-012	APW-2	Groundwater	3	01/19/2018 12:45

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
18011138-001A	APW-1R	01/17/2018 14:45	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 14:27
	SW-846 9036 (Total)				01/22/2018 19:45
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:06
	SW-846 9214 (Total)				01/19/2018 18:54
	SW-846 9251 (Total)				01/22/2018 19:38
18011138-001B	APW-1R	01/17/2018 14:45	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-001C	APW-1R	01/17/2018 14:45	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 13:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:14
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 14:19
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:01
18011138-002A	APW-9	01/17/2018 16:00	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 14:27
	SW-846 9036 (Total)				01/22/2018 19:54
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:11
	SW-846 9214 (Total)				01/19/2018 18:56
	SW-846 9251 (Total)				01/22/2018 19:46
18011138-002B	APW-9	01/17/2018 16:00	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-002C	APW-9	01/17/2018 16:00	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 13:44
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:22
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 14:27
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:08
18011138-003A	APW-8	01/17/2018 17:10	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 14:28
	SW-846 9036 (Total)				01/24/2018 12:03
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:14
	SW-846 9214 (Total)				01/19/2018 18:57
	SW-846 9251 (Total)				01/22/2018 19:54
18011138-003B	APW-8	01/17/2018 17:10	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-003C	APW-8	01/17/2018 17:10	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 13:52

Client: ERM **Work Order:** 18011138

Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:30
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 14:35
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:10
18011138-004A	APW-7	01/18/2018 10:20	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 14:28
	SW-846 9036 (Total)				01/24/2018 15:58
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:20
	SW-846 9214 (Total)				01/19/2018 19:00
	SW-846 9251 (Total)				01/22/2018 20:32
18011138-004B	APW-7	01/18/2018 10:20	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-004C	APW-7	01/18/2018 10:20	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 14:01
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:39
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 14:44
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:13
18011138-005A	APW-10D	01/18/2018 12:20	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 14:28
	SW-846 9036 (Total)				01/24/2018 12:33
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:21
	SW-846 9214 (Total)				01/19/2018 19:02
	SW-846 9251 (Total)				01/22/2018 20:40
18011138-005B	APW-10D	01/18/2018 12:20	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-005C	APW-10D	01/18/2018 12:20	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 14:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:47
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 14:52
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:15
18011138-006A	APW-10S	01/18/2018 13:10	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 15:13
	SW-846 9036 (Total)				01/24/2018 15:53
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:26
	SW-846 9214 (Total)				01/19/2018 19:07
	SW-846 9251 (Total)				01/22/2018 20:45
18011138-006B	APW-10S	01/18/2018 13:10	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
18011138-006C	APW-10S	01/18/2018 13:10	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 14:42
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 20:55
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 15:00
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:22
18011138-007A	APW-5	01/18/2018 14:15	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 15:14
	SW-846 9036 (Total)				01/22/2018 20:56
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:28
	SW-846 9214 (Total)				01/19/2018 19:09
	SW-846 9251 (Total)				01/22/2018 20:48
18011138-007B	APW-5	01/18/2018 14:15	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-007C	APW-5	01/18/2018 14:15	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 14:50
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 21:03
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 15:08
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:24
18011138-008A	APW-6S	01/18/2018 15:15	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/22/2018 15:14
	SW-846 9036 (Total)				01/22/2018 21:20
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:30
	SW-846 9214 (Total)				01/19/2018 19:11
	SW-846 9251 (Total)				01/22/2018 21:12
18011138-008B	APW-6S	01/18/2018 15:15	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-008C	APW-6S	01/18/2018 15:15	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 14:58
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 21:36
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 15:16
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:26
18011138-009A	APW-6D	01/18/2018 16:05	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/23/2018 13:05
	SW-846 9036 (Total)				01/22/2018 21:28
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:32
	SW-846 9214 (Total)				01/19/2018 19:13
	SW-846 9251 (Total)				01/22/2018 21:20

Client: ERM **Work Order:** 18011138

Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			Prep Date/Time	Analysis Date/Time
18011138-009B	APW-6D	01/18/2018 16:05	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-009C	APW-6D	01/18/2018 16:05	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 15:06
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 21:44
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 15:25
	SW-846 7470A (Total)			01/19/2018 16:21	01/22/2018 12:28
18011138-010A	APW-4	01/19/2018 9:55	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/23/2018 13:06
	SW-846 9036 (Total)				01/22/2018 21:36
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:33
	SW-846 9214 (Total)				01/19/2018 19:14
	SW-846 9251 (Total)				01/22/2018 21:28
18011138-010B	APW-4	01/19/2018 9:55	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-010C	APW-4	01/19/2018 9:55	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 15:14
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 21:52
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 15:58
	SW-846 7470A (Total)			01/19/2018 16:24	01/22/2018 11:23
18011138-011A	APW-3	01/19/2018 11:30	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/23/2018 13:06
	SW-846 9036 (Total)				01/22/2018 21:44
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:39
	SW-846 9214 (Total)				01/19/2018 19:18
	SW-846 9251 (Total)				01/22/2018 21:37
18011138-011B	APW-3	01/19/2018 11:30	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-011C	APW-3	01/19/2018 11:30	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 15:23
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 22:01
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 16:06
	SW-846 7470A (Total)			01/19/2018 16:24	01/22/2018 11:26
18011138-012A	APW-2	01/19/2018 12:45	01/19/2018 15:35		
	Standard Methods 2540 C (Total) 1997				01/23/2018 13:06
	SW-846 9036 (Total)				01/22/2018 21:52

Client: ERM **Work Order:** 18011138

Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 9040B, Laboratory Analyzed				01/19/2018 19:41
	SW-846 9214 (Total)				01/19/2018 19:20
	SW-846 9251 (Total)				01/22/2018 21:45
18011138-012B	APW-2	01/19/2018 12:45	01/19/2018 15:35		
	EPA 903.0/904.0, Radium 226/228				02/19/2018 0:00
18011138-012C	APW-2	01/19/2018 12:45	01/19/2018 15:35		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/22/2018 15:31
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/24/2018 22:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			01/19/2018 16:38	01/25/2018 16:14
	SW-846 7470A (Total)			01/19/2018 16:24	01/22/2018 11:28

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STANDARD METHODS 2540 C (TOTAL) 1997

Batch R242616 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						01/23/2018
Total Dissolved Solids	20		**< 20**						01/22/2018
Total Dissolved Solids	20		**< 20**						01/22/2018
Total Dissolved Solids	20		**< 20**						01/22/2018

Batch R242616 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**962**	1000	0	96.2	90	110	01/22/2018

Batch R242616 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**928**	1000	0	92.8	90	110	01/22/2018
Total Dissolved Solids	20		**950**	1000	0	95.0	90	110	01/22/2018
Total Dissolved Solids	20		**970**	1000	0	97.0	90	110	01/23/2018

Batch R242616 **SampType:** MS Units **mg/L**
SampID: 18011138-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**944**	500.0	434.0	102.0	85	115	01/22/2018

Batch R242616 **SampType:** MSD Units **mg/L** RPD Limit **5**
SampID: 18011138-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**904**	500.0	434.0	94.0	944.0	4.33	01/22/2018

Batch R242616 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 18011138-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20	R	**726**				680.0	6.54	01/22/2018

SW-846 9036 (TOTAL)

Batch R242575 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/22/2018

Batch R242575 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	100.3	90	110	01/22/2018

Quality Control Results

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Client: ERM
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SW-846 9036 (TOTAL)

Batch R242717 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						01/24/2018

Batch R242717 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**20**	20.00	0	99.7	90	110	01/24/2018

Batch R242717 **SampType:** MS Units **mg/L**
SampID: 18011138-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	20		**61**	20.00	39.17	111.5	85	115	01/24/2018

Batch R242717 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18011138-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	20		**61**	20.00	39.17	108.0	61.47	1.16	01/24/2018

SW-846 9040B, LABORATORY ANALYZED

Batch R242484 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.99**	7.000	0	99.9	99.1	100.8	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**
SampID: 18011138-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.13**				7.090	0.56	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**
SampID: 18011138-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.48**				7.570	1.20	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**
SampID: 18011138-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.08**				7.040	0.57	01/19/2018

Client: ERM **Work Order:** 18011138

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SW-846 9040B, LABORATORY ANALYZED

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.01**				6.970	0.57	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.07**				7.030	0.57	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.01**				7.060	0.71	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.25**				7.230	0.28	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.10**				7.090	0.14	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.20**				7.210	0.14	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.24**				7.250	0.14	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.27**				7.260	0.14	01/19/2018

Batch R242484 **SampType:** DUP Units RPD Limit **10**

SampID: 18011138-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.06**				7.060	0.00	01/19/2018

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Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

SW-846 9214 (TOTAL)

Batch R242534 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						01/19/2018

Batch R242534 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**0.96**	1.000	0	96.0	90	110	01/19/2018

Batch R242534 **SampType:** MS Units **mg/L**
SampID: 18011138-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.49**	2.000	0.2990	109.4	85	115	01/19/2018

Batch R242534 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18011138-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.44**	2.000	0.2990	107.0	2.487	1.95	01/19/2018

Batch R242534 **SampType:** MS Units **mg/L**
SampID: 18011138-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.34**	2.000	0.1730	108.1	85	115	01/19/2018

Batch R242534 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18011138-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.35**	2.000	0.1730	108.8	2.335	0.56	01/19/2018

SW-846 9251 (TOTAL)

Batch R242576 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						01/22/2018

Batch R242576 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	100.8	90	110	01/22/2018

Quality Control Results

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Client: ERM

Client Project: Grand Tower CCR GW

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SW-846 9251 (TOTAL)

Batch **R242576** **SampType:** **MS** Units **mg/L**

SampID: 18011138-003AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**30**	20.00	12.03	90.8	85	115	01/22/2018

Batch **R242576** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 18011138-003AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**30**	20.00	12.03	87.8	30.18	1.97	01/22/2018

Batch **R242718** **SampType:** **MBLK** Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	1		**< 1**						01/24/2018

Batch **R242718** **SampType:** **LCS** Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	98.6	90	110	01/24/2018

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **138252** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-138252

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	01/22/2018
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	01/25/2018
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/24/2018
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Lithium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	01/22/2018

Quality Control Results

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Client: ERM

Client Project: Grand Tower CCR GW

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SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138252 **SampType:** LCS Units **mg/L**

SampID: LCS-138252

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.496**	0.5000	0	99.1	80	120	01/22/2018
Arsenic	0.0010		**0.518**	0.5000	0	103.5	80	120	01/22/2018
Barium	0.0010		**2.02**	2.000	0	100.8	80	120	01/22/2018
Beryllium	0.0010		**0.0506**	0.05000	0	101.3	80	120	01/22/2018
Boron	0.0250		**0.512**	0.5000	0	102.3	80	120	01/22/2018
Cadmium	0.0010		**0.0489**	0.05000	0	97.7	80	120	01/22/2018
Calcium	0.125		**2.13**	2.500	0	85.1	80	120	01/25/2018
Chromium	0.0010		**0.200**	0.2000	0	100.2	80	120	01/24/2018
Cobalt	0.0010		**0.500**	0.5000	0	100.1	80	120	01/22/2018
Lead	0.0010		**0.512**	0.5000	0	102.3	80	120	01/22/2018
Lithium	0.0010		**0.497**	0.5000	0	99.3	80	120	01/22/2018
Molybdenum	0.0010		**0.489**	0.5000	0	97.7	80	120	01/22/2018
Nickel	0.0010		**0.508**	0.5000	0	101.6	80	120	01/22/2018
Selenium	0.0010		**0.498**	0.5000	0	99.7	80	120	01/22/2018
Thallium	0.0010		**0.239**	0.2500	0	95.8	80	120	01/22/2018

Batch 138252 **SampType:** MS Units **mg/L**

SampID: 18011138-005CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.494**	0.5000	0	98.8	75	125	01/22/2018
Arsenic	0.0010		**0.510**	0.5000	0.001026	101.7	75	125	01/22/2018
Barium	0.0010		**2.37**	2.000	0.3907	99.2	75	125	01/22/2018
Beryllium	0.0010		**0.0514**	0.05000	0	102.9	75	125	01/22/2018
Boron	0.0250		**0.635**	0.5000	0.09228	108.6	75	125	01/22/2018
Cadmium	0.0010		**0.0475**	0.05000	0	94.9	75	125	01/22/2018
Calcium	0.125	S	**132**	2.500	147.7	-609.9	75	125	01/25/2018
Chromium	0.0010		**0.203**	0.2000	0.004181	99.2	75	125	01/24/2018
Cobalt	0.0010		**0.471**	0.5000	0.002600	93.8	75	125	01/22/2018
Lead	0.0010		**0.497**	0.5000	0	99.4	75	125	01/22/2018
Lithium	0.0010		**0.528**	0.5000	0.01420	102.7	75	125	01/22/2018
Molybdenum	0.0010		**0.483**	0.5000	0.0007084	96.6	75	125	01/22/2018
Nickel	0.0010		**0.478**	0.5000	0.007153	94.1	75	125	01/22/2018
Selenium	0.0010		**0.505**	0.5000	0.001636	100.7	75	125	01/22/2018
Thallium	0.0010		**0.232**	0.2500	0	92.9	75	125	01/22/2018

Client: ERM **Work Order:** 18011138

Client Project: Grand Tower CCR GW **Report Date:** 01-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138252 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18011138-005CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.495**	0.5000	0	99.0	0.4940	0.21	01/22/2018
Arsenic	0.0010		**0.505**	0.5000	0.001026	100.8	0.5095	0.91	01/22/2018
Barium	0.0010		**2.38**	2.000	0.3907	99.6	2.375	0.30	01/22/2018
Beryllium	0.0010		**0.0520**	0.05000	0	104.0	0.05144	1.07	01/22/2018
Boron	0.0250		**0.618**	0.5000	0.09228	105.1	0.6353	2.83	01/22/2018
Cadmium	0.0010		**0.0477**	0.05000	0	95.5	0.04747	0.58	01/22/2018
Calcium	0.125	S	**135**	2.500	147.7	-494.5	132.4	2.16	01/25/2018
Chromium	0.0010		**0.201**	0.2000	0.004181	98.6	0.2025	0.53	01/24/2018
Cobalt	0.0010		**0.475**	0.5000	0.002600	94.5	0.4715	0.77	01/22/2018
Lead	0.0010		**0.501**	0.5000	0	100.1	0.4971	0.69	01/22/2018
Lithium	0.0010		**0.534**	0.5000	0.01420	104.0	0.5279	1.20	01/22/2018
Molybdenum	0.0010		**0.488**	0.5000	0.0007084	97.4	0.4835	0.86	01/22/2018
Nickel	0.0010		**0.485**	0.5000	0.007153	95.5	0.4776	1.47	01/22/2018
Selenium	0.0010		**0.504**	0.5000	0.001636	100.4	0.5051	0.24	01/22/2018
Thallium	0.0010		**0.239**	0.2500	0	95.4	0.2323	2.70	01/22/2018

Batch 138252 **SampType:** MS Units **mg/L**

SampID: 18011138-009CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.498**	0.5000	0	99.6	75	125	01/22/2018
Arsenic	0.0010		**0.515**	0.5000	0.01062	100.8	75	125	01/22/2018
Barium	0.0010		**2.15**	2.000	0.1657	99.0	75	125	01/22/2018
Beryllium	0.0010		**0.0513**	0.05000	0	102.6	75	125	01/22/2018
Boron	0.0250		**3.84**	0.5000	3.303	107.2	75	125	01/22/2018
Cadmium	0.0010		**0.0480**	0.05000	0	96.1	75	125	01/22/2018
Calcium	0.125	S	**107**	2.500	105.4	46.7	75	125	01/25/2018
Chromium	0.0010		**0.200**	0.2000	0.002975	98.7	75	125	01/24/2018
Cobalt	0.0010		**0.475**	0.5000	0.0005448	94.8	75	125	01/22/2018
Lead	0.0010		**0.504**	0.5000	0	100.8	75	125	01/22/2018
Lithium	0.0010		**0.534**	0.5000	0.01653	103.4	75	125	01/22/2018
Molybdenum	0.0010		**0.530**	0.5000	0.04646	96.7	75	125	01/22/2018
Nickel	0.0010		**0.480**	0.5000	0.003177	95.3	75	125	01/22/2018
Selenium	0.0010		**0.493**	0.5000	0	98.6	75	125	01/22/2018
Thallium	0.0010		**0.240**	0.2500	0	95.9	75	125	01/22/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138252 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18011138-009CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.498**	0.5000	0	99.6	0.4979	0.02	01/22/2018
Arsenic	0.0010		**0.518**	0.5000	0.01062	101.5	0.5148	0.67	01/22/2018
Barium	0.0010		**2.13**	2.000	0.1657	98.2	2.147	0.77	01/22/2018
Beryllium	0.0010		**0.0517**	0.05000	0	103.4	0.05128	0.86	01/22/2018
Boron	0.0250		**3.84**	0.5000	3.303	107.7	3.840	0.06	01/22/2018
Cadmium	0.0010		**0.0480**	0.05000	0	96.1	0.04803	0.00	01/22/2018
Calcium	0.125	S	**106**	2.500	105.4	35.8	106.6	0.26	01/25/2018
Chromium	0.0010		**0.199**	0.2000	0.002975	98.2	0.2003	0.44	01/24/2018
Cobalt	0.0010		**0.475**	0.5000	0.0005448	94.8	0.4745	0.00	01/22/2018
Lead	0.0010		**0.505**	0.5000	0	100.9	0.5042	0.10	01/22/2018
Lithium	0.0010		**0.535**	0.5000	0.01653	103.7	0.5337	0.29	01/22/2018
Molybdenum	0.0010		**0.529**	0.5000	0.04646	96.5	0.5300	0.24	01/22/2018
Nickel	0.0010		**0.479**	0.5000	0.003177	95.2	0.4796	0.14	01/22/2018
Selenium	0.0010		**0.494**	0.5000	0	98.8	0.4931	0.22	01/22/2018
Thallium	0.0010		**0.235**	0.2500	0	94.1	0.2397	1.82	01/22/2018

SW-846 7470A (TOTAL)

Batch 138226 **SampType:** MBLK Units **mg/L**

SampID: MBLK-138226

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	01/22/2018

Batch 138226 **SampType:** LCS Units **mg/L**

SampID: LCS-138226

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00488**	0.00500	0	97.7	85	115	01/22/2018

Batch 138243 **SampType:** MBLK Units **mg/L**

SampID: MBLK-138243

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	01/22/2018

Batch 138243 **SampType:** LCS Units **mg/L**

SampID: LCS-138243

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00491**	0.00500	0	98.3	85	115	01/22/2018

Batch 138243 **SampType:** MS Units **mg/L**

SampID: 18011138-005CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00471**	0.00500	0	94.3	75	125	01/22/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

SW-846 7470A (TOTAL)

Batch **138243** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 18011138-005CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00497**	0.005000	0	99.4	0.004713	5.35	01/22/2018

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18011138

Report Date: 01-Mar-18

Carrier: Employee

Received By: KF

Completed by: Kalyn Foecke
On: 19-Jan-18

Reviewed by: Elizabeth A. Hurley
On: 19-Jan-18

Pages to follow: Chain of custody 2 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 3.62
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

Additional nitric acid was needed in APW-6S upon arrival at the laboratory. - kfoecke - 1/19/2018 4:08:09 PM

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 18011138

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 3.6 °C
Preserved in: ☒ LAB ☐ FIELD
Lab Notes APW-Les cooled HNO3 gmo 1/19/18

FOR LAB USE ONLY

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☒ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M. Halley / G. Moore

Results Requested
☒ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
18011138-001	APW-1R	1/17/18; 1445	1	3												X	X	X	X	X	X	X	X
002	APW-9	1/17/18; 1600	1	3												X	X	X	X	X	X	X	X
003	APW-8	1/17/18; 1710	1	3												X	X	X	X	X	X	X	X
004	APW-7	1/18/18; 1020	1	3												X	X	X	X	X	X	X	X
005	APW-10D	1/18/18; 1220	1	3												X	X	X	X	X	X	X	X
006	APW-10S	1/18/18; 1310	1	3												X	X	X	X	X	X	X	X
007	APW-5	1/18/18; 1415	1	3												X	X	X	X	X	X	X	X
008	APW-6S	1/18/18; 1515	1	3												X	X	X	X	X	X	X	X
009	APW-6D	1/18/18; 1605	1	3												X	X	X	X	X	X	X	X
010	APW-4	1/19/18; 0955	1	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
(ERM)	1/19/18; 1530		1/19/18 1530

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 41516

gmo 1/19/18

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 18011138

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☐ ICE ☐ BLUE ICE ☐ NO ICE _____ °C
Preserved in: ☐ LAB ☐ FIELD
FOR LAB USE ONLY
Lab Notes

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☒ No
Are these samples known to be hazardous? ☐ Yes ☒ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☒ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M. Halley / G. Moore

Results Requested
☒ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
18011138-011	APW-3	1/19/18; 1130	1	3												X	X	X	X	X	X	X	X
012	APW-2	1/19/18; 1245	1	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
(ERM)	1/19/18; 1530	KCleek	1/19/18 1530

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 41516

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

February 28, 2018

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 18011138

Dear Mike Austin:

Order No.: 18011210

Summit Environmental Technologies, Inc. received 12 sample(s) on 1/25/2018 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia VELAP 9456, Washington C891

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Case Narrative

WO#: **18011210**
Date: **2/28/2018**

CLIENT: TEKLAB Inc,
Project: 18011138

WorkOrder Narrative:
18011210: This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Analytical Sequence QC Notes:
lcsd-30908 Radium-228_DW(904.0): The LCS and LCSD exhibited high RPD; however, spike recoveries are within acceptance limits.

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Workorder Sample Summary

WO#: **18011210**

28-Feb-18

CLIENT: TEKLAB Inc,
Project: 18011138

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
18011210-001	18011138-01		1/17/2018 2:45:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-002	18011138-02		1/17/2018 4:00:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-003	18011138-03		1/17/2018 5:10:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-004	18011138-04		1/18/2018 10:20:00 AM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-005	18011138-05		1/18/2018 12:20:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-006	18011138-06		1/18/2018 1:10:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-007	18011138-07		1/18/2018 2:15:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-008	18011138-08		1/18/2018 3:15:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-009	18011138-09		1/18/2018 4:05:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-010	18011138-10		1/19/2018 9:55:00 AM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-011	18011138-11		1/19/2018 11:30:00 AM	1/25/2018 2:30:00 PM	Non-Potable Water
18011210-012	18011138-12		1/19/2018 12:45:00 PM	1/25/2018 2:30:00 PM	Non-Potable Water

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

DATES REPORT

WO#: **18011210**

28-Feb-18

Client: TEKLAB Inc,
Project: 18011138

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18011210-001A	18011138-01	1/17/2018 2:45:00 PM	Non-Potable Water	Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:43:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:02:00 PM
18011210-002A	18011138-02	1/17/2018 4:00:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:43:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:02:00 PM
18011210-003A	18011138-03	1/17/2018 5:10:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:43:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-004A	18011138-04	1/18/2018 10:20:00 AM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:44:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:02:00 PM
18011210-005A	18011138-05	1/18/2018 12:20:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:44:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-006A	18011138-06	1/18/2018 1:10:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:41:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-007A	18011138-07	1/18/2018 2:15:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:41:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-008A	18011138-08	1/18/2018 3:15:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:41:00 PM

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

DATES REPORT

WO#: **18011210**

28-Feb-18

Client: TEKLAB Inc,
Project: 18011138

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18011210-008A	18011138-08	1/18/2018 3:15:00 PM	Non-Potable Water	Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-009A	18011138-09	1/18/2018 4:05:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)		2/15/2018 8:14:39 AM	2/20/2018 12:41:00 PM
				Radium-228 (EPA 904.0)		2/15/2018 8:14:39 AM	2/19/2018 2:54:00 PM
18011210-010A	18011138-10	1/19/2018 9:55:00 AM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)			2/20/2018 1:58:00 PM
				Radium-228 (EPA 904.0)			2/19/2018 2:59:00 PM
18011210-011A	18011138-11	1/19/2018 11:30:00 AM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)			2/20/2018 1:58:00 PM
				Radium-228 (EPA 904.0)			2/19/2018 2:59:00 PM
18011210-012A	18011138-12	1/19/2018 12:45:00 PM		Combined Radium (EPA903+904)			2/20/2018
				Radium-226 (EPA 903.0)			2/20/2018 1:58:00 PM
				Radium-228 (EPA 904.0)			2/19/2018 2:59:00 PM

Original

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/17/2018 2:45:00 PM
Project: 18011138
Lab ID: 18011210-001
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-01

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.01	2.00	U	pCi/L	± 0.69	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.03	1.00	U	pCi/L	± 0.07	1	2/20/2018 12:43:00 PM
Yield	1					1	2/20/2018 12:43:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.98	1.00	J	pCi/L	± 0.62	1	2/19/2018 2:02:00 PM
Yield	0.87					1	2/19/2018 2:02:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/17/2018 4:00:00 PM
Project: 18011138
Lab ID: 18011210-002
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-02

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.51	2.00	U	pCi/L	± 0.54	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.05	1.00	U	pCi/L	± 0.08	1	2/20/2018 12:43:00 PM
Yield	1					1	2/20/2018 12:43:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.46	1.00	U	pCi/L	± 0.46	1	2/19/2018 2:02:00 PM
Yield	1					1	2/19/2018 2:02:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/17/2018 5:10:00 PM
Project: 18011138
Lab ID: 18011210-003
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-03

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.85	2.00	U	pCi/L	± 0.6	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.21	1.00	U	pCi/L	± 0.11	1	2/20/2018 12:43:00 PM
Yield	1					1	2/20/2018 12:43:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.64	1.00	U	pCi/L	± 0.49	1	2/19/2018 2:54:00 PM
Yield	1					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 10:20:00 AM
Project: 18011138
Lab ID: 18011210-004
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-04

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.33	2.00	U	pCi/L	± 0.64	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.14	1.00	U	pCi/L	± 0.09	1	2/20/2018 12:44:00 PM
Yield	1					1	2/20/2018 12:44:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.19	1.00		pCi/L	± 0.55	1	2/19/2018 2:02:00 PM
Yield	1					1	2/19/2018 2:02:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 12:20:00 PM
Project: 18011138
Lab ID: 18011210-005
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-05

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.06	2.00	U	pCi/L	± 0.7	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.08	1.00	U	pCi/L	± 0.1	1	2/20/2018 12:44:00 PM
Yield	1					1	2/20/2018 12:44:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.98	1.00	J	pCi/L	± 0.6	1	2/19/2018 2:54:00 PM
Yield	0.99					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Cuyahoga Falls, Ohio 44223
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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 1:10:00 PM
Project: 18011138
Lab ID: 18011210-006
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-06

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	3	2.00		pCi/L	± 0.9	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.29	1.00	U	pCi/L	± 0.12	1	2/20/2018 12:41:00 PM
Yield	1					1	2/20/2018 12:41:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	2.71	1.00		pCi/L	± 0.78	1	2/19/2018 2:54:00 PM
Yield	0.88					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 2:15:00 PM
Project: 18011138
Lab ID: 18011210-007
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-07

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.17	2.00	U	pCi/L	± 0.66	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.13	1.00	U	pCi/L	± 0.1	1	2/20/2018 12:41:00 PM
Yield	1					1	2/20/2018 12:41:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	1.04	1.00		pCi/L	± 0.56	1	2/19/2018 2:54:00 PM
Yield	1					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 3:15:00 PM
Project: 18011138
Lab ID: 18011210-008
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-08

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.8	2.00	U	pCi/L	± 0.62	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.09	1.00	U	pCi/L	± 0.09	1	2/20/2018 12:41:00 PM
Yield	1					1	2/20/2018 12:41:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.71	1.00	J	pCi/L	± 0.53	1	2/19/2018 2:54:00 PM
Yield	0.95					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/18/2018 4:05:00 PM
Project: 18011138
Lab ID: 18011210-009
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-09

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.77	2.00	U	pCi/L	± 0.65	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.03	1.00	U	pCi/L	± 0.08	1	2/20/2018 12:41:00 PM
Yield	1					1	2/20/2018 12:41:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.74	1.00	J	pCi/L	± 0.57	1	2/19/2018 2:54:00 PM
Yield	1					1	2/19/2018 2:54:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/19/2018 9:55:00 AM
Project: 18011138
Lab ID: 18011210-010
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-10

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.34	2.00	U	pCi/L	± 0.59	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**		Analyst: **BRD**
Radium-226	-0.05	1.00	U	pCi/L	± 0.08	1	2/20/2018 1:58:00 PM
Yield	1					1	2/20/2018 1:58:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**		Analyst: **BRD**
Radium-228	0.34	1.00	U	pCi/L	± 0.51	1	2/19/2018 2:59:00 PM
Yield	1					1	2/19/2018 2:59:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/19/2018 11:30:00 AM
Project: 18011138
Lab ID: 18011210-011
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-11

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.42	2.00	U	pCi/L	± 0.78	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**		Analyst: **BRD**
Radium-226	0.1	1.00	U	pCi/L	± 0.1	1	2/20/2018 1:58:00 PM
Yield	1					1	2/20/2018 1:58:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**		Analyst: **BRD**
Radium-228	1.32	1.00		pCi/L	± 0.68	1	2/19/2018 2:59:00 PM
Yield	0.99					1	2/19/2018 2:59:00 PM

Qualifiers:				
	*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
	H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
	MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
	ND	Not Detected	O	RSD is greater than RSDlimit
	P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18011210**

Date Reported: **2/28/2018**

CLIENT: TEKLAB Inc,
Collection Date: 1/19/2018 12:45:00 PM
Project: 18011138
Lab ID: 18011210-012
Matrix: NON-POTABLE WATER
Client Sample ID 18011138-12

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.55	2.00	U	pCi/L	± 0.74	1	2/20/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**		Analyst: **BRD**
Radium-226	0.47	1.00	U	pCi/L	± 0.15	1	2/20/2018 1:58:00 PM
Yield	1					1	2/20/2018 1:58:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**		Analyst: **BRD**
Radium-228	1.08	1.00		pCi/L	± 0.59	1	2/19/2018 2:59:00 PM
Yield	1					1	2/19/2018 2:59:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18011210**
28-Feb-18

Client: TEKLAB Inc,
Project: 18011138 **BatchID:** **30908**

Sample ID **lcs-30908** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80830**
Client ID: **LCSW** Batch ID: **30908** TestNo: **E904.0** **E903-904** Analysis Date: **2/19/2018** SeqNo: **1425435**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	2.24	1.00	2.500	0	89.4	70	130				QLR
Yield	1.00			0	0						

Sample ID **lcsd-30908** SampType: **LCSD** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80830**
Client ID: **LCSS02** Batch ID: **30908** TestNo: **E904.0** **E903-904** Analysis Date: **2/19/2018** SeqNo: **1425436**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	2.94	1.00	2.500	0	117	70	130	2.235	27.1	20	R
Yield	1.00			0	0			1.000	0		

NOTES:
The LCS and LCSD exhibited high RPD; however, spike recoveries are within acceptance limits.

Sample ID **MB-30908** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80830**
Client ID: **PBW** Batch ID: **30908** TestNo: **E904.0** **E903-904** Analysis Date: **2/19/2018** SeqNo: **1425460**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18011210**
28-Feb-18

Client: TEKLAB Inc,
Project: 18011138 **BatchID:** **30908**

Sample ID **mb-30908** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **PBW** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425561**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **lcs-30908** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **LCSW** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425562**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.14	1.00	5.000	0	82.8	70	130				

Sample ID **lcsd-30908** SampType: **LCSD** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **LCSS02** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425563**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	3.88	1.00	5.000	0	77.6	70	130	4.140	6.48	20	

Sample ID **18011511-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **BatchQC** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425566**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18011210**
28-Feb-18

Client: TEKLAB Inc,
Project: 18011138 **BatchID:** **30908**

Sample ID **18011511-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **BatchQC** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425566**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.61	1.00	5.000	0	92.2	70	130				

Sample ID **18011408-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **BatchQC** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425581**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Sample ID **18011408-002adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **2/15/2018** RunNo: **80832**
Client ID: **BatchQC** Batch ID: **30908** TestNo: **E903.0** **E903-904** Analysis Date: **2/20/2018** SeqNo: **1425583**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	4.15	1.00						4.240	2.15	20	
Yield	1.00							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time.
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 18011138

Contact: Michael Austin Email: maustin@teklabinc.com

Requested Due Date: NTAT Billing/PO: 25707 Phone: (618) 344-1004 ext. 16

CSL 18011210-001012

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium											CPM
	18011138-001	1/17/18 14.45	HNO3	Groundwater	✓	✓	✓											20
	18011138-002	1/17/18 16.00	HNO3	Groundwater	✓	✓	✓											14
	18011138-003	1/17/18 17.10	HNO3	Groundwater	✓	✓	✓											14
	18011138-004	1/18/18 10.20	HNO3	Groundwater	✓	✓	✓											16
	18011138-005	1/18/18 12.20	HNO3	Groundwater	✓	✓	✓											22
	18011138-006	1/18/18 13.10	HNO3	Groundwater	✓	✓	✓											26
	18011138-007	1/18/18 14.15	HNO3	Groundwater	✓	✓	✓											31
	18011138-008	1/18/18 15.15	HNO3	Groundwater	✓	✓	✓											24
	18011138-009	1/18/18 16.05	HNO3	Groundwater	✓	✓	✓											16
	18011138-010	1/19/18 9.55	HNO3	Groundwater	✓	✓	✓											18
	18011138-011	1/19/18 11.30	HNO3	Groundwater	✓	✓	✓											19

*Relinquished By	Date/Time	Received By	Date/Time
[signature]		[signature]	1-25-18 1430

10.8
11.2
10.9

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization, and proprietary rights.
Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Please analyze for Radium (226, 228, and combined) by method EPA903.0/904.0
on your standard turnaround time.
Batch QC and CCR EDD are required with the report. Receipt summary requested.

Project# 18011138

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: NTAT Billing/PO: 25707 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Combined Radium										
	18011138-012	1/19/18 12.45	HNO3	Groundwater	✓	✓	✓										
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													

CRM
27

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]		[illegible]	1-25-18 1430

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Sample Log-In Check List

Client Name: **TEK-IL-62234-A** Work Order Number: **18011210** RcptNo: **1**

Logged by:	**Christopher Livengood**	**1/25/2018 2:30:00 PM**
Completed By:	**Christopher Livengood**	**1/25/2018 9:50:25 PM**
Reviewed By:	**Jennifer Woolf**	**1/29/2018 9:45:38 AM**

Chain of Custody

1. Were seals intact? Yes ☑ No ☐ Not Present ☐
2. Is Chain of Custody complete? Yes ☑ No ☐ Not Present ☐
3. How was the sample delivered? FedEx

Log In

4. Coolers are present? Yes ☑ No ☐ NA ☐
5. Was an attempt made to cool the samples? Yes ☐ No ☑ NA ☐
6. Were all samples received at a temperature of >0° C to 6.0°C Yes ☑ No ☐ NA ☐
7. Sample(s) in proper container(s)? Yes ☑ No ☐
8. Sufficient sample volume for indicated test(s)? Yes ☑ No ☐
9. Are samples (except VOA and ONG) properly preserved? Yes ☑ No ☐
10. Was preservative added to bottles? Yes ☐ No ☐ NA ☑
11. Is the headspace in the VOA vials less than 1/4 inch or 6 mm? Yes ☐ No ☐ No VOA Vials NA ☑
12. Were any sample containers received broken? Yes ☐ No ☑
13. Does paperwork match bottle labels? Yes ☑ No ☐
    (Note discrepancies on chain of custody)
14. Are matrices correctly identified on Chain of Custody? Yes ☑ No ☐
15. Is it clear what analyses were requested? Yes ☑ No ☐
16. Were all holding times able to be met? Yes ☑ No ☐
    (If no, notify customer for authorization.)

Special Handling (if applicable)

17. Was client notified of all discrepancies with this order? Yes ☐ No ☐ NA ☑

Person Notified:		Date	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

18. Additional remarks:

Cooler Information

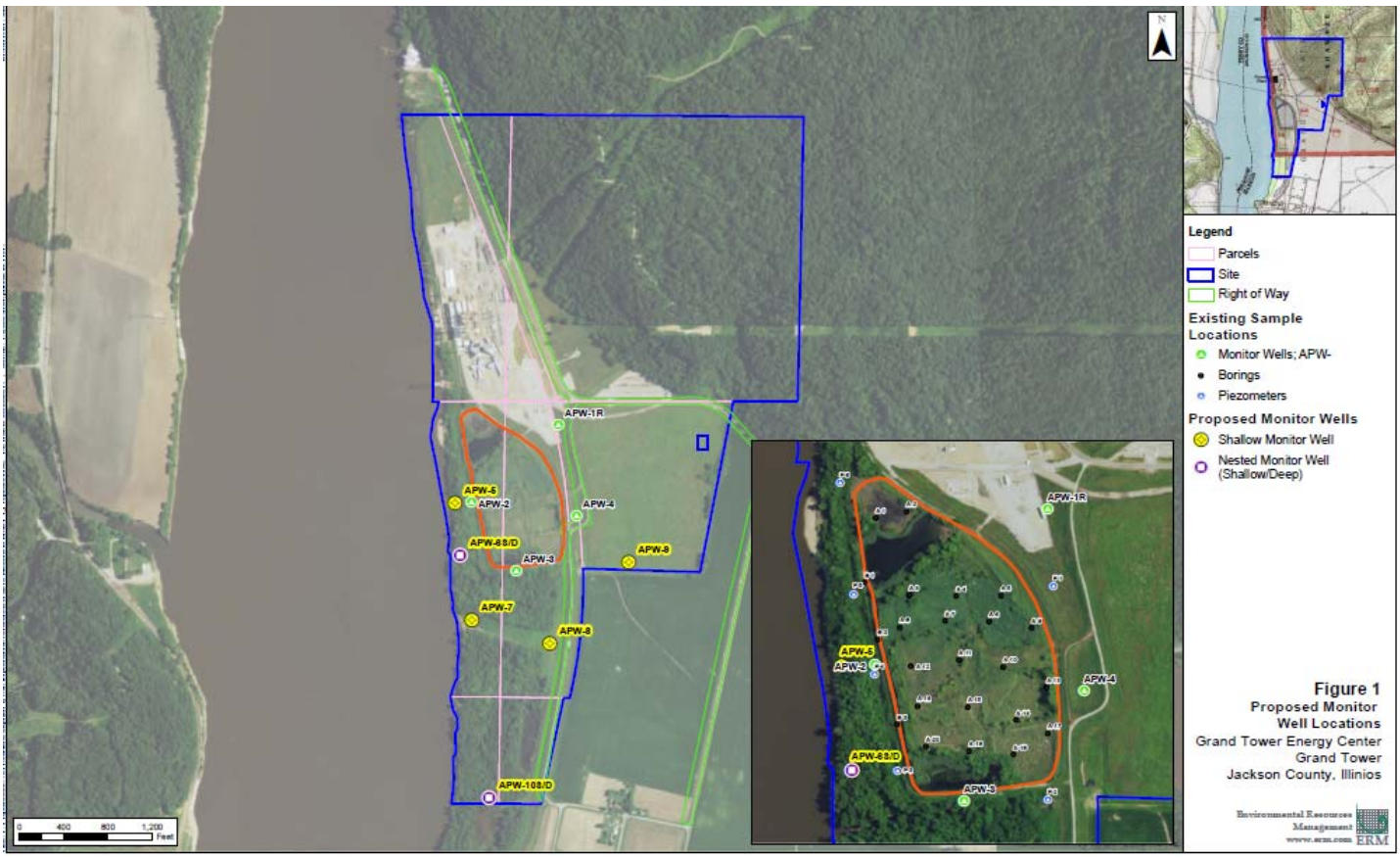
Cooler No	Temp ºC	Condition	Seal Intact	Seal No	Seal Date	Signed By
1	10.8	Good	Not Present			
2	11.2	Good	Not Present			
3	10.9	Good	Not Present			

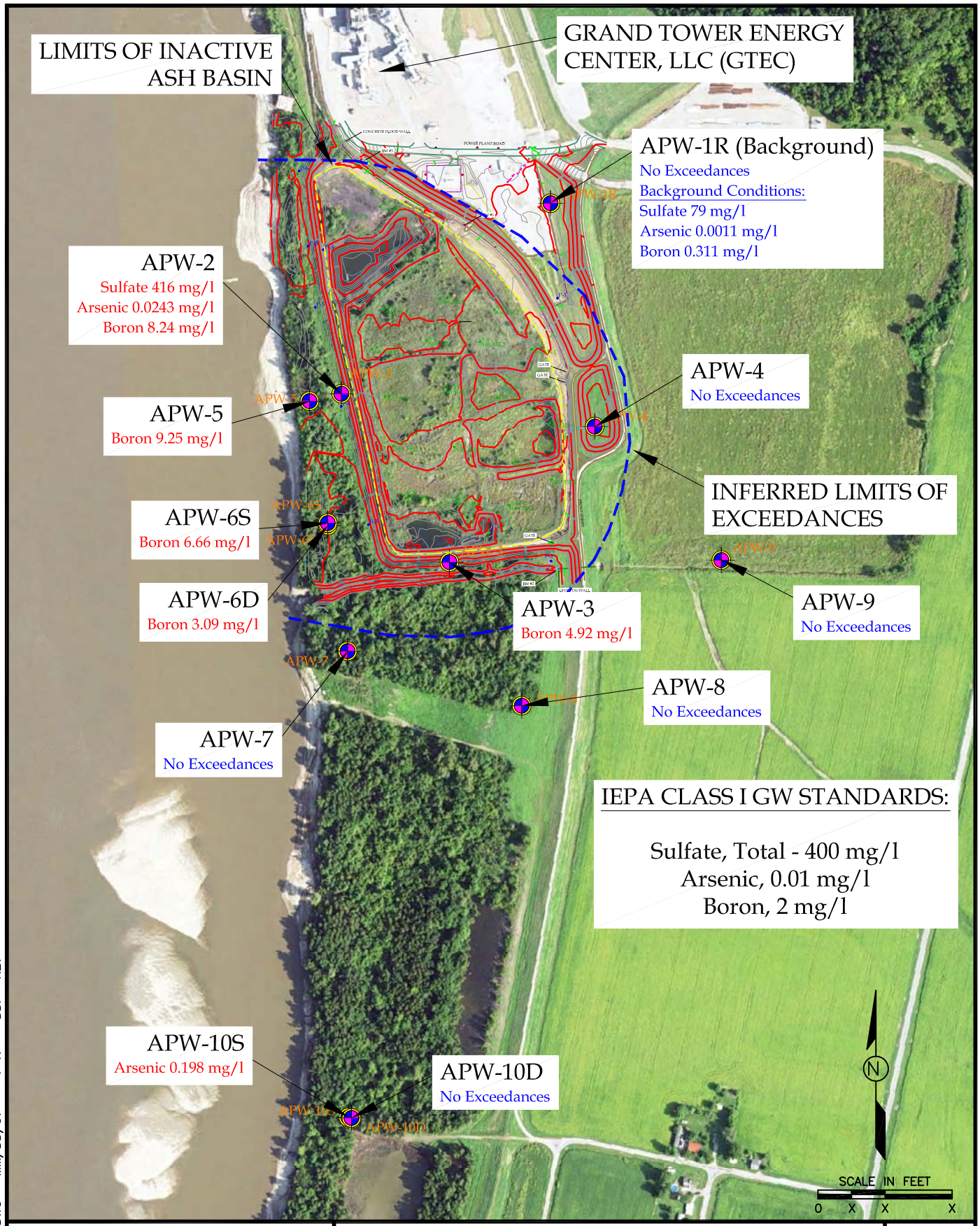
Event 8

Grand Tower Energy Center, LLC (GTEC) - Inactive Ash Basin - Groundwater Assessment

Sampling Event # 8 **Date Samples Collected:** **From** 2/7/18 **To** 2/9/18

			GTEC Inactive Ash Basin Monitoring Well #											
IEPA Class I GW Standards - Section 620.410			**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**	**APW**
Constituent	**Units**	**Standard**	**1R**	**2**	**3**	**4**	**5**	**6S**	**6D**	**7**	**8**	**9**	**10S**	**10D**
Chloride, Total	mg/L	200	10	12	23	11	16	25	17	15	11	**768**	6	16
Sulfate, Total	mg/L	400	79	**416**	194	92	378	220	189	64	37	25	<10	44
Fluoride, Total	mg/L	4	0.16	0.24	0.34	0.16	0.32	0.24	0.21	0.18	0.28	0.19	0.16	<0.1
Lab pH		6.5 - 9.0	6.52	6.96	7.78	7.2	7.18	7.02	7.2	6.88	7.04	7.33	6.91	7.03
Total Dissolved Solids	mg/L	1200	392	888	456	528	804	666	584	740	442	**3380**	762	512
Antimony	mg/L	0.006	<0.001	0.0021	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	mg/L	0.01	0.0011	**0.0243**	0.0018	0.0015	0.0019	0.0011	0.0096	<0.001	<0.001	0.0022	**0.198**	<0.001
Barium	mg/L	2	0.18	0.739	0.0806	0.144	0.195	0.205	0.148	0.359	0.215	0.125	0.585	0.357
Beryllium	mg/L	0.004	<0.001	0.0011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Boron	mg/L	2	0.311	**8.24**	**4.92**	1.18	**8.73**	**6.66**	**3.09**	0.318	0.132	0.255	0.582	0.0906
Cadmium	mg/L	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Calcium	No Standard		85.8	175	77.1	113	124	97.4	105	185	97.8	92	140	124
Chromium	mg/L	0.1	0.0015	**0.112**	<0.001	<0.001	<0.001	<0.001	0.0014	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	1	<0.001	0.011	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0026
Lead	mg/L	0.0075	<0.001	**0.0239**	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	No Standard		0.0159	0.0604	0.0239	0.0397	0.0397	0.0417	0.0162	0.0178	0.0196	0.0148	0.0297	0.014
Molybdenum	No Standard		<0.001	0.131	0.0849	0.057	0.249	0.323	0.0463	0.0036	<0.001	0.0224	<0.001	<0.001
Nickel	mg/L	0.1	0.0057	0.0725	0.001	0.003	<0.001	0.0012	0.0025	<0.001	0.0026	<0.001	<0.001	0.0053
Selenium	mg/L	0.05	0.0037	<0.001	<0.001	0.0102	<0.001	<0.001	<0.001	<0.001	0.013	0.0134	<0.001	0.0016
Thallium	mg/L	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Mercury, Total	mg/L	0.002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Radium-226	pCi/l	20	-0.04	0.97	0.31	0.13	0.26	0.15	0.2	0.24	0.39	0.13	0.24	0
Radium-228	pCi/l	20	0.22	0.99	0.06	0.64	0.35	0.89	0.24	0.53	0.49	0.23	0.93	0.59
Radium-226/228 Comb.	pCi/l	-----	0.18	1.96	0.37	0.77	0.61	1.04	0.44	0.77	0.88	0.36	1.17	0.59





PROJ_NUM_SITE.DWG MM/DD/07 1=X DDP REV

ERM

ERM NC, INC.

SAMPLING EVENT 8 – RESULTS
GTEC GMZ APPLICATION
GRAND TOWER ENERGY CENTER, LLC
JACKSON COUNTY, ILLINOIS

FIGURE
8

March 15, 2018

Brett Carney
ERM
68 Villa Grove
Springfield, IL 62712
TEL: (217) 529-0914
FAX:

RE: Grand Tower CCR GW **WorkOrder:** 18020574

Dear Brett Carney:

TEKLAB, INC received 12 samples on 2/9/2018 1:45:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Michael L. Austin
Project Manager
(618)344-1004 ex 16
MAustin@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

This reporting package includes the following:

Cover Letter	1
Report Contents	2
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Case Narrative	4
Accreditations	5
Laboratory Results	6
Sample Summary	18
Dates Report	19
Quality Control Results	24
Receiving Check List	35
Chain of Custody	Appended

Definitions

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilutions factors.
DNI	Did not ignite
DUP	Laboratory duplicate is an aliquot of a sample taken from the same container under laboratory conditions for independent processing and analysis independently of the original aliquot.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample, spiked with verified known amounts of analytes, is analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system. The acceptable recovery range is in the QC Package (provided upon request).
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	Method detection limit means the minimum concentration of a substance that can be measured and reported with 99% confidence that the analyte concentration is greater than zero.
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions. The acceptable recovery range is listed in the QC Package (provided upon request).
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
E -	Value above quantitation range	H -	Holding times exceeded
I -	Associated internal standard was outside method criteria	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Cooler Receipt Temp: 3.82 °C

Radium Analysis performed by Summit Environmental Technologies, Inc. in Cayuhoga Falls, OH. See attached report for results.

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

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Accreditations

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2019	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2018	Collinsville
Louisiana	LDEQ	166493	NELAP	6/30/2018	Collinsville
Louisiana	LDEQ	166578	NELAP	6/30/2018	Collinsville
Texas	TCEQ	T104704515-12-1	NELAP	7/31/2018	Collinsville
Arkansas	ADEQ	88-0966		3/14/2019	Collinsville
Illinois	IDPH	17584		5/31/2019	Collinsville
Indiana	ISDH	C-IL-06		1/31/2019	Collinsville
Kentucky	KDEP	98006		12/31/2018	Collinsville
Kentucky	UST	0073		1/31/2019	Collinsville
Louisiana	LDPH	LA170027		12/31/2018	Collinsville
Missouri	MDNR	930		1/31/2019	Collinsville
Missouri	MDNR	00930		5/31/2019	Collinsville
Oklahoma	ODEQ	9978		8/31/2018	Collinsville
Tennessee	TDEC	04905		1/31/2019	Collinsville

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-001
Client Sample ID: APW-1R
Matrix: GROUNDWATER
Collection Date: 02/07/2018 15:30

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**392**	mg/L	1	02/12/2018 16:03	R243453
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**79**	mg/L	5	02/15/2018 12:00	R243573
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.52**		1	02/09/2018 15:43	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	02/09/2018 19:04	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**10**	mg/L	1	02/12/2018 17:11	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	02/15/2018 0:26	138875
Barium	NELAP	0.0010		**0.180**	mg/L	5	02/15/2018 0:26	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Boron	NELAP	0.0250		**0.311**	mg/L	5	02/15/2018 21:54	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Calcium	NELAP	0.125	S	**85.8**	mg/L	5	02/19/2018 10:27	138875
Chromium	NELAP	0.0010		**0.0015**	mg/L	5	02/15/2018 0:26	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Lithium	*	0.0010		**0.0159**	mg/L	5	02/15/2018 0:26	138875
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Nickel	NELAP	0.0010		**0.0057**	mg/L	5	02/15/2018 0:26	138875
Selenium	NELAP	0.0010		**0.0037**	mg/L	5	02/15/2018 0:26	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:26	138875
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:55	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-002
Client Sample ID: APW-5
Matrix: GROUNDWATER
Collection Date: 02/07/2018 16:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**804**	mg/L	1	02/12/2018 16:04	R243453
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**378**	mg/L	20	02/12/2018 17:40	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.18**		1	02/09/2018 15:46	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.32**	mg/L	1	02/09/2018 19:06	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	02/12/2018 17:33	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Arsenic	NELAP	0.0010		**0.0019**	mg/L	5	02/14/2018 23:53	138875
Barium	NELAP	0.0010		**0.195**	mg/L	5	02/14/2018 23:53	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Boron	NELAP	0.0250		**8.73**	mg/L	5	02/15/2018 21:22	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Calcium	NELAP	0.125		**124**	mg/L	5	02/16/2018 17:39	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Lithium	*	0.0010		**0.0397**	mg/L	5	02/14/2018 23:53	138875
Molybdenum	NELAP	0.0010		**0.249**	mg/L	5	02/14/2018 23:53	138875
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/14/2018 23:53	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:01	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-003
Client Sample ID: APW-2
Matrix: GROUNDWATER
Collection Date: 02/07/2018 17:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**888**	mg/L	1	02/12/2018 16:04	R243453
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**416**	mg/L	20	02/12/2018 17:48	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.96**		1	02/09/2018 15:58	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	02/09/2018 19:10	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**12**	mg/L	1	02/12/2018 17:41	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**0.0021**	mg/L	5	02/15/2018 0:01	138875
Arsenic	NELAP	0.0010		**0.0243**	mg/L	5	02/15/2018 0:01	138875
Barium	NELAP	0.0010		**0.739**	mg/L	5	02/15/2018 0:01	138875
Beryllium	NELAP	0.0010		**0.0011**	mg/L	5	02/15/2018 21:33	138875
Boron	NELAP	0.0250		**8.24**	mg/L	5	02/15/2018 21:33	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:01	138875
Calcium	NELAP	0.125		**175**	mg/L	5	02/16/2018 17:47	138875
Chromium	NELAP	0.0010		**0.112**	mg/L	5	02/15/2018 0:01	138875
Cobalt	NELAP	0.0010		**0.0110**	mg/L	5	02/15/2018 0:01	138875
Lead	NELAP	0.0010		**0.0239**	mg/L	5	02/15/2018 0:01	138875
Lithium	*	0.0010		**0.0604**	mg/L	5	02/15/2018 0:01	138875
Molybdenum	NELAP	0.0010		**0.131**	mg/L	5	02/15/2018 0:01	138875
Nickel	NELAP	0.0010		**0.0725**	mg/L	5	02/15/2018 0:01	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:01	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:01	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:04	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-004
Client Sample ID: APW-6S
Matrix: GROUNDWATER
Collection Date: 02/08/2018 9:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**666**	mg/L	1	02/13/2018 14:06	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**220**	mg/L	10	02/12/2018 18:13	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.02**		1	02/09/2018 16:01	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	02/09/2018 19:11	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**25**	mg/L	1	02/12/2018 18:05	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Arsenic	NELAP	0.0010		**0.0011**	mg/L	5	02/15/2018 0:09	138875
Barium	NELAP	0.0010		**0.205**	mg/L	5	02/15/2018 0:09	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Boron	NELAP	0.0250		**6.66**	mg/L	5	02/15/2018 23:49	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Calcium	NELAP	0.125		**97.4**	mg/L	5	02/16/2018 17:55	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Lithium	*	0.0010		**0.0417**	mg/L	5	02/15/2018 0:09	138875
Molybdenum	NELAP	0.0010		**0.323**	mg/L	5	02/15/2018 0:09	138875
Nickel	NELAP	0.0010		**0.0012**	mg/L	5	02/15/2018 0:09	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 0:09	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:06	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-005
Client Sample ID: APW-6D
Matrix: GROUNDWATER
Collection Date: 02/08/2018 10:20

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**584**	mg/L	1	02/13/2018 14:06	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	100		**189**	mg/L	10	02/12/2018 18:21	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.20**		1	02/09/2018 16:03	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.21**	mg/L	1	02/09/2018 19:13	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**17**	mg/L	1	02/12/2018 18:13	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Arsenic	NELAP	0.0010		**0.0096**	mg/L	5	02/15/2018 1:56	138875
Barium	NELAP	0.0010		**0.148**	mg/L	5	02/15/2018 1:56	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Boron	NELAP	0.0250		**3.09**	mg/L	5	02/15/2018 23:59	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Calcium	NELAP	0.125		**105**	mg/L	5	02/16/2018 18:03	138875
Chromium	NELAP	0.0010		**0.0014**	mg/L	5	02/15/2018 1:56	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Lithium	*	0.0010		**0.0162**	mg/L	5	02/15/2018 1:56	138875
Molybdenum	NELAP	0.0010		**0.0463**	mg/L	5	02/15/2018 1:56	138875
Nickel	NELAP	0.0010		**0.0025**	mg/L	5	02/15/2018 1:56	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 1:56	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:08	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-006
Client Sample ID: APW-7
Matrix: GROUNDWATER
Collection Date: 02/08/2018 11:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**740**	mg/L	1	02/13/2018 14:06	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	20		**64**	mg/L	2	02/12/2018 18:29	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.88**		1	02/09/2018 16:06	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.18**	mg/L	1	02/09/2018 19:15	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**15**	mg/L	1	02/12/2018 18:21	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Barium	NELAP	0.0010		**0.359**	mg/L	5	02/15/2018 2:04	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Boron	NELAP	0.0250		**0.318**	mg/L	5	02/16/2018 0:10	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Calcium	NELAP	0.125		**185**	mg/L	5	02/16/2018 18:11	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Lithium	*	0.0010		**0.0178**	mg/L	5	02/15/2018 2:04	138875
Molybdenum	NELAP	0.0010		**0.0036**	mg/L	5	02/15/2018 2:04	138875
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:04	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:10	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

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Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-007
Client Sample ID: APW-8
Matrix: GROUNDWATER
Collection Date: 02/08/2018 12:35

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**442**	mg/L	1	02/13/2018 14:06	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**37**	mg/L	1	02/12/2018 18:34	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.04**		1	02/09/2018 16:07	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.28**	mg/L	1	02/09/2018 19:17	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	02/12/2018 18:32	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Barium	NELAP	0.0010		**0.215**	mg/L	5	02/15/2018 2:13	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Boron	NELAP	0.0250		**0.132**	mg/L	5	02/16/2018 0:20	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Calcium	NELAP	0.125		**97.8**	mg/L	5	02/16/2018 18:20	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Lithium	*	0.0010		**0.0196**	mg/L	5	02/15/2018 2:13	138875
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
Nickel	NELAP	0.0010		**0.0026**	mg/L	5	02/15/2018 2:13	138875
Selenium	NELAP	0.0010		**0.0130**	mg/L	5	02/15/2018 2:13	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:13	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 10:13	138877
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-008
Client Sample ID: APW-9
Matrix: GROUNDWATER
Collection Date: 02/08/2018 13:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**3380**	mg/L	1	02/13/2018 16:09	R243511
Estimated results due to sample contamination.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**25**	mg/L	1	02/12/2018 18:37	R243470
Results estimated due to contamination of sample with TISAB. Reagent blank analyzed with TISAB showed no contamination for SO4.								
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.33**		1	02/09/2018 16:10	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.19**	mg/L	1	02/09/2018 19:30	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	100		**768**	mg/L	20	02/15/2018 12:11	R243567
Sample contaminated with TISAB, results unreliable. TISAB blank showed substantial CL contamination.								
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Arsenic	NELAP	0.0010		**0.0022**	mg/L	5	02/15/2018 2:21	138875
Barium	NELAP	0.0010		**0.125**	mg/L	5	02/15/2018 2:21	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Boron	NELAP	0.0250		**0.255**	mg/L	5	02/16/2018 0:30	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Calcium	NELAP	0.125		**92.0**	mg/L	5	02/16/2018 18:28	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Lithium	*	0.0010		**0.0148**	mg/L	5	02/15/2018 2:21	138875
Molybdenum	NELAP	0.0010		**0.0224**	mg/L	5	02/15/2018 2:21	138875
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
Selenium	NELAP	0.0010		**0.0134**	mg/L	5	02/15/2018 2:21	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:21	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:10	138889
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-009
Client Sample ID: APW-4
Matrix: GROUNDWATER
Collection Date: 02/08/2018 14:55

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**528**	mg/L	1	02/13/2018 14:06	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**92**	mg/L	5	02/12/2018 19:04	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.20**		1	02/09/2018 16:11	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	02/09/2018 19:21	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**11**	mg/L	1	02/12/2018 18:43	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Arsenic	NELAP	0.0010		**0.0015**	mg/L	5	02/15/2018 2:29	138875
Barium	NELAP	0.0010		**0.144**	mg/L	5	02/15/2018 2:29	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Boron	NELAP	0.0250		**1.18**	mg/L	5	02/16/2018 0:41	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Calcium	NELAP	0.125		**113**	mg/L	5	02/16/2018 18:36	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
Lithium	*	0.0010		**0.0397**	mg/L	5	02/15/2018 2:29	138875
Molybdenum	NELAP	0.0010		**0.0570**	mg/L	5	02/15/2018 2:29	138875
Nickel	NELAP	0.0010		**0.0030**	mg/L	5	02/15/2018 2:29	138875
Selenium	NELAP	0.0010		**0.0102**	mg/L	5	02/15/2018 2:29	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:29	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:16	138889
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-010
Client Sample ID: APW-3
Matrix: GROUNDWATER
Collection Date: 02/08/2018 16:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**456**	mg/L	1	02/13/2018 14:07	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	50		**194**	mg/L	5	02/12/2018 19:20	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.78**		1	02/09/2018 16:14	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.34**	mg/L	1	02/09/2018 19:26	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**23**	mg/L	1	02/12/2018 19:07	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Arsenic	NELAP	0.0010		**0.0018**	mg/L	5	02/15/2018 2:37	138875
Barium	NELAP	0.0010		**0.0806**	mg/L	5	02/15/2018 2:37	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Boron	NELAP	0.0250		**4.92**	mg/L	5	02/16/2018 0:51	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Calcium	NELAP	0.125		**77.1**	mg/L	5	02/16/2018 18:44	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Lithium	*	0.0010		**0.0239**	mg/L	5	02/15/2018 2:37	138875
Molybdenum	NELAP	0.0010		**0.0849**	mg/L	5	02/15/2018 2:37	138875
Nickel	NELAP	0.0010		**0.0010**	mg/L	5	02/15/2018 2:37	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:37	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:19	138889
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-011
Client Sample ID: APW-10S
Matrix: GROUNDWATER
Collection Date: 02/09/2018 9:45

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**762**	mg/L	1	02/13/2018 14:07	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**< 10**	mg/L	1	02/15/2018 12:11	R243573
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**6.91**		1	02/09/2018 16:16	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.16**	mg/L	1	02/09/2018 19:27	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**6**	mg/L	1	02/15/2018 12:08	R243567
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Arsenic	NELAP	0.0010		**0.198**	mg/L	5	02/15/2018 2:46	138875
Barium	NELAP	0.0010		**0.585**	mg/L	5	02/15/2018 2:46	138875
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Boron	NELAP	0.0250		**0.582**	mg/L	5	02/16/2018 1:02	138875
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Calcium	NELAP	0.125		**140**	mg/L	5	02/16/2018 19:42	138875
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Cobalt	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Lithium	*	0.0010		**0.0297**	mg/L	5	02/15/2018 2:46	138875
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Nickel	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:46	138875
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:21	138889
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Laboratory Results

http://www.teklabinc.com/

Client: ERM
Work Order: 18020574
Client Project: Grand Tower CCR GW
Report Date: 15-Mar-18
Lab ID: 18020574-012
Client Sample ID: APW-10D
Matrix: GROUNDWATER
Collection Date: 02/09/2018 10:40

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**512**	mg/L	1	02/13/2018 14:07	R243511
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**44**	mg/L	1	02/12/2018 20:01	R243470
SW-846 9040B, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.03**		1	02/09/2018 16:17	R243347
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**< 0.10**	mg/L	1	02/09/2018 19:28	R243367
SW-846 9251 (TOTAL)								
Chloride	NELAP	5		**16**	mg/L	1	02/12/2018 19:59	R243398
SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)								
Antimony	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Arsenic	NELAP	0.0010		**< 0.0010**	mg/L	5	02/16/2018 3:49	138888
Barium	NELAP	0.0010		**0.357**	mg/L	5	02/15/2018 2:54	138888
Beryllium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Boron	NELAP	0.0250		**0.0906**	mg/L	5	02/16/2018 3:49	138888
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Calcium	NELAP	0.125	S	**124**	mg/L	5	02/16/2018 15:27	138888
Chromium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Cobalt	NELAP	0.0010		**0.0026**	mg/L	5	02/15/2018 2:54	138888
Lead	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Lithium	*	0.0010		**0.0140**	mg/L	5	02/15/2018 2:54	138888
Molybdenum	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Nickel	NELAP	0.0010		**0.0053**	mg/L	5	02/15/2018 2:54	138888
Selenium	NELAP	0.0010		**0.0016**	mg/L	5	02/15/2018 2:54	138888
Thallium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/15/2018 2:54	138888
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
SW-846 7470A (TOTAL)								
Mercury	NELAP	0.00020		**< 0.00020**	mg/L	1	02/12/2018 9:23	138889
EPA 903.0/904.0, RADIUM 226/228								
Radium-226	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682
Radium-228	*	0		**See attached**	pci/L	1	03/05/2018 0:00	R244682

Sample Summary

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Lab Sample ID	Client Sample ID	Matrix	Fractions	Collection Date
18020574-001	APW-1R	Groundwater	3	02/07/2018 15:30
18020574-002	APW-5	Groundwater	3	02/07/2018 16:50
18020574-003	APW-2	Groundwater	3	02/07/2018 17:40
18020574-004	APW-6S	Groundwater	3	02/08/2018 9:15
18020574-005	APW-6D	Groundwater	3	02/08/2018 10:20
18020574-006	APW-7	Groundwater	3	02/08/2018 11:45
18020574-007	APW-8	Groundwater	3	02/08/2018 12:35
18020574-008	APW-9	Groundwater	3	02/08/2018 13:40
18020574-009	APW-4	Groundwater	3	02/08/2018 14:55
18020574-010	APW-3	Groundwater	3	02/08/2018 16:15
18020574-011	APW-10S	Groundwater	3	02/09/2018 9:45
18020574-012	APW-10D	Groundwater	3	02/09/2018 10:40

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
18020574-001A	APW-1R	02/07/2018 15:30	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/12/2018 16:03
	SW-846 9036 (Total)				02/15/2018 12:00
	SW-846 9040B, Laboratory Analyzed				02/09/2018 15:43
	SW-846 9214 (Total)				02/09/2018 19:04
	SW-846 9251 (Total)				02/12/2018 17:11
18020574-001B	APW-1R	02/07/2018 15:30	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-001C	APW-1R	02/07/2018 15:30	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 0:26
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 21:54
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/19/2018 10:27
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 9:55
18020574-002A	APW-5	02/07/2018 16:50	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/12/2018 16:04
	SW-846 9036 (Total)				02/12/2018 17:40
	SW-846 9040B, Laboratory Analyzed				02/09/2018 15:46
	SW-846 9214 (Total)				02/09/2018 19:06
	SW-846 9251 (Total)				02/12/2018 17:33
18020574-002B	APW-5	02/07/2018 16:50	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-002C	APW-5	02/07/2018 16:50	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/14/2018 23:53
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 21:22
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 17:39
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:01
18020574-003A	APW-2	02/07/2018 17:40	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/12/2018 16:04
	SW-846 9036 (Total)				02/12/2018 17:48
	SW-846 9040B, Laboratory Analyzed				02/09/2018 15:58
	SW-846 9214 (Total)				02/09/2018 19:10
	SW-846 9251 (Total)				02/12/2018 17:41
18020574-003B	APW-2	02/07/2018 17:40	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-003C	APW-2	02/07/2018 17:40	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 0:01

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 21:33
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 17:47
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:04
18020574-004A	APW-6S	02/08/2018 9:15	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:06
	SW-846 9036 (Total)				02/12/2018 18:13
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:01
	SW-846 9214 (Total)				02/09/2018 19:11
	SW-846 9251 (Total)				02/12/2018 18:05
18020574-004B	APW-6S	02/08/2018 9:15	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-004C	APW-6S	02/08/2018 9:15	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 0:09
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 23:49
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 17:55
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:06
18020574-005A	APW-6D	02/08/2018 10:20	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:06
	SW-846 9036 (Total)				02/12/2018 18:21
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:03
	SW-846 9214 (Total)				02/09/2018 19:13
	SW-846 9251 (Total)				02/12/2018 18:13
18020574-005B	APW-6D	02/08/2018 10:20	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-005C	APW-6D	02/08/2018 10:20	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 1:56
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 23:59
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:03
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:08
18020574-006A	APW-7	02/08/2018 11:45	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:06
	SW-846 9036 (Total)				02/12/2018 18:29
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:06
	SW-846 9214 (Total)				02/09/2018 19:15
	SW-846 9251 (Total)				02/12/2018 18:21
18020574-006B	APW-7	02/08/2018 11:45	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00

Dates Report

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
18020574-006C	APW-7	02/08/2018 11:45	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:04
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 0:10
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:11
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:10
18020574-007A	APW-8	02/08/2018 12:35	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:06
	SW-846 9036 (Total)				02/12/2018 18:34
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:07
	SW-846 9214 (Total)				02/09/2018 19:17
	SW-846 9251 (Total)				02/12/2018 18:32
18020574-007B	APW-8	02/08/2018 12:35	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-007C	APW-8	02/08/2018 12:35	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:13
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 0:20
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:20
	SW-846 7470A (Total)			02/09/2018 15:03	02/12/2018 10:13
18020574-008A	APW-9	02/08/2018 13:40	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 16:09
	SW-846 9036 (Total)				02/12/2018 18:37
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:10
	SW-846 9214 (Total)				02/09/2018 19:30
	SW-846 9251 (Total)				02/15/2018 12:11
18020574-008B	APW-9	02/08/2018 13:40	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-008C	APW-9	02/08/2018 13:40	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:21
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 0:30
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:28
	SW-846 7470A (Total)			02/09/2018 15:06	02/12/2018 9:10
18020574-009A	APW-4	02/08/2018 14:55	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:06
	SW-846 9036 (Total)				02/12/2018 19:04
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:11
	SW-846 9214 (Total)				02/09/2018 19:21
	SW-846 9251 (Total)				02/12/2018 18:43

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

Sample ID	Client Sample ID / Test Name	Collection Date	Received Date	Prep Date/Time	Analysis Date/Time
18020574-009B	APW-4	02/08/2018 14:55	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-009C	APW-4	02/08/2018 14:55	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:29
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 0:41
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:36
	SW-846 7470A (Total)			02/09/2018 15:06	02/12/2018 9:16
18020574-010A	APW-3	02/08/2018 16:15	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:07
	SW-846 9036 (Total)				02/12/2018 19:20
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:14
	SW-846 9214 (Total)				02/09/2018 19:26
	SW-846 9251 (Total)				02/12/2018 19:07
18020574-010B	APW-3	02/08/2018 16:15	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-010C	APW-3	02/08/2018 16:15	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:37
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 0:51
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 18:44
	SW-846 7470A (Total)			02/09/2018 15:06	02/12/2018 9:19
18020574-011A	APW-10S	02/09/2018 9:45	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:07
	SW-846 9036 (Total)				02/15/2018 12:11
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:16
	SW-846 9214 (Total)				02/09/2018 19:27
	SW-846 9251 (Total)				02/15/2018 12:08
18020574-011B	APW-10S	02/09/2018 9:45	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-011C	APW-10S	02/09/2018 9:45	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/15/2018 2:46
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 1:02
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 14:56	02/16/2018 19:42
	SW-846 7470A (Total)			02/09/2018 15:06	02/12/2018 9:21
18020574-012A	APW-10D	02/09/2018 10:40	02/09/2018 13:45		
	Standard Methods 2540 C (Total) 1997				02/13/2018 14:07
	SW-846 9036 (Total)				02/12/2018 20:01

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Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Sample ID	Client Sample ID	Collection Date	Received Date		
	Test Name			**Prep Date/Time**	**Analysis Date/Time**
	SW-846 9040B, Laboratory Analyzed				02/09/2018 16:17
	SW-846 9214 (Total)				02/09/2018 19:28
	SW-846 9251 (Total)				02/12/2018 19:59
18020574-012B	APW-10D	02/09/2018 10:40	02/09/2018 13:45		
	EPA 903.0/904.0, Radium 226/228				03/05/2018 0:00
18020574-012C	APW-10D	02/09/2018 10:40	02/09/2018 13:45		
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 15:01	02/15/2018 2:54
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 15:01	02/16/2018 3:49
	SW-846 3005A, 6020A, Metals by ICPMS (Total)			02/09/2018 15:01	02/16/2018 15:27
	SW-846 7470A (Total)			02/09/2018 15:06	02/12/2018 9:23

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R243453 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						02/12/2018
Total Dissolved Solids	20		**< 20**						02/12/2018

Batch R243453 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**968**	1000	0	96.8	90	110	02/12/2018

Batch R243453 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1010**	1000	0	100.8	90	110	02/12/2018

Batch R243453 **SampType:** DUP Units **mg/L** RPD Limit **5**
SampID: 18020574-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**378**				392.0	3.64	02/12/2018

Batch R243511 **SampType:** MBLK Units **mg/L**
SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**< 20**						02/13/2018
Total Dissolved Solids	20		**< 20**						02/13/2018
Total Dissolved Solids	20		**< 20**						02/13/2018

Batch R243511 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**996**	1000	0	99.6	90	110	02/13/2018

Batch R243511 **SampType:** LCSQC Units **mg/L**
SampID: LCSQC

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1010**	1000	0	101.0	90	110	02/13/2018
Total Dissolved Solids	20		**976**	1000	0	97.6	90	110	02/13/2018

Batch R243511 **SampType:** MS Units **mg/L**
SampID: 18020574-012AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Total Dissolved Solids	20		**1020**	500.0	512.0	101.2	85	115	02/13/2018

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

STANDARD METHODS 2540 C (TOTAL) 1997

Batch R243511 **SampType:** MSD Units **mg/L** RPD Limit **5**

SampID: 18020574-012AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**1000**	500.0	512.0	97.6	1018	1.78	02/13/2018

Batch R243511 **SampType:** DUP Units **mg/L** RPD Limit **5**

SampID: 18020574-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Total Dissolved Solids	20		**3440**				3378	1.76	02/13/2018

SW-846 9036 (TOTAL)

Batch R243470 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						02/12/2018

Batch R243470 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**19**	20.00	0	97.4	90	110	02/12/2018

Batch R243470 **SampType:** MS Units **mg/L**

SampID: 18020574-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**243**	50.00	193.5	98.3	85	115	02/12/2018

Batch R243470 **SampType:** MSD Units **mg/L** RPD Limit **10**

SampID: 18020574-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**244**	50.00	193.5	101.0	242.7	0.55	02/12/2018

Batch R243573 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**< 10**						02/15/2018

Batch R243573 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	10		**18**	20.00	0	90.5	90	110	02/15/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 18020574
Report Date: 15-Mar-18

SW-846 9036 (TOTAL)

Batch R243573 **SampType:** MS Units **mg/L**
SampID: 18020574-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Sulfate	50		**130**	50.00	78.64	103.7	85	115	02/15/2018

Batch R243573 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18020574-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Sulfate	50		**128**	50.00	78.64	98.2	130.5	2.11	02/15/2018

SW-846 9040B, LABORATORY ANALYZED

Batch R243347 **SampType:** LCS Units
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Lab pH	1.00		**6.98**	7.000	0	99.7	99.1	100.8	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**
SampID: 18020574-001ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.59**				6.520	1.07	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**
SampID: 18020574-002ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.24**				7.180	0.83	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**
SampID: 18020574-003ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.98**				6.960	0.29	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**
SampID: 18020574-004ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.06**				7.020	0.57	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**
SampID: 18020574-005ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.21**				7.200	0.14	02/09/2018

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

SW-846 9040B, LABORATORY ANALYZED

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-006ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.86**				6.880	0.29	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-007ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.05**				7.040	0.14	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-008ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.35**				7.330	0.27	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-009ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.20**				7.200	0.00	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-010ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.78**				7.780	0.00	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-011ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**6.92**				6.910	0.14	02/09/2018

Batch R243347 **SampType:** DUP Units RPD Limit **10**

SampID: 18020574-012ADUP

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Lab pH	1.00		**7.04**				7.030	0.14	02/09/2018

SW-846 9214 (TOTAL)

Batch R243367 **SampType:** MBLK Units **mg/L**

SampID: MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**< 0.10**						02/09/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM
Client Project: Grand Tower CCR GW

Work Order: 18020574
Report Date: 15-Mar-18

SW-846 9214 (TOTAL)

Batch R243367 **SampType:** LCS Units **mg/L**
SampID: LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**1.01**	1.000	0	101.1	90	110	02/09/2018

Batch R243367 **SampType:** MS Units **mg/L**
SampID: 18020574-002AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.36**	2.000	0.3190	101.8	85	115	02/09/2018

Batch R243367 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18020574-002AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.39**	2.000	0.3190	103.8	2.355	1.64	02/09/2018

Batch R243367 **SampType:** MS Units **mg/L**
SampID: 18020574-009AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Fluoride	0.10		**2.29**	2.000	0.1580	106.4	85	115	02/09/2018

Batch R243367 **SampType:** MSD Units **mg/L** RPD Limit **10**
SampID: 18020574-009AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Fluoride	0.10		**2.34**	2.000	0.1580	109.0	2.287	2.21	02/09/2018

SW-846 9251 (TOTAL)

Batch R243398 **SampType:** MBLK Units **mg/L**
SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						02/12/2018

Batch R243398 **SampType:** LCS Units **mg/L**
SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	101.4	90	110	02/12/2018

Batch R243398 **SampType:** MS Units **mg/L**
SampID: 18020574-001AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**29**	20.00	9.530	97.6	85	115	02/12/2018

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

SW-846 9251 (TOTAL)

Batch R243398 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 18020574-001AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**30**	20.00	9.530	100.1	29.06	1.67	02/12/2018

Batch R243398 **SampType:** MS Units **mg/L**

SampID: 18020574-010AMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**44**	20.00	22.76	105.0	85	115	02/12/2018

Batch R243398 **SampType:** MSD Units **mg/L** RPD Limit **15**

SampID: 18020574-010AMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Chloride	5		**43**	20.00	22.76	103.6	43.77	0.69	02/12/2018

Batch R243567 **SampType:** MBLK Units **mg/L**

SampID: ICB/MBLK

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**< 5**						02/15/2018

Batch R243567 **SampType:** MBLK Units **mg/Kg**

SampID: MB-R243567

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	50		**< 50**						02/15/2018

Batch R243567 **SampType:** LCS Units **mg/L**

SampID: ICV/LCS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	5		**20**	20.00	0	101.4	90	110	02/15/2018

Batch R243567 **SampType:** LCS Units **mg/Kg**

SampID: LCS-R243567

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Chloride	50		**< 50**	20.00	0	101.4	90	110	02/15/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138875 **SampType:** MBLK Units **mg/L**

SampID: MBLK-138875

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/16/2018
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	02/16/2018
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	02/13/2018
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Lithium	0.0010		**< 0.0010**	0.00100	0	73.2	-100	100	02/13/2018
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/13/2018

Batch 138875 **SampType:** LCS Units **mg/L**

SampID: LCS-138875

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.485**	0.5000	0	97.0	80	120	02/15/2018
Arsenic	0.0010		**0.483**	0.5000	0	96.5	80	120	02/15/2018
Barium	0.0010		**1.87**	2.000	0	93.5	80	120	02/15/2018
Beryllium	0.0010		**0.0526**	0.05000	0	105.2	80	120	02/15/2018
Boron	0.0250		**0.502**	0.5000	0	100.4	80	120	02/15/2018
Cadmium	0.0010		**0.0486**	0.05000	0	97.2	80	120	02/15/2018
Calcium	0.125		**2.30**	2.500	0	92.0	80	120	02/16/2018
Chromium	0.0010		**0.200**	0.2000	0	100.2	80	120	02/15/2018
Cobalt	0.0010		**0.498**	0.5000	0	99.6	80	120	02/15/2018
Lead	0.0010		**0.497**	0.5000	0	99.3	80	120	02/15/2018
Lithium	0.0010		**0.521**	0.5000	0	104.1	80	120	02/15/2018
Molybdenum	0.0010		**0.496**	0.5000	0	99.2	80	120	02/15/2018
Nickel	0.0010		**0.505**	0.5000	0	100.9	80	120	02/15/2018
Selenium	0.0010		**0.477**	0.5000	0	95.5	80	120	02/15/2018
Thallium	0.0010		**0.240**	0.2500	0	96.0	80	120	02/15/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138875 **SampType:** MS Units **mg/L**

SampID: 18020574-001CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.485**	0.5000	0	97.1	75	125	02/15/2018
Arsenic	0.0010		**0.487**	0.5000	0.001144	97.1	75	125	02/15/2018
Barium	0.0010		**2.03**	2.000	0.1800	92.5	75	125	02/15/2018
Beryllium	0.0010		**0.0501**	0.05000	0	100.2	75	125	02/15/2018
Boron	0.0250		**0.815**	0.5000	0.3107	100.8	75	125	02/15/2018
Cadmium	0.0010		**0.0474**	0.05000	0	94.7	75	125	02/15/2018
Calcium	0.125	S	**87.6**	2.500	85.81	69.7	75	125	02/19/2018
Chromium	0.0010		**0.200**	0.2000	0.001502	99.1	75	125	02/15/2018
Cobalt	0.0010		**0.486**	0.5000	0.0004217	97.1	75	125	02/15/2018
Lead	0.0010		**0.493**	0.5000	0.0002646	98.6	75	125	02/15/2018
Lithium	0.0010		**0.517**	0.5000	0.01594	100.1	75	125	02/15/2018
Molybdenum	0.0010		**0.492**	0.5000	0.0004313	98.3	75	125	02/15/2018
Nickel	0.0010		**0.493**	0.5000	0.005679	97.4	75	125	02/15/2018
Selenium	0.0010		**0.480**	0.5000	0.003741	95.2	75	125	02/15/2018
Thallium	0.0010		**0.238**	0.2500	0	95.3	75	125	02/15/2018

Batch 138875 **SampType:** MSD Units **mg/L** RPD Limit **20**

SampID: 18020574-001CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.491**	0.5000	0	98.1	0.4855	1.07	02/15/2018
Arsenic	0.0010		**0.483**	0.5000	0.001144	96.4	0.4868	0.79	02/15/2018
Barium	0.0010		**2.05**	2.000	0.1800	93.3	2.030	0.75	02/15/2018
Beryllium	0.0010		**0.0504**	0.05000	0	100.8	0.05009	0.58	02/15/2018
Boron	0.0250		**0.785**	0.5000	0.3107	94.8	0.8146	3.71	02/15/2018
Cadmium	0.0010		**0.0484**	0.05000	0	96.8	0.04737	2.17	02/15/2018
Calcium	0.125	S	**86.6**	2.500	85.81	32.9	87.56	1.06	02/19/2018
Chromium	0.0010		**0.198**	0.2000	0.001502	98.5	0.1996	0.57	02/15/2018
Cobalt	0.0010		**0.479**	0.5000	0.0004217	95.8	0.4862	1.42	02/15/2018
Lead	0.0010		**0.487**	0.5000	0.0002646	97.4	0.4934	1.22	02/15/2018
Lithium	0.0010		**0.518**	0.5000	0.01594	100.4	0.5167	0.29	02/15/2018
Molybdenum	0.0010		**0.496**	0.5000	0.0004313	99.0	0.4919	0.75	02/15/2018
Nickel	0.0010		**0.488**	0.5000	0.005679	96.6	0.4926	0.84	02/15/2018
Selenium	0.0010		**0.478**	0.5000	0.003741	94.8	0.4796	0.36	02/15/2018
Thallium	0.0010		**0.236**	0.2500	0	94.3	0.2382	1.01	02/15/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch 138888 **SampType:** MBLK Units **mg/L**

SampID: MBLK-138888

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Arsenic	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Barium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Beryllium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Boron	0.0250		**< 0.0250**	0.02500	0	0	-100	100	02/15/2018
Cadmium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Calcium	0.125		**< 0.125**	0.1250	0	0	-100	100	02/15/2018
Chromium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Cobalt	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Lead	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Lithium	0.0010		**< 0.0010**	0.00100	0	55.7	-100	100	02/15/2018
Molybdenum	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Nickel	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Selenium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018
Thallium	0.0010		**< 0.0010**	0.00100	0	0	-100	100	02/15/2018

Batch 138888 **SampType:** LCS Units **mg/L**

SampID: LCS-138888

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.495**	0.5000	0	99.1	80	120	02/15/2018
Arsenic	0.0010		**0.496**	0.5000	0	99.1	80	120	02/15/2018
Barium	0.0010		**1.89**	2.000	0	94.5	80	120	02/15/2018
Beryllium	0.0010		**0.0510**	0.05000	0	102.0	80	120	02/15/2018
Boron	0.0250		**0.518**	0.5000	0	103.7	80	120	02/15/2018
Cadmium	0.0010		**0.0492**	0.05000	0	98.4	80	120	02/15/2018
Calcium	0.125		**2.44**	2.500	0	97.6	80	120	02/15/2018
Chromium	0.0010		**0.200**	0.2000	0	100.0	80	120	02/15/2018
Cobalt	0.0010		**0.499**	0.5000	0	99.9	80	120	02/15/2018
Lead	0.0010		**0.506**	0.5000	0	101.2	80	120	02/15/2018
Lithium	0.0010		**0.516**	0.5000	0	103.2	80	120	02/15/2018
Molybdenum	0.0010		**0.501**	0.5000	0	100.2	80	120	02/15/2018
Nickel	0.0010		**0.508**	0.5000	0	101.5	80	120	02/15/2018
Selenium	0.0010		**0.503**	0.5000	0	100.6	80	120	02/15/2018
Thallium	0.0010		**0.240**	0.2500	0	95.9	80	120	02/15/2018

Client: ERM **Work Order:** 18020574

Client Project: Grand Tower CCR GW **Report Date:** 15-Mar-18

SW-846 3005A, 6020A, METALS BY ICPMS (TOTAL)

Batch **138888** **SampType:** **MS** Units **mg/L**

SampID: 18020574-012CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Antimony	0.0010		**0.488**	0.5000	0	97.6	75	125	02/15/2018
Arsenic	0.0010		**0.494**	0.5000	0.0008693	98.7	75	125	02/16/2018
Barium	0.0010		**2.24**	2.000	0.3568	94.2	75	125	02/15/2018
Beryllium	0.0010		**0.0510**	0.05000	0	102.0	75	125	02/15/2018
Boron	0.0250		**0.576**	0.5000	0.09059	97.2	75	125	02/16/2018
Cadmium	0.0010		**0.0484**	0.05000	0	96.7	75	125	02/15/2018
Calcium	0.125	S	**121**	2.500	123.5	-84.6	75	125	02/16/2018
Chromium	0.0010		**0.199**	0.2000	0.0007635	99.3	75	125	02/15/2018
Cobalt	0.0010		**0.485**	0.5000	0.002595	96.4	75	125	02/15/2018
Lead	0.0010		**0.496**	0.5000	0	99.1	75	125	02/15/2018
Lithium	0.0010		**0.523**	0.5000	0.01403	101.8	75	125	02/15/2018
Molybdenum	0.0010		**0.499**	0.5000	0.0007157	99.7	75	125	02/15/2018
Nickel	0.0010		**0.491**	0.5000	0.005294	97.2	75	125	02/15/2018
Selenium	0.0010		**0.485**	0.5000	0.001558	96.8	75	125	02/15/2018
Thallium	0.0010		**0.239**	0.2500	0	95.8	75	125	02/15/2018

Batch **138888** **SampType:** **MSD** Units **mg/L** RPD Limit **20**

SampID: 18020574-012CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Antimony	0.0010		**0.501**	0.5000	0	100.1	0.4879	2.56	02/15/2018
Arsenic	0.0010		**0.498**	0.5000	0.0008693	99.4	0.4944	0.73	02/16/2018
Barium	0.0010		**2.29**	2.000	0.3568	96.6	2.241	2.15	02/15/2018
Beryllium	0.0010		**0.0528**	0.05000	0	105.7	0.05100	3.54	02/15/2018
Boron	0.0250		**0.611**	0.5000	0.09059	104.0	0.5764	5.79	02/16/2018
Cadmium	0.0010		**0.0501**	0.05000	0	100.1	0.04837	3.47	02/15/2018
Calcium	0.125		**126**	2.500	123.5	100.6	121.4	3.74	02/16/2018
Chromium	0.0010		**0.203**	0.2000	0.0007635	101.2	0.1994	1.90	02/15/2018
Cobalt	0.0010		**0.495**	0.5000	0.002595	98.4	0.4847	2.04	02/15/2018
Lead	0.0010		**0.503**	0.5000	0	100.6	0.4956	1.53	02/15/2018
Lithium	0.0010		**0.538**	0.5000	0.01403	104.7	0.5228	2.81	02/15/2018
Molybdenum	0.0010		**0.514**	0.5000	0.0007157	102.7	0.4992	2.92	02/15/2018
Nickel	0.0010		**0.503**	0.5000	0.005294	99.6	0.4912	2.45	02/15/2018
Selenium	0.0010		**0.489**	0.5000	0.001558	97.4	0.4853	0.72	02/15/2018
Thallium	0.0010		**0.243**	0.2500	0	97.1	0.2395	1.35	02/15/2018

SW-846 7470A (TOTAL)

Batch **138877** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-138877

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	.000200	0	0	-100	100	02/12/2018

Quality Control Results

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

SW-846 7470A (TOTAL)

Batch **138877** **SampType:** **LCS** Units **mg/L**

SampID: LCS-138877

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00507**	0.005000	0	101.3	85	115	02/12/2018

Batch **138889** **SampType:** **MBLK** Units **mg/L**

SampID: MBLK-138889

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**< 0.00020**	0.000200	0	0	-100	100	02/12/2018

Batch **138889** **SampType:** **LCS** Units **mg/L**

SampID: LCS-138889

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00522**	0.005000	0	104.5	85	115	02/12/2018

Batch **138889** **SampType:** **MS** Units **mg/L**

SampID: 18020574-008CMS

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	Low Limit	High Limit	Date Analyzed
Mercury	0.00020		**0.00508**	0.005000	0	101.6	75	125	02/12/2018

Batch **138889** **SampType:** **MSD** Units **mg/L** RPD Limit **15**

SampID: 18020574-008CMSD

Analyses	RL	Qual	Result	Spike	SPK Ref Val	%REC	RPD Ref Val	%RPD	Date Analyzed
Mercury	0.00020		**0.00519**	0.005000	0	103.9	0.005081	2.21	02/12/2018

Receiving Check List

http://www.teklabinc.com/

Client: ERM

Client Project: Grand Tower CCR GW

Work Order: 18020574

Report Date: 15-Mar-18

Carrier: Matt Halley

Received By: AMD

Completed by: Amber Dilallo
On: 09-Feb-18

Reviewed by: Elizabeth A. Hurley
On: 09-Feb-18

Pages to follow: Chain of custody 2 Extra pages included 24

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 3.82
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☐	No ☑		
Reported field parameters measured:	Field ☐	Lab ☑	NA ☐	

Sample analyses to be measured in the field and/or within 15 minutes of collection were analyzed in the lab as soon as practicable. These analyses include Chlorine (demand, free and/or residual), Carbon Dioxide, Dissolved Oxygen, Ferrous Iron, pH, and Sulfite.

Container/Temp Blank temperature in compliance?	Yes ☑	No ☐	

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

Additional Nitric Acid was needed in APW-7 and APW-10S upon arrival at the laboratory. - adilallo - 2/9/2018 2:11:15 PM

CHAIN OF CUSTODY

pg. 1 of 2 Work order # 18020574

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: [X] ICE [ ] BLUE ICE [ ] NO ICE 3.8 °C
Preserved in: [X] LAB [ ] FIELD
FOR LAB USE ONLY
Lab Notes: Added HNO3 to Radium for APW7 + APW10S, HNO3 to metals for APW7. KF 2/9/18

Are these samples known to be involved in litigation? If yes, a surcharge will apply [ ] Yes [ ] No
Are these samples known to be hazardous? [ ] Yes [ ] No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. [ ] Yes [ ] No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number: Grand Tower CCR GW
Sample Collector's Name: M. Halley

Results Requested: [ ] Standard [ ] 1-2 Day (100% Surcharge) [ ] Other ____ [ ] 3 Day (50% Surcharge)
Billing Instructions:

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
18020574-001	APW-1R	2/7/18 1530	1	3												X	X	X	X	X	X	X	X
002	APW-5	1650																					
003	APW-2	1740																					
004	APW-6S	2/8/18 0915																					
005	APW-6D	1020																					
006	APW-7	1145																					
007	APW-8	1235																					
008	APW-9	1340																					
009	APW-4	1455																					
010	APW-3	1615																					

Relinquished By	Date/Time	Received By	Date/Time
[signature]	2/9/18 1345	[signature]	2/9/18 1345

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 42194

KF 2/9/18

CHAIN OF CUSTODY

pg. 2 of 2 Work order # 18020574

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: ERM
Address: 68 Villa Grove
City / State / Zip Springfield, IL 62712
Contact: Brett Carney **Phone:** (217) 529-0914
E-Mail: brett.carney@erm.com **Fax:**

Samples on: ☒ ICE ☒ BLUE ICE ☒ NO ICE _____ °C
Preserved in: ☒ LAB ☒ FIELD
FOR LAB USE ONLY
Lab Notes

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Total Metals: ICP/MS 6020 (Sb As Ba Be B Cd Ca Cr Co Pb Li Mo Ni Se Tl) and Hg

Subcontract to Summit, Ohio
Sub COC needs: Please analyze for Radium (226, 228, and combined) by Method EPA 903.0/904.0 on your standard Turnaround Time. Please include negative values where applicable (no ND). Batch QC and CCR EDD are required with the report. Receipt Summary requested.

Project Name/Number
Grand Tower CCR GW

Sample Collector's Name
M. Halley

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other _____ ☐ 3 Day (50% Surcharge)

Billing Instructions

Lab Use Only	Sample Identification	Date/Time Sampled	# and Type of Containers: UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	MATRIX: Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Chloride	Fluoride	pH	Radium 226/228/Combined	Sulfate	TDS	Total Metals
18020574-011	APW-105	2/9/18 0945	1	3												X	X	X	X	X	X	X	X
012	APW-107	2/9/18 1040	1	3												X	X	X	X	X	X	X	X

Relinquished By	Date/Time	Received By	Date/Time
[signature]	2/9/18 1345	[signature]	2/9/18 1345

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 42194

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

March 14, 2018

Mike Austin
TEKLAB Inc,
5445 Horseshoe lake Road
Collinsville, IL 62234
TEL: 618 344 1004
FAX: 618 344 1005

RE: 18020574

Dear Mike Austin:

Order No.: 18020734

Summit Environmental Technologies, Inc. received 12 sample(s) on 2/13/2018 for the analyses presented in the following report.

Jennifer Woolf
Project Manager
3310 Win St.
Cuyahoga Falls, Ohio 44223

Arkansas 88-0735, California 07256CA, Colorado, Connecticut PH-0108, Delaware, Florida NELAC E87688, Georgia E87688, Idaho OH00923, Illinois 200061, Indiana C-OH-13, Kansas E-10347, Kentucky (Underground Storage Tank) 3, Kentucky 90146, Louisiana 04061, Maryland 339, Minnesota 409711, New Hampshire 2996, New Jersey OH006, New York 11777, North Carolina 39705 and 631, North Dakota R-201, Oklahoma 9940, Oregon OH200001, Rhode Island LA000317, South Carolina 92016001, Texas T104704466-11-5, Utah OH009232011-1, Virginia VELAP 9456, Washington C891

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Case Narrative

WO#: **18020734**
Date: **3/14/2018**

CLIENT: TEKLAB Inc,
Project: 18020574

This report in its entirety consists of the following documents: Cover Letter, Case Narrative, Analytical Results, QC Summary Report, Applicable Accreditation Information, Chain-of-Custody, Cooler Receipt Form, and other applicable forms as necessary. All documents contain the Summit Environmental Technologies, Inc., Work Order Number assigned to this report.

Summit Environmental Technologies, Inc., holds the accreditations/certifications listed at the bottom of the cover letter that may or may not pertain to this report. State Certificates and Scopes of Accreditation are attached as applicable. Results provided in this report for any parameter not listed on the Scope of Accreditation should be considered “not certified.”

The information contained in this analytical report is the sole property of Summit Environmental Technologies, Inc. and that of the customer. It cannot be reproduced in any form without the consent of Summit Environmental Technologies, Inc. or the customer for which this report was issued. The results contained in this report are only representative of the samples received. Conditions can vary at different times and at different sampling conditions. Summit Environmental Technologies, Inc. is not responsible for use or interpretation of the data included herein.

All results for Solid Samples are reported on an "as received" or "wet weight" basis unless indicated as "dry weight" using the "-dry" designation on the reporting units.

This report is believed to meet all of the requirements of the accrediting agency, where applicable. Any comments or problems with the analytical events associated with this report are noted below.

Summit Environmental Technologies, In
3310 Win S
Cuyahoga Falls, Ohio 4422
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Qualifiers and Acronyms

WO#: **18020734**
Date: **3/14/2018**

These commonly used Qualifiers and Acronyms may or may not be present in this report.

Qualifiers

U	The compound was analyzed for but was not detected.
J	The reported value is greater than the Method Detection Limit but less than the Reporting Limit.
H	The hold time for sample preparation and/or analysis was exceeded.
D	The result is reported from a dilution.
E	The result exceeded the linear range of the calibration or is estimated due to interference.
MC	The result is below the Minimum Compound Limit.
*****	The result exceeds the Regulatory Limit or Maximum Contamination Limit.
m	Manual integration was used to determine the area response.
d	Manual integration in which peak was deleted
N	The result is presumptive based on a Mass Spectral library search assuming a 1:1 response.
P	The second column confirmation exceeded 25% difference.
C	The result has been confirmed by GC/MS.
X	The result was not confirmed when GC/MS Analysis was performed.
B/MB+	The analyte was detected in the associated blank.
G	The ICB or CCB contained reportable amounts of analyte.
QC-/+	The CCV recovery failed low (-) or high (+).
R/QDR	The RPD was outside of accepted recovery limits.
QL-/+	The LCS or LCSD recovery failed low (-) or high (+).
QLR	The LCS/LCSD RPD was outside of accepted recovery limits.
QM-/+	The MS or MSD recovery failed low (-) or high (+).
QMR	The MS/MSD RPD was outside of accepted recovery limits.
QV-/+	The ICV recovery failed low (-) or high (+).
S	The spike result was outside of accepted recovery limits.
Z	Deviation; A deviation from the method was performed; Please refer to the Case Narrative for additional information

Acronyms

ND	Not Detected	**RL**	Reporting Limit
QC	Quality Control	**MDL**	Method Detection Limit
MB	Method Blank	**LOD**	Level of Detection
LCS	Laboratory Control Sample	**LOQ**	Level of Quantitation
LCSD	Laboratory Control Sample Duplicate	**PQL**	Practical Quantitation Limit
QCS	Quality Control Sample	**CRQL**	Contract Required Quantitation Limit
DUP	Duplicate	**PL**	Permit Limit
MS	Matrix Spike	**RegLvl**	Regulatory Limit
MSD	Matrix Spike Duplicate	**MCL**	Maximum Contamination Limit
RPD	Relative Percent Different	**MinCL**	Minimum Compound Limit
ICV	Initial Calibration Verification	**RA**	Reanalysis
ICB	Initial Calibration Blank	**RE**	Reextraction
CCV	Continuing Calibration Verification	**TIC**	Tentatively Identified Compound
CCB	Continuing Calibration Blank	**RT**	Retention Time
RLC	Reporting Limit Check	**CF**	Calibration Factor
DF	Dilution Factor	**RF**	Response Factor

This list of Qualifiers and Acronyms reflects the most commonly utilized Qualifiers and Acronyms for reporting. Please refer to the Analytical Notes in the Case Narrative for any Qualifiers or Acronyms that do not appear in this list or for additional information regarding the use of these Qualifiers on reported data.

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Workorder Sample Summary

WO#: **18020734**
14-Mar-18

CLIENT: TEKLAB Inc,
Project: 18020574

Lab SampleID	Client Sample ID	Tag No	Date Collected	Date Received	Matrix
18020734-001	18020574-001		2/7/2018 3:30:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-002	18020574-002		2/7/2018 4:50:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-003	18020574-003		2/7/2018 5:40:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-004	18020574-004		2/8/2018 9:15:00 AM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-005	18020574-005		2/8/2018 10:20:00 AM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-006	18020574-006		2/8/2018 11:45:00 AM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-007	18020574-007		2/8/2018 12:35:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-008	18020574-008		2/8/2018 1:40:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-009	18020574-009		2/8/2018 2:55:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-010	18020574-010		2/8/2018 4:15:00 PM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-011	18020574-011		2/9/2018 9:45:00 AM	2/13/2018 4:00:00 PM	Non-Potable Water
18020734-012	18020574-012		2/9/2018 10:40:00 AM	2/13/2018 4:00:00 PM	Non-Potable Water

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DATES REPORT

WO#: **18020734**

14-Mar-18

Client: TEKLAB Inc,
Project: 18020574

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18020734-001A	18020574-001	2/7/2018 3:30:00 PM	Non-Potable Water	Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:13:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:07:00 PM
18020734-002A	18020574-002	2/7/2018 4:50:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:14:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:08:00 PM
18020734-003A	18020574-003	2/7/2018 5:40:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:14:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:08:00 PM
18020734-004A	18020574-004	2/8/2018 9:15:00 AM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:15:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-005A	18020574-005	2/8/2018 10:20:00 AM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:15:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-006A	18020574-006	2/8/2018 11:45:00 AM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:15:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-007A	18020574-007	2/8/2018 12:35:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:17:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-008A	18020574-008	2/8/2018 1:40:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:21:00 PM

Original

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DATES REPORT

WO#: **18020734**

14-Mar-18

Client: TEKLAB Inc,
Project: 18020574

Sample ID	Client Sample ID	Collection Date	Matrix	Test Name	Leachate Date	Prep Date	Analysis Date
18020734-008A	18020574-008	2/8/2018 1:40:00 PM	Non-Potable Water	Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-009A	18020574-009	2/8/2018 2:55:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:21:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-010A	18020574-010	2/8/2018 4:15:00 PM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 12:21:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-011A	18020574-011	2/9/2018 9:45:00 AM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 2:02:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM
18020734-012A	18020574-012	2/9/2018 10:40:00 AM		Combined Radium (EPA903+904)			3/6/2018
				Radium-226 (EPA 903.0)		3/1/2018 8:52:57 AM	3/6/2018 2:02:00 PM
				Radium-228 (EPA 904.0)		3/1/2018 8:52:57 AM	3/5/2018 3:40:00 PM

Original

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/7/2018 3:30:00 PM
Project: 18020574
Lab ID: 18020734-001
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-001

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.22	2.00	U	pCi/L	± 0.42	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	-0.04	1.00	U	pCi/L	± 0.08	1	3/6/2018 12:13:00 PM
Yield	1					1	3/6/2018 12:13:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.22	1.00	U	pCi/L	± 0.34	1	3/5/2018 3:07:00 PM
Yield	1					1	3/5/2018 3:07:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/7/2018 4:50:00 PM
Project: 18020574
Lab ID: 18020734-002
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-002

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.61	2.00	U	pCi/L	± 0.53	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.26	1.00	U	pCi/L	± 0.13	1	3/6/2018 12:14:00 PM
Yield	1					1	3/6/2018 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.35	1.00	U	pCi/L	± 0.4	1	3/5/2018 3:08:00 PM
Yield	0.93					1	3/5/2018 3:08:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/7/2018 5:40:00 PM
Project: 18020574
Lab ID: 18020734-003
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-003

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	1.96	2.00	U	pCi/L	± 0.73	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.97	1.00	J	pCi/L	± 0.23	1	3/6/2018 12:14:00 PM
Yield	1					1	3/6/2018 12:14:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.99	1.00	J	pCi/L	± 0.5	1	3/5/2018 3:08:00 PM
Yield	1					1	3/5/2018 3:08:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 9:15:00 AM
Project: 18020574
Lab ID: 18020734-004
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-004

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.04	2.00	U	pCi/L	± 0.49	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.15	1.00	U	pCi/L	± 0.11	1	3/6/2018 12:15:00 PM
Yield	1					1	3/6/2018 12:15:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.89	1.00	J	pCi/L	± 0.38	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 10:20:00 AM
Project: 18020574
Lab ID: 18020734-005
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-005

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.44	2.00	U	pCi/L	± 0.47	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.2	1.00	U	pCi/L	± 0.13	1	3/6/2018 12:15:00 PM
Yield	1					1	3/6/2018 12:15:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.24	1.00	U	pCi/L	± 0.34	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 11:45:00 AM
Project: 18020574
Lab ID: 18020734-006
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-006

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.77	2.00	U	pCi/L	± 0.54	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.24	1.00	U	pCi/L	± 0.14	1	3/6/2018 12:15:00 PM
Yield	1					1	3/6/2018 12:15:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.53	1.00	U	pCi/L	± 0.4	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 12:35:00 PM
Project: 18020574
Lab ID: 18020734-007
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-007

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.88	2.00	U	pCi/L	± 0.58	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.39	1.00	U	pCi/L	± 0.15	1	3/6/2018 12:17:00 PM
Yield	1					1	3/6/2018 12:17:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.49	1.00	U	pCi/L	± 0.43	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 1:40:00 PM
Project: 18020574
Lab ID: 18020734-008
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-008

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.36	2.00	U	pCi/L	± 0.5	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.13	1.00	U	pCi/L	± 0.13	1	3/6/2018 12:21:00 PM
Yield	1					1	3/6/2018 12:21:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.23	1.00	U	pCi/L	± 0.37	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 2:55:00 PM
Project: 18020574
Lab ID: 18020734-009
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-009

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.77	2.00	U	pCi/L	± 0.59	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.13	1.00	U	pCi/L	± 0.11	1	3/6/2018 12:21:00 PM
Yield	1					1	3/6/2018 12:21:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.64	1.00	U	pCi/L	± 0.48	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/8/2018 4:15:00 PM
Project: 18020574
Lab ID: 18020734-010
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-010

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	0.37	2.00	U	pCi/L	± 0.51	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.31	1.00	U	pCi/L	± 0.15	1	3/6/2018 12:21:00 PM
Yield	1					1	3/6/2018 12:21:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.06	1.00	U	pCi/L	± 0.36	1	3/5/2018 3:40:00 PM
Yield	0.92					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

Summit Environmental Technologies, Inc.
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Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/9/2018 9:45:00 AM
Project: 18020574
Lab ID: 18020734-011
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-011

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)					**CALCULATION**		Analyst: **BRD**
Radium-226/Radium-228	1.17	2.00	U	pCi/L	± 0.65	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0.24	1.00	U	pCi/L	± 0.13	1	3/6/2018 2:02:00 PM
Yield	1					1	3/6/2018 2:02:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.93	1.00	J	pCi/L	± 0.52	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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Website: http://www.settek.com

Analytical Report

(consolidated)

WO#: **18020734**

Date Reported: **3/14/2018**

CLIENT: TEKLAB Inc,
Collection Date: 2/9/2018 10:40:00 AM
Project: 18020574
Lab ID: 18020734-012
Matrix: NON-POTABLE WATER
Client Sample ID 18020574-012

Analyses	Result	PQL	Qual	Units	Uncertainty	DF	Date Analyzed
RAD226/228 COMBINED RADIUM (EPA903+904)				**CALCULATION**			Analyst: **BRD**
Radium-226/Radium-228	0.59	2.00	U	pCi/L	± 0.5	1	3/6/2018
RAD226/228 RADIUM-226 (EPA 903.0)					**E903.0**	**E903-904**	Analyst: **BRD**
Radium-226	0	1.00	U	pCi/L	± 0.07	1	3/6/2018 2:02:00 PM
Yield	1					1	3/6/2018 2:02:00 PM
RAD226/228 RADIUM-228 (EPA 904.0)					**E904.0**	**E903-904**	Analyst: **BRD**
Radium-228	0.59	1.00	U	pCi/L	± 0.43	1	3/5/2018 3:40:00 PM
Yield	1					1	3/5/2018 3:40:00 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	M	Manual Integration used to determine area response
MC	Value is below Minimum Compound Limit.	N	Tentatively identified compounds
ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit

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QC SUMMARY REPORT

WO#: **18020734**
14-Mar-18

Client: TEKLAB Inc,
Project: 18020574 **BatchID:** **31126**

Sample ID **mb-31126** SampType: **MBLK** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **PBW** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443615**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0						U
Yield	1.00			0	0						

Sample ID **lcs-31126** SampType: **LCS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **LCSW** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443616**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.08	1.00	5.000	0	81.5	70	130				
Yield	0.690			0	0						

Sample ID **lcsd-31126** SampType: **LCSD** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **LCSS02** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443617**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.21	1.00	5.000	0	84.2	70	130	4.075	3.26	20	
Yield	1.00			0	0			0.6900	36.7		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18020734**
14-Mar-18

Client: TEKLAB Inc,
Project: 18020574 **BatchID:** **31126**

Sample ID **18020851-001aMS** SampType: **MS** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **BatchQC** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443620**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	4.03	1.00	5.000	0	80.6	70	130				
Yield	0.660			1.000	0						

Sample ID **18020734-001adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **18020574-001** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443628**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0	0	20	U
Yield	1.00			0	0			1.000	0		

Sample ID **18020734-012adup** SampType: **DUP** TestCode: **Radium-228_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81424**
Client ID: **18020574-012** Batch ID: **31126** TestNo: **E904.0** **E903-904** Analysis Date: **3/5/2018** SeqNo: **1443640**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-228	ND	1.00		0	0			0	0	20	U
Yield	1.00			0	0			1.000	0		

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

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QC SUMMARY REPORT

WO#: **18020734**
14-Mar-18

Client: TEKLAB Inc,
Project: 18020574 **BatchID:** **31126**

Sample ID **mb-31126** SampType: **MBLK** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **PBW** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443696**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00									U
Yield	1.00										

Sample ID **lcs-31126** SampType: **LCS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **LCSW** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443697**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	6.46	1.00	5.000	0	129	70	130				

Sample ID **lcsd-31126** SampType: **LCSD** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **LCSS02** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443698**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	6.10	1.00	5.000	0	122	70	130	6.460	5.73	20	

Sample ID **18020851-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **BatchQC** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443701**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

Summit Environmental Technologies, Inc.
3310 Win St.
Cuyahoga Falls, Ohio 44223
TEL: (330) 253-8211 FAX: (330) 253-4489
Website: http://www.settek.com

QC SUMMARY REPORT

WO#: **18020734**
14-Mar-18

Client: TEKLAB Inc,
Project: 18020574 **BatchID:** **31126**

Sample ID **18020851-001aMS** SampType: **MS** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **BatchQC** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443701**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	5.75	1.00	5.000	0	115	70	130				

Sample ID **18020734-001adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **18020574-001** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443709**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Sample ID **18020734-012adup** SampType: **DUP** TestCode: **Radium-226_** Units: **pCi/L** Prep Date: **3/1/2018** RunNo: **81425**
Client ID: **18020574-012** Batch ID: **31126** TestNo: **E903.0** **E903-904** Analysis Date: **3/6/2018** SeqNo: **1443721**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Radium-226	ND	1.00						0	0	20	U
Yield	1.00							1.000	0	0	

Qualifiers:

*	Value exceeds Maximum Contaminant Level.	B	Analyte detected in the associated Method Blank	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	M	Manual Integration used to determine
MC	Value is below Minimum Compound Limit.	ND	Not Detected	O	RSD is greater than RSDlimit
P	Second column confirmation exceeds	PL	Permit Limit	R	RPD outside accepted recovery limits

Original

18020734-001 012 CSL

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: **Please issue reports and invoices via email only**
Please analyze for Radium (226 and 228) by method EPA903.0/904.0
on your standard turnaround time.
Batch QC is required with the report.

Project# 18020574

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25786 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Radium 226/228											
	18020574-001	2/7/18 15:30	HNO3	Groundwater	✓	✓	✓											21
	18020574-002	2/7/18 16:50	HNO3	Groundwater	✓	✓	✓											20
	18020574-003	2/7/18 17:40	HNO3	Groundwater	✓	✓	✓											14
	18020574-004	2/8/18 9:15	HNO3	Groundwater	✓	✓	✓											13
	18020574-005	2/8/18 10:20	HNO3	Groundwater	✓	✓	✓											19
	18020574-006	2/8/18 11:45	HNO3	Groundwater	✓	✓	✓											18
	18020574-007	2/8/18 12:35	HNO3	Groundwater	✓	✓	✓											14
	18020574-008	2/8/18 13:40	HNO3	Groundwater	✓	✓	✓											15
	18020574-009	2/8/18 14:55	HNO3	Groundwater	✓	✓	✓											19
	18020574-010	2/8/18 16:15	HNO3	Groundwater	✓	✓	✓											19
	18020574-~~010~~ 011	2/9/18 9:45	HNO3	Groundwater	✓	✓	✓											18

TE OMO 2/9/18

*Relinquished By	Date/Time	Received By	Date/Time
Amber Dicillo		[signature]	2-13-18 900pm

3 cooler fed ex 11, 10, 10.1

Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization, and proprietary rights. Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

SubCocRevA
3/2/2016

Pg ___ of ___

TEKLAB, INC. Chain of Custody

5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Are the samples chilled? YES ☐ NO ☑ With: ☐ Ice ☐ Blue Ice Preserved in: ☐ Lab ☐ Field

Teklab Inc
5445 Horseshoe Lake Road
Collinsville, IL 62234

Cooler Temp: ____ Sampler: Client QC Level: 3

Comments: **Please Issue reports and invoices via email only**
Please analyze for Radium (226 and 228) by method EPA903.0/904.0
on your standard turnaround time.
Batch QC is required with the report.

Project# 18020574

Contact: Michael Austin Email: maustin@teklabinc.com
Requested Due Date: 20 business days or less Billing/PO: 25786 Phone: (618) 344-1004 ext. 16

PLEASE NOTE:

NELAP accreditation is required on the requested analytes and must be documented as such on the final report. If your laboratory does not currently hold a NELAP accreditation for the requested method and/or analytes, please contact Teklab immediately. If your laboratory loses accreditation or is suspended for any analyte/method during the life of the contract, you must contact Teklab immediately.

Lab Use	Sample ID	Sample Date/Time	Preservative	Matrix	Radium 226	Radium 228	Radium 226/228										
	18020574-012	2/9/18 10:40	HNO3	Groundwater	✓	✓	✓										cpm 30
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													
			HNO3	Groundwater													

*Relinquished By	Date/Time	Received By	Date/Time
[illegible]		[illegible]	2-13-18 4:00pm

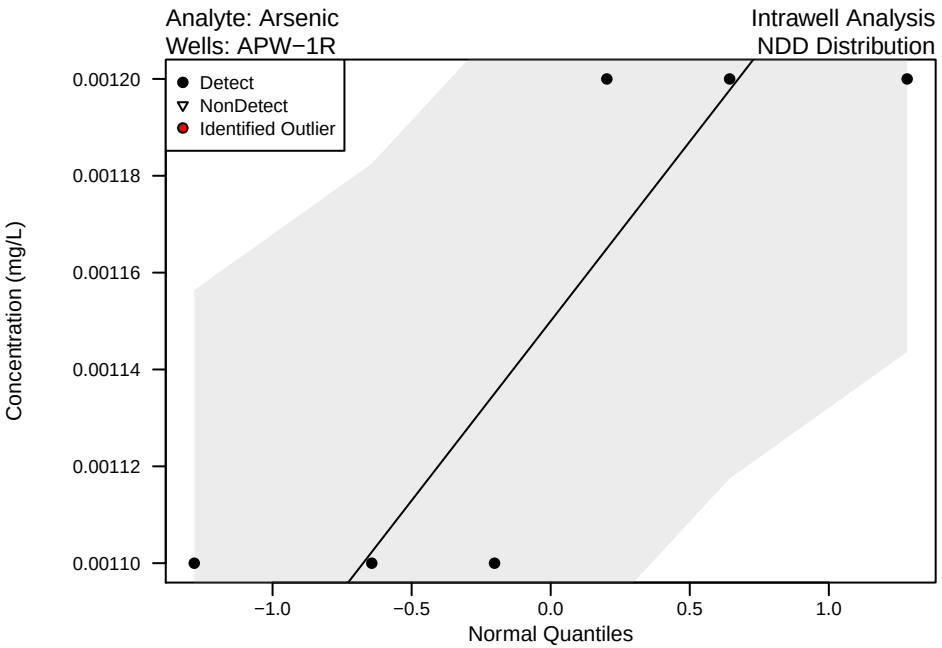
Teklab maintains a strict policy of client confidentiality and as such does not provide client/sampler information without proper authorization. and proprietary rights, Teklab, Inc. protects clients' confidential information as directed by local, state or federal laws. (Teklab QAM Section 9.1, TNI V1 M2 Section 4.1.5 c)

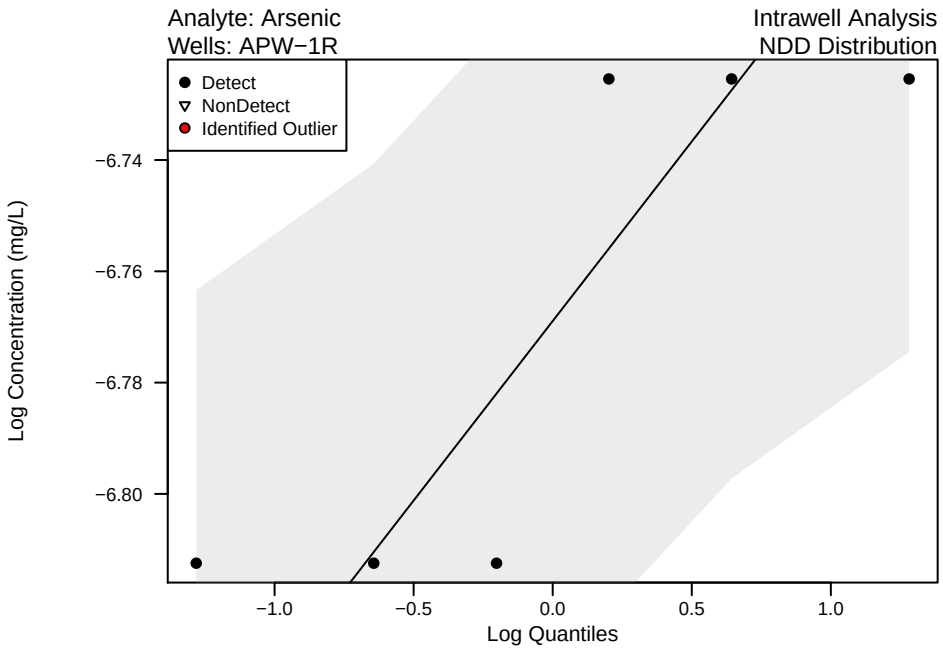
SubCocRevA
3/2/2016

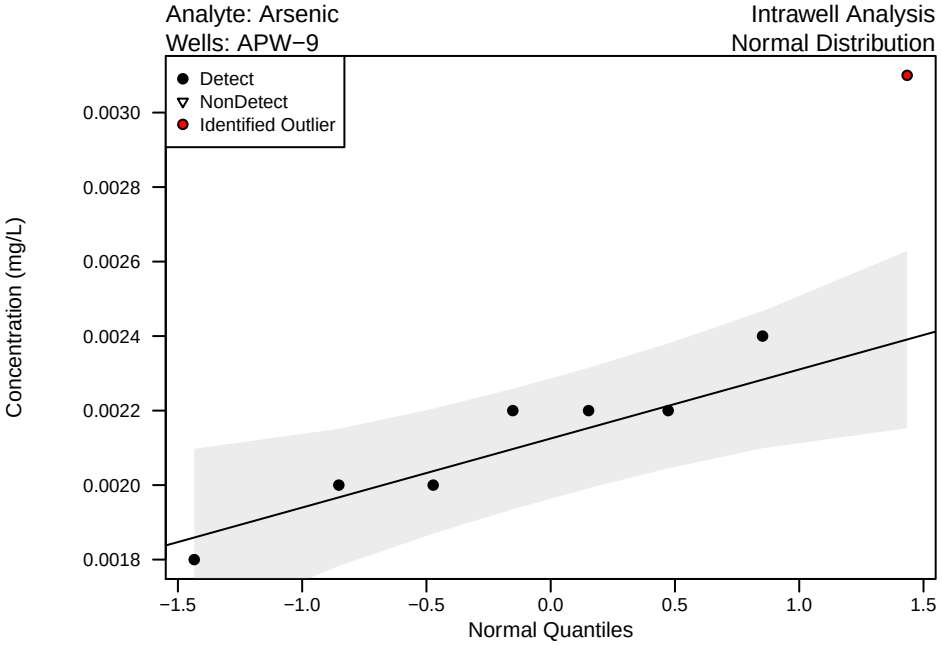
Appendix C
Documentation of Statistical Analyses

QQ Plots of Upgradient Wells

QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:







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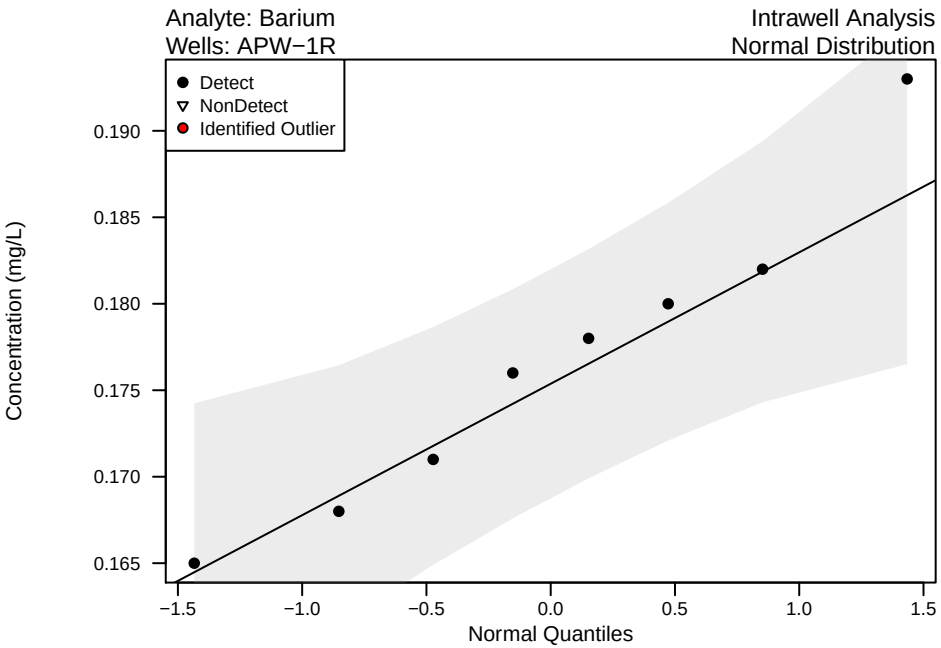
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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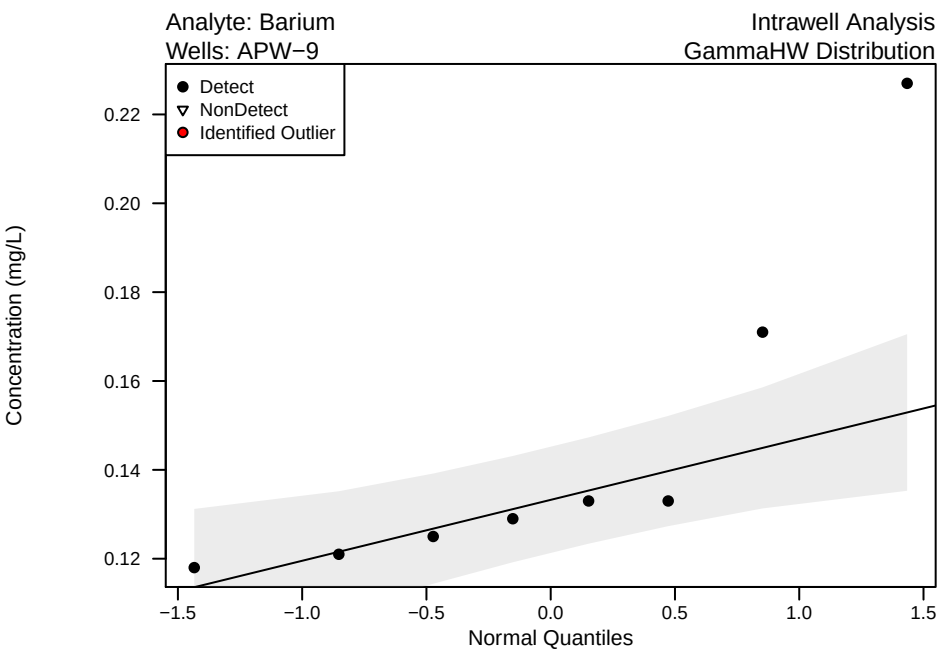
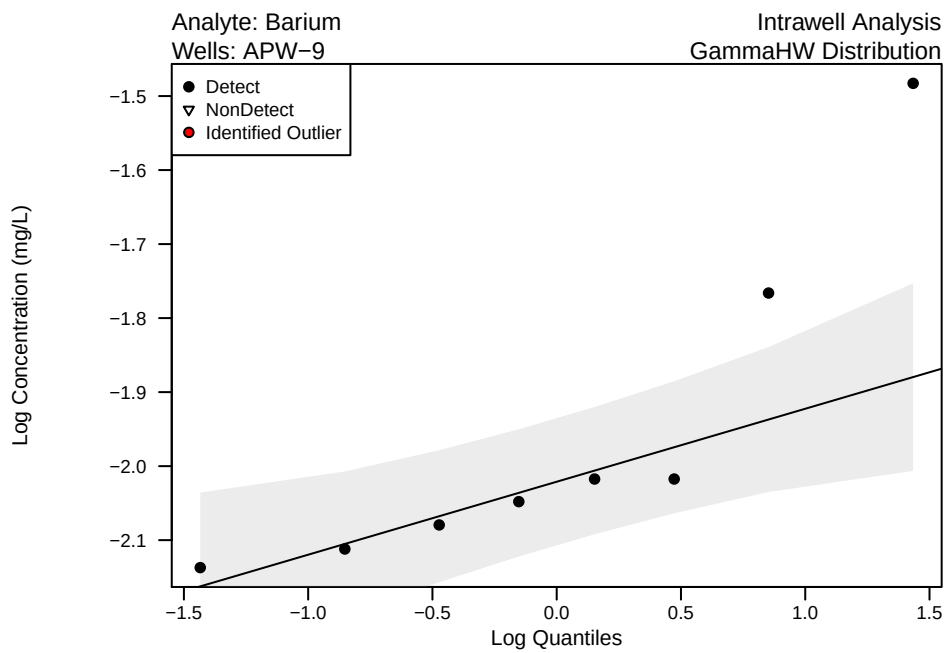
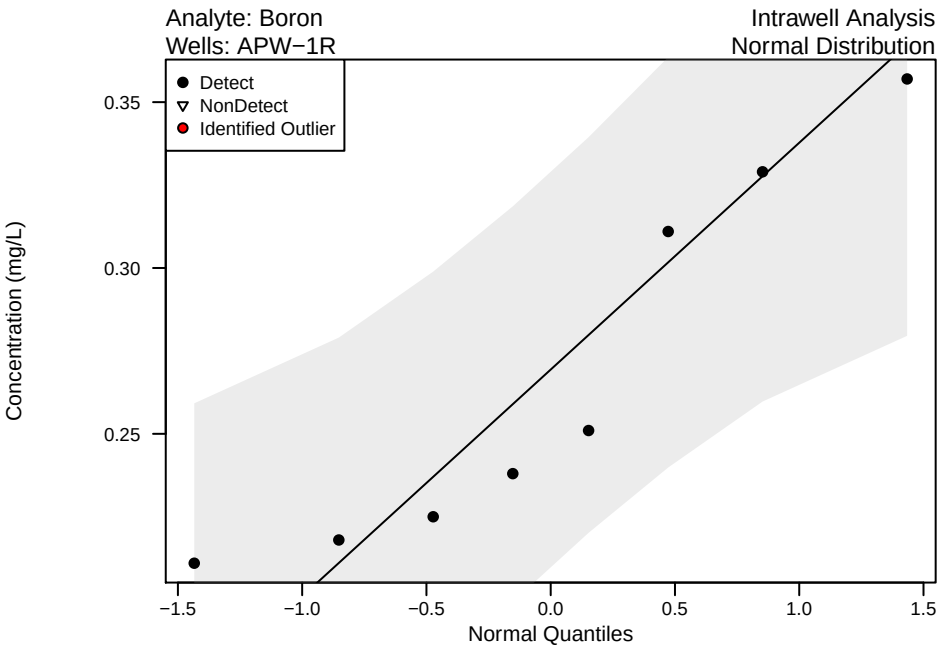




QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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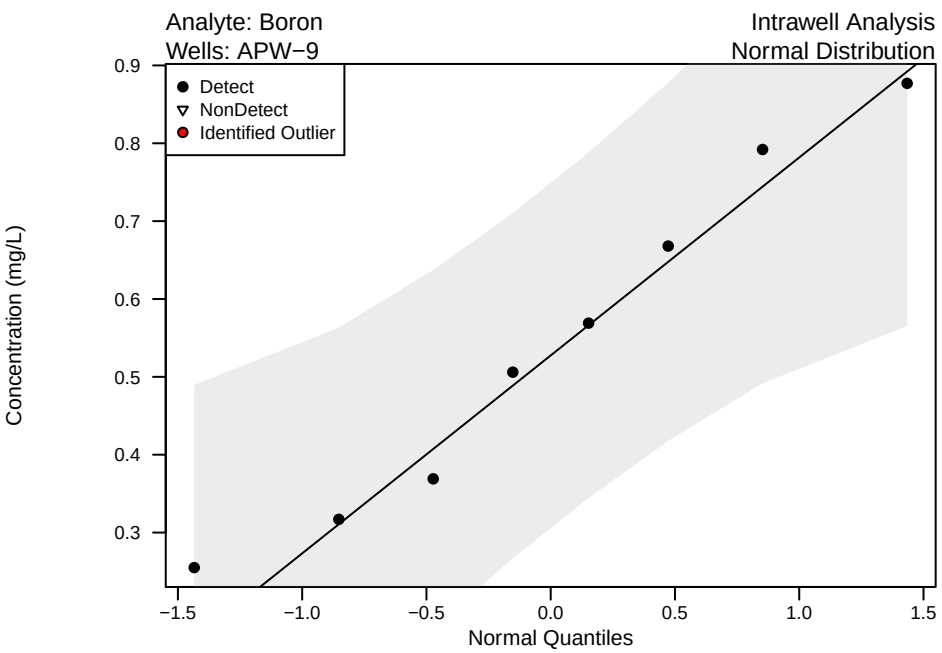

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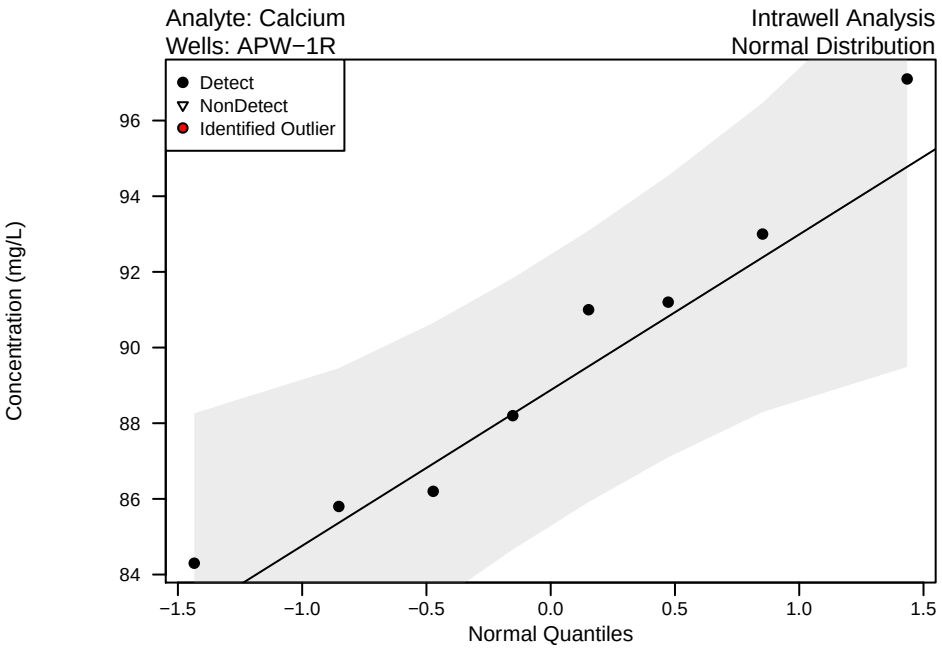
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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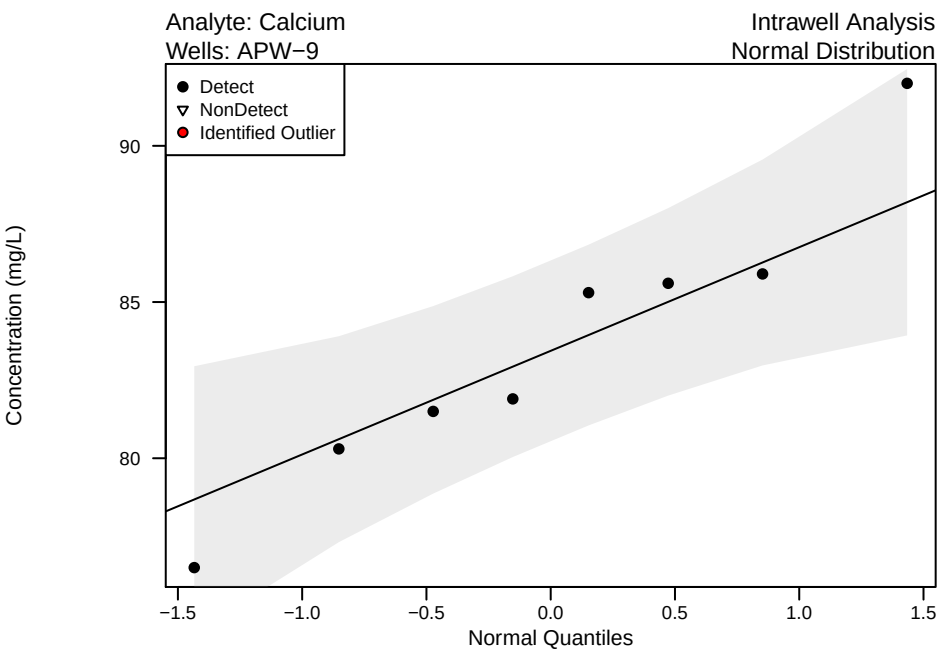

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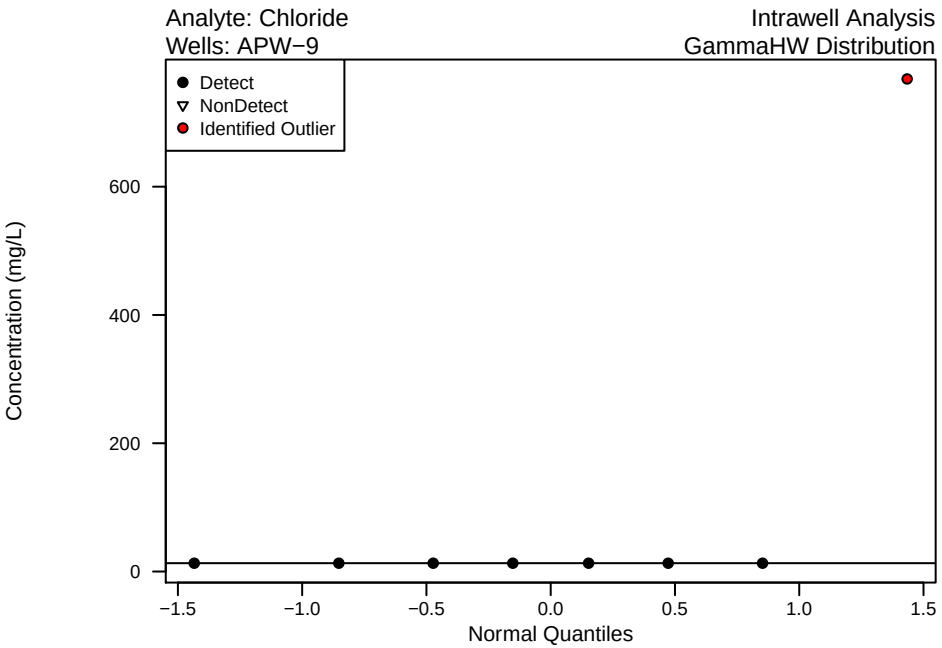
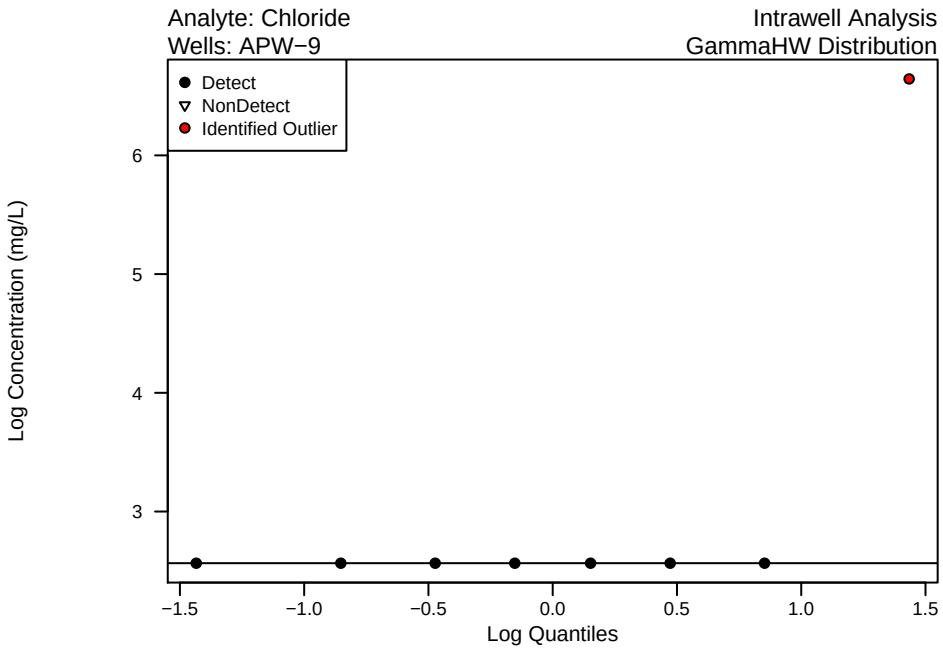
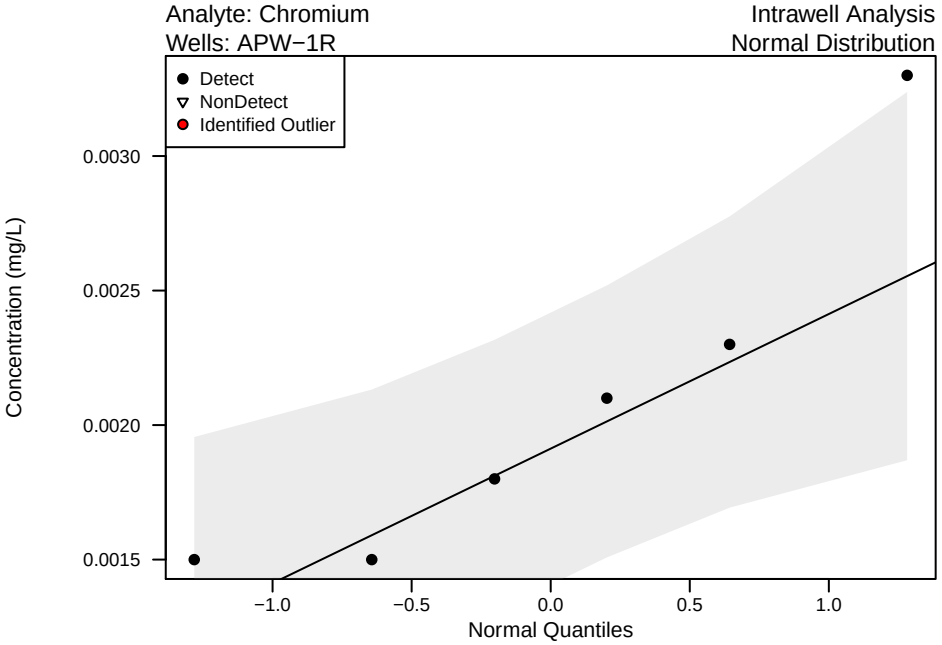
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:







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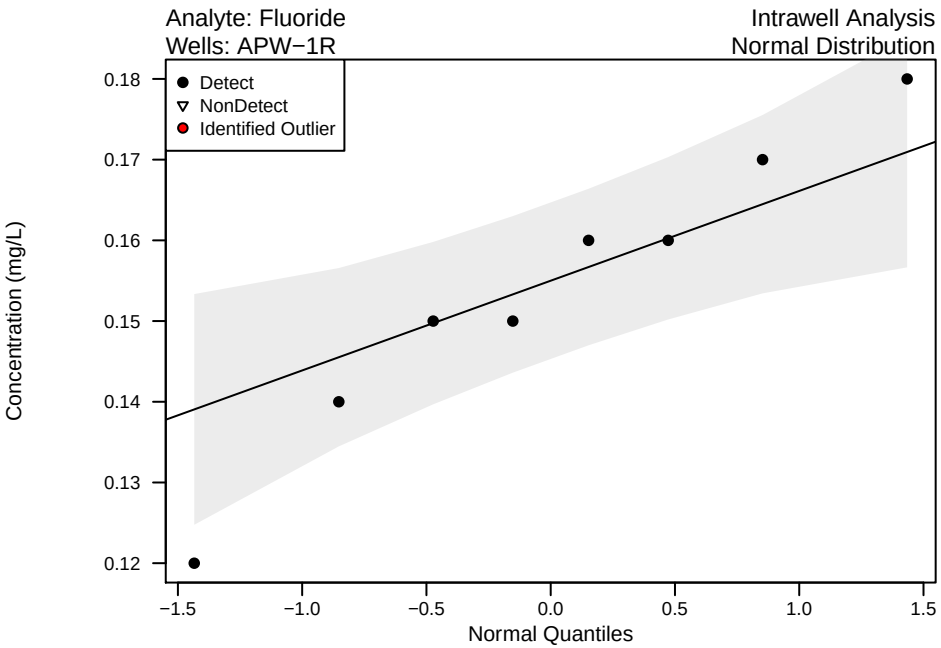
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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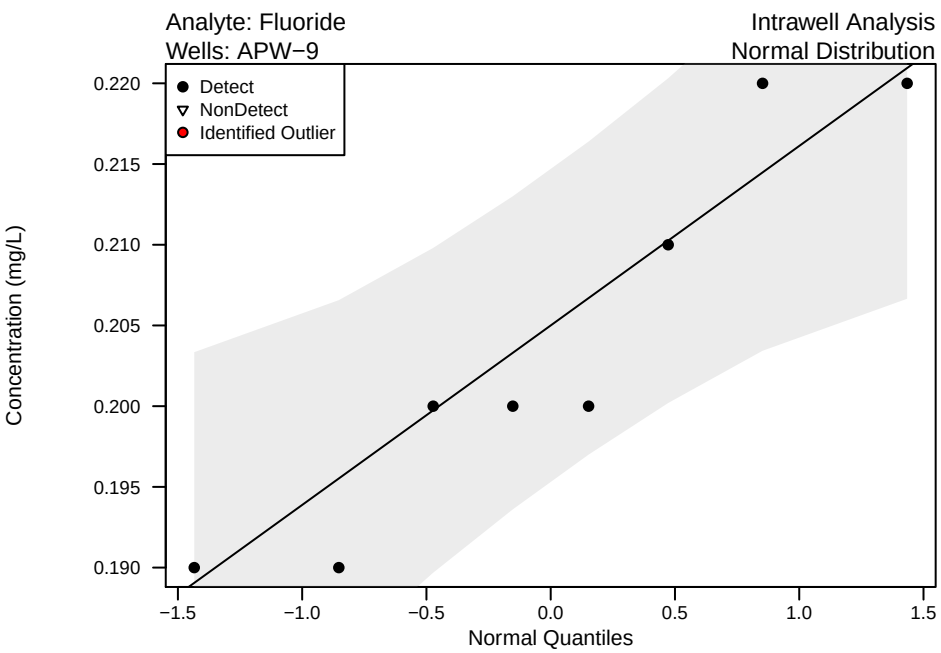

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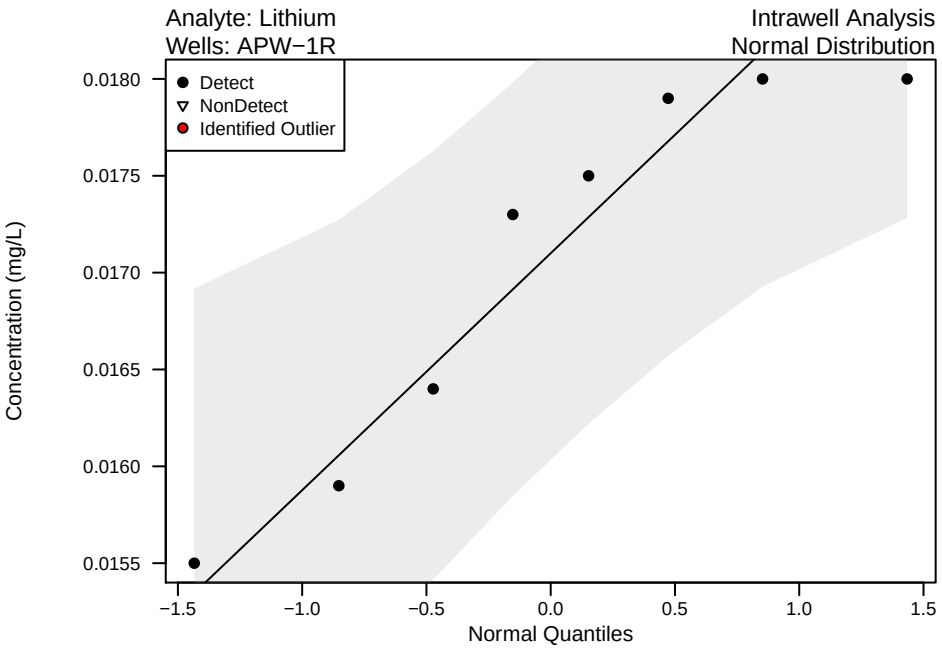
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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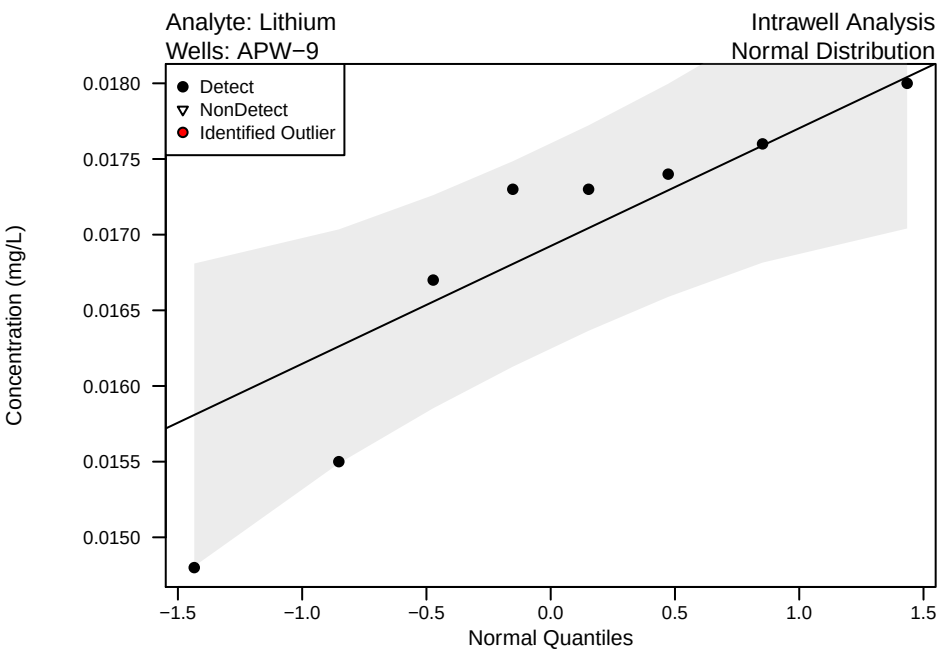

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QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:

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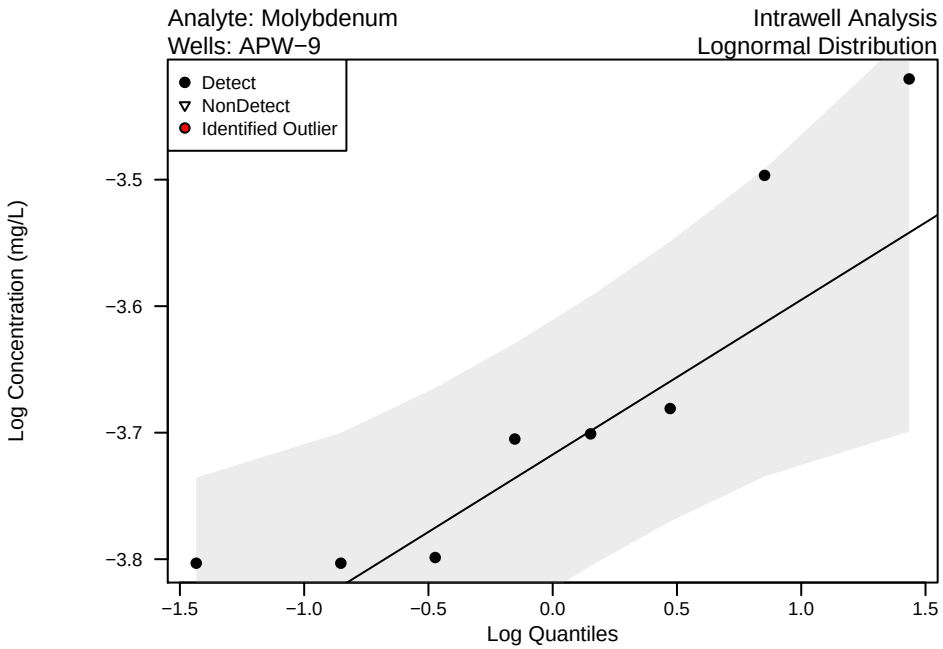

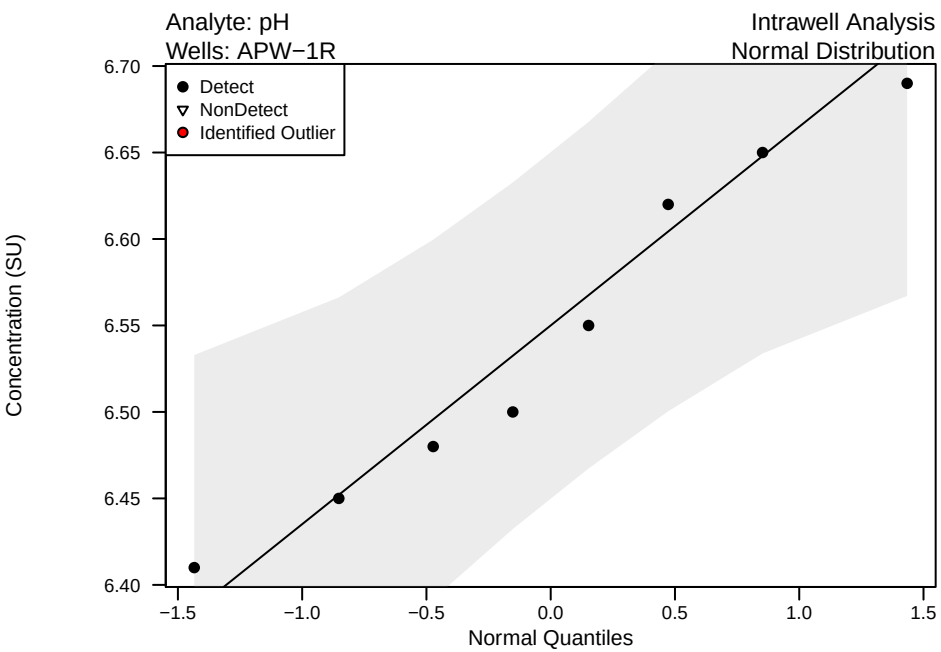

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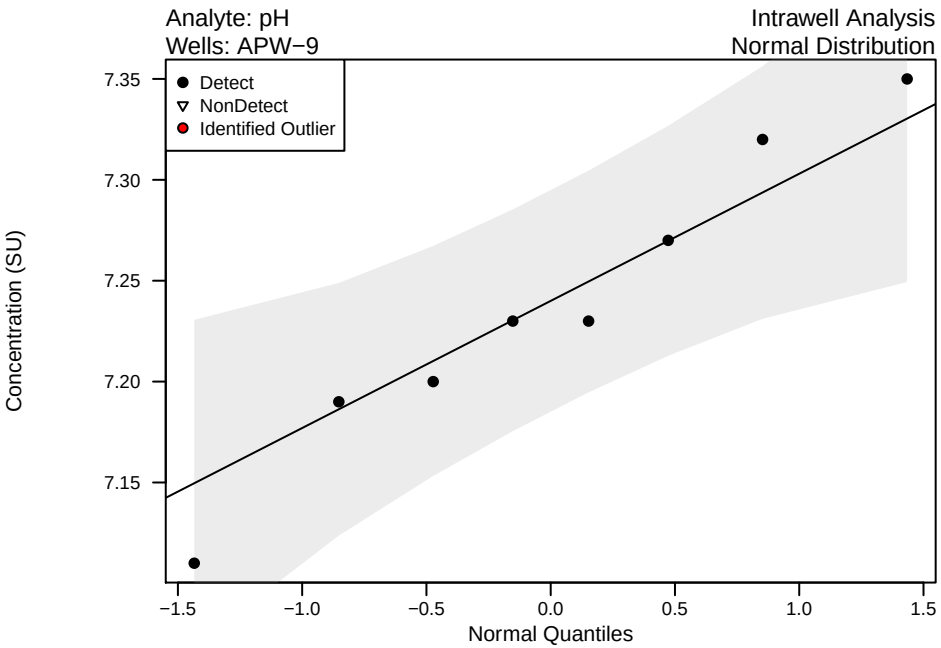
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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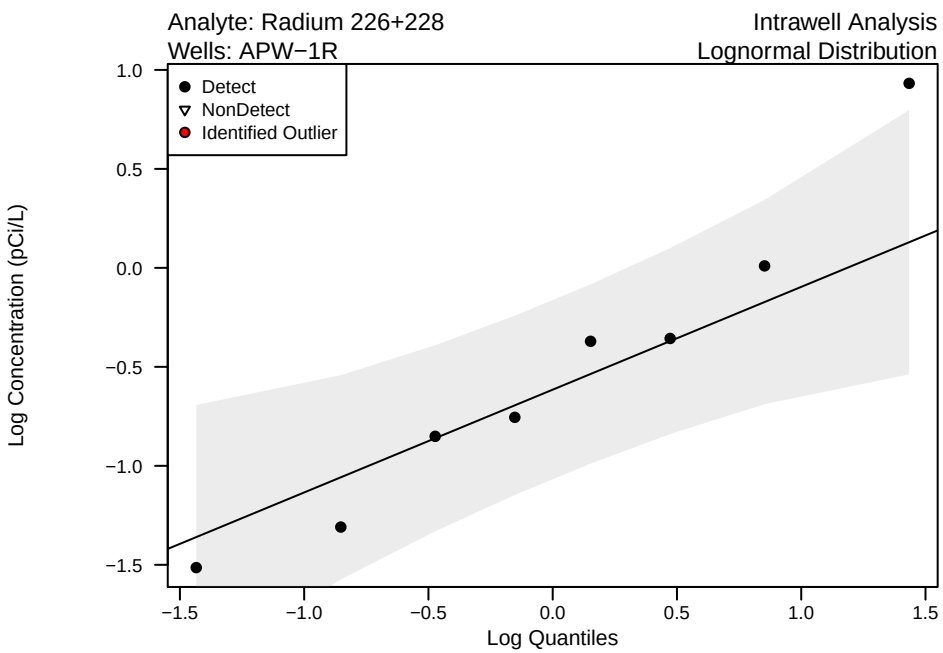
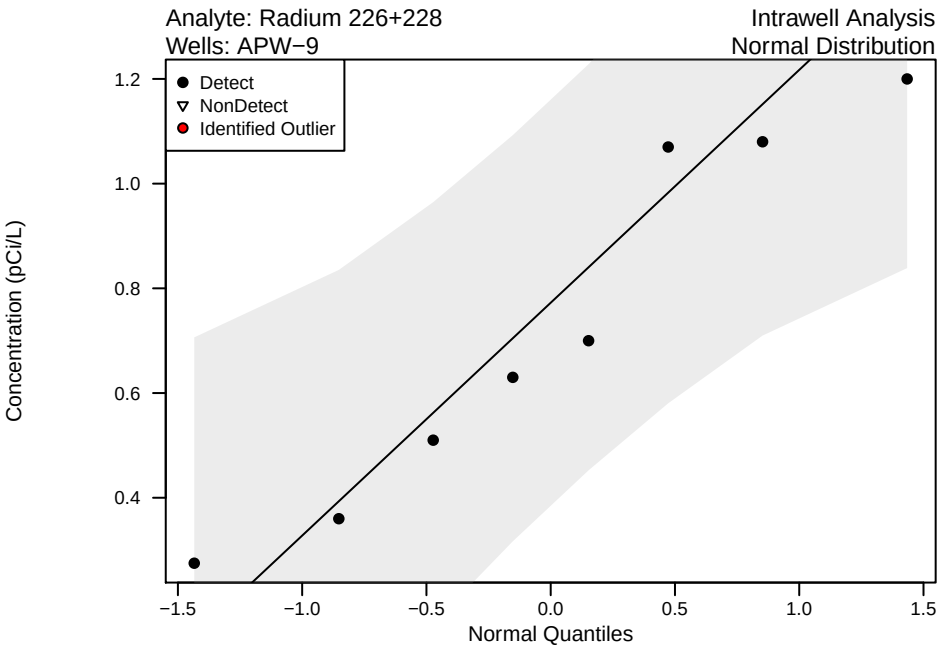


QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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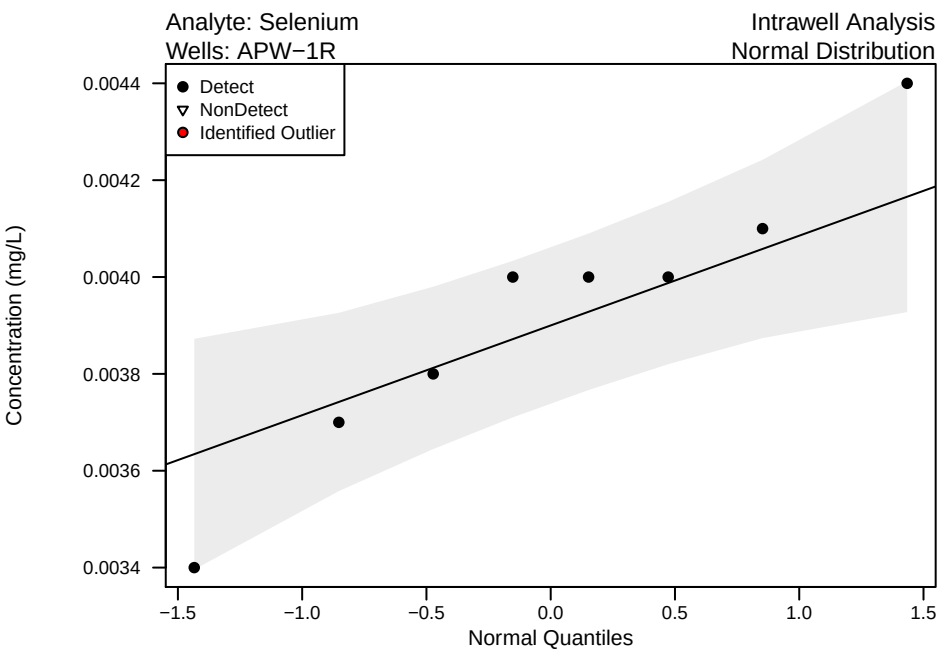

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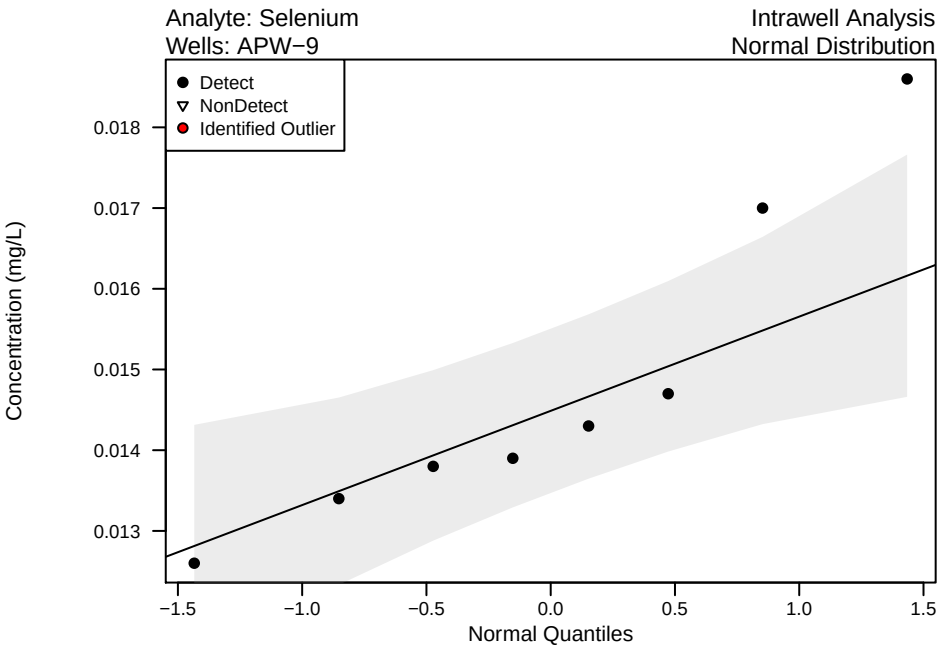
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:



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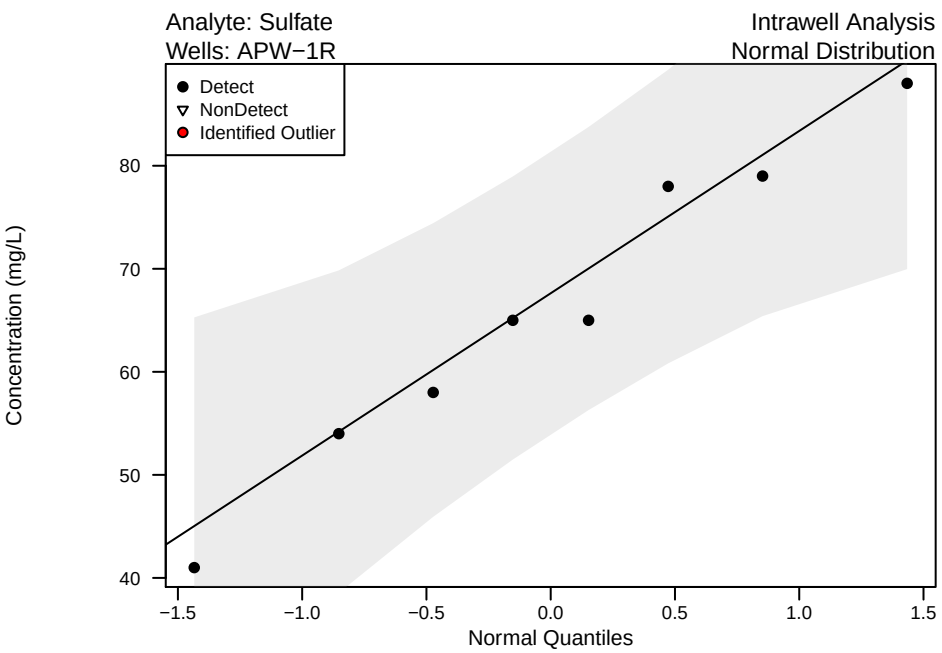

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QQ Plots of Upgradient Wells
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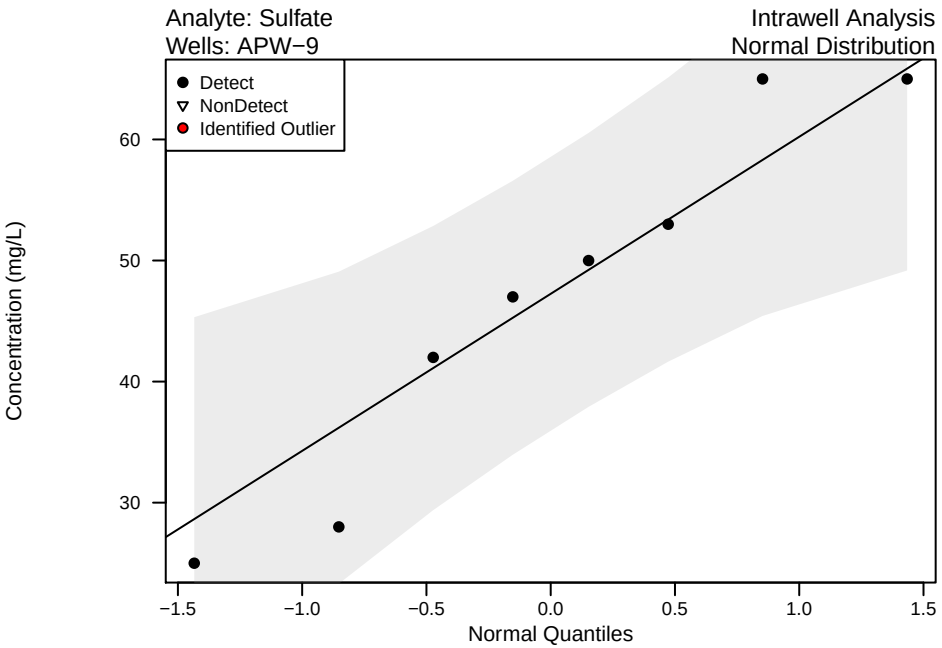
Geology:



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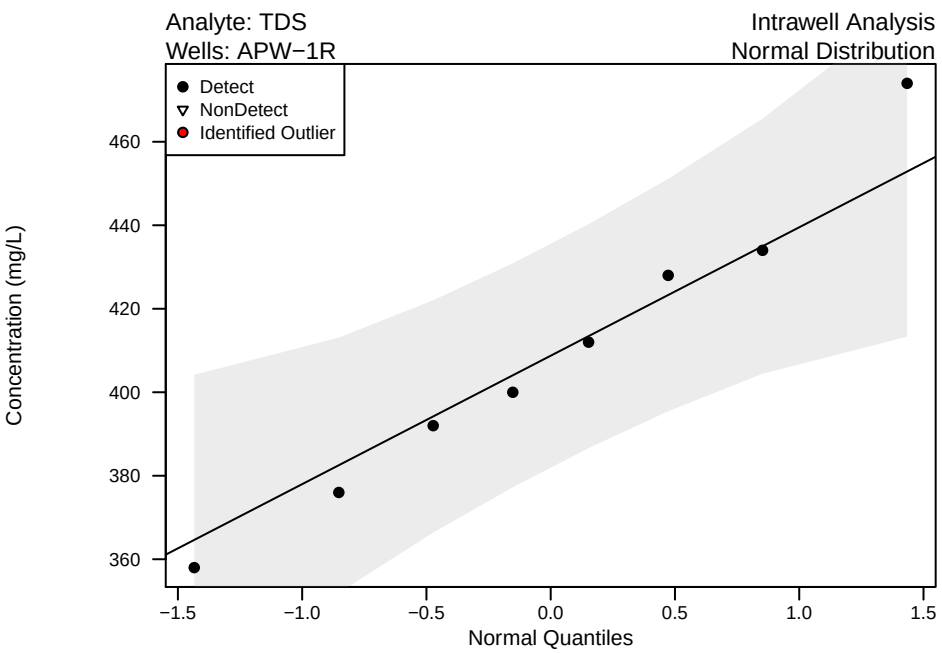

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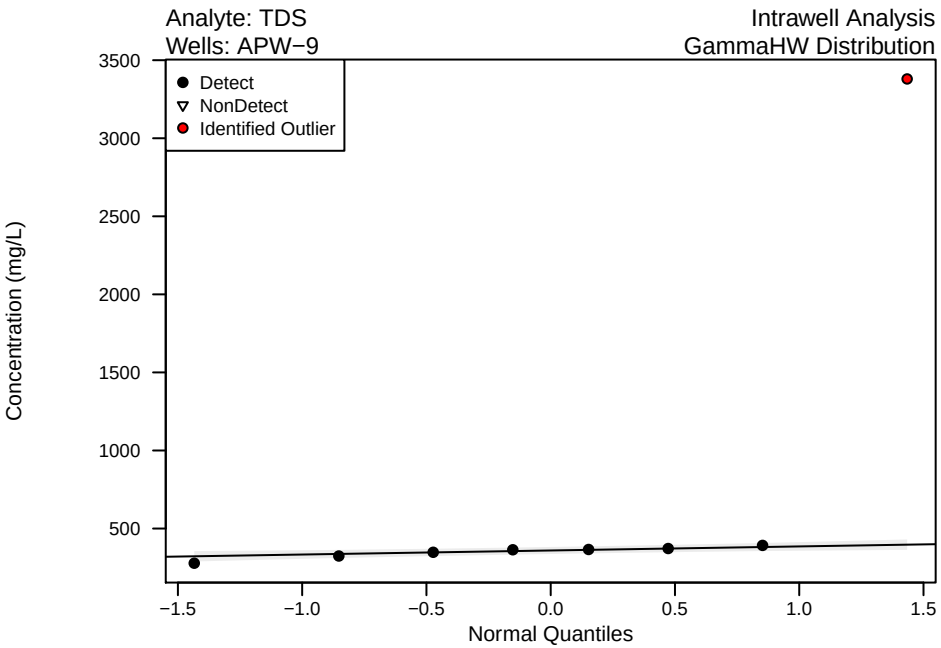
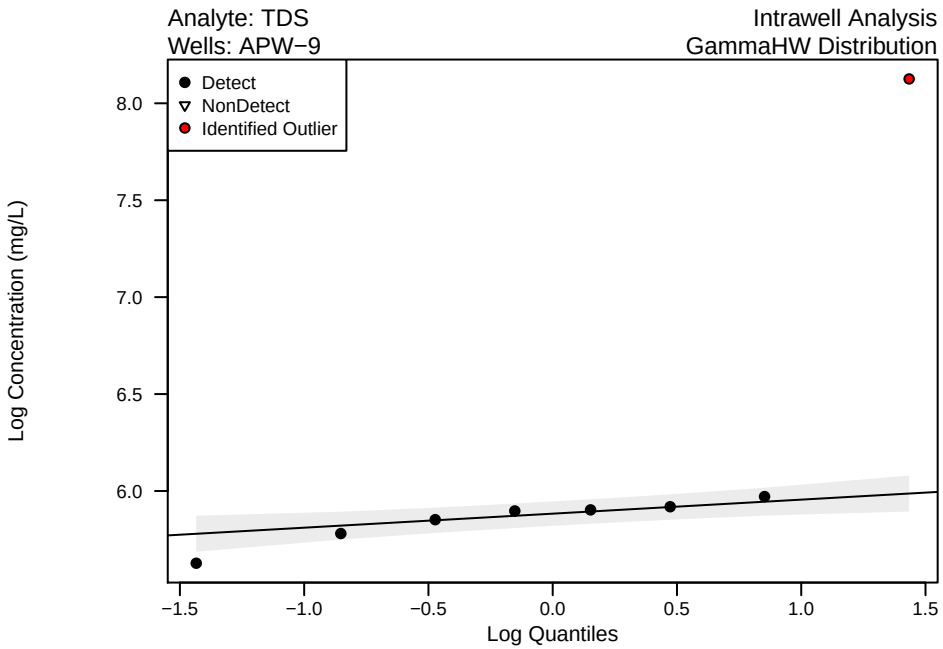
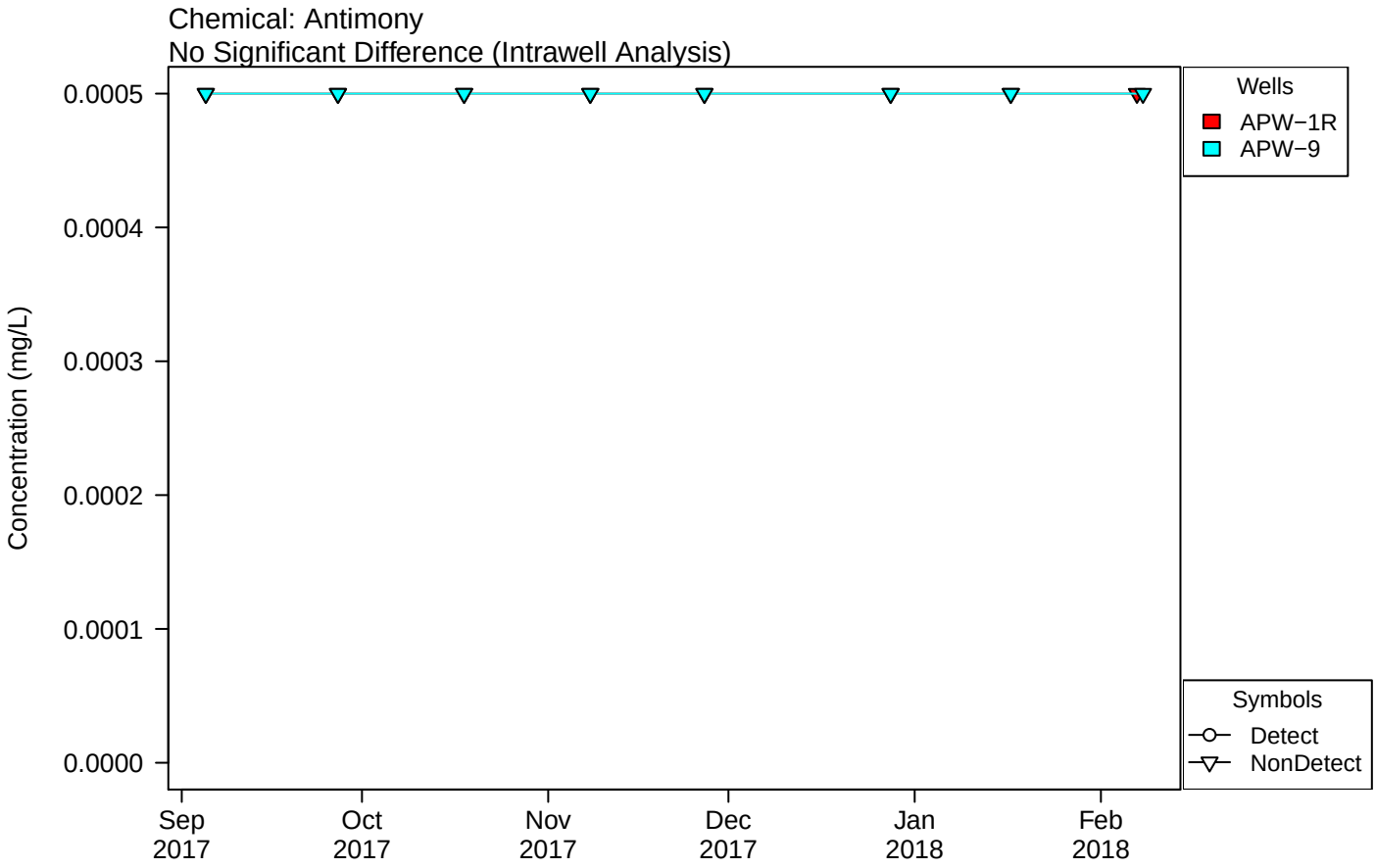
QQ Plots of Upgradient Wells
Unit: Grand Tower
Geology:

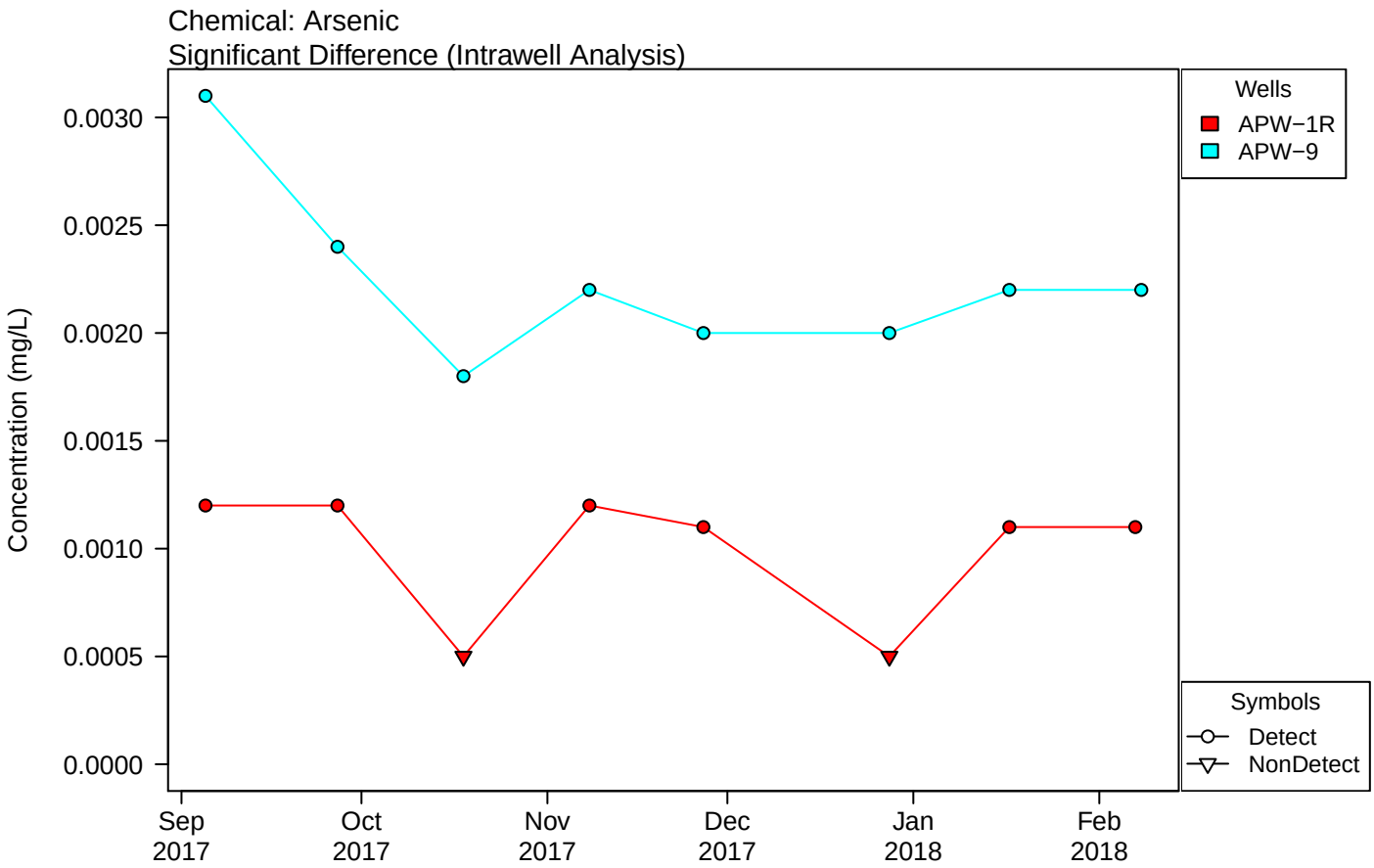




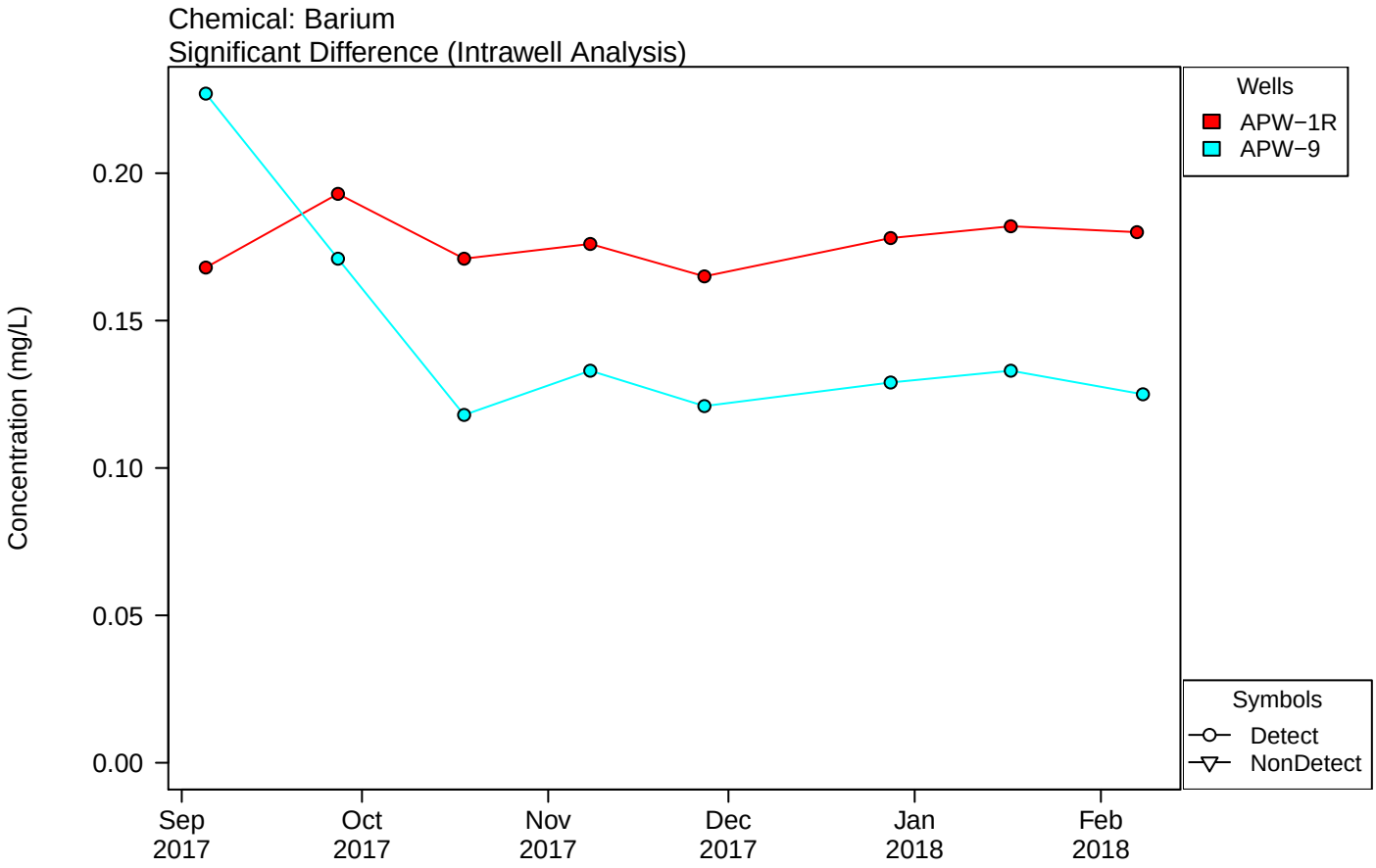
Timeseries of Upgradient Wells

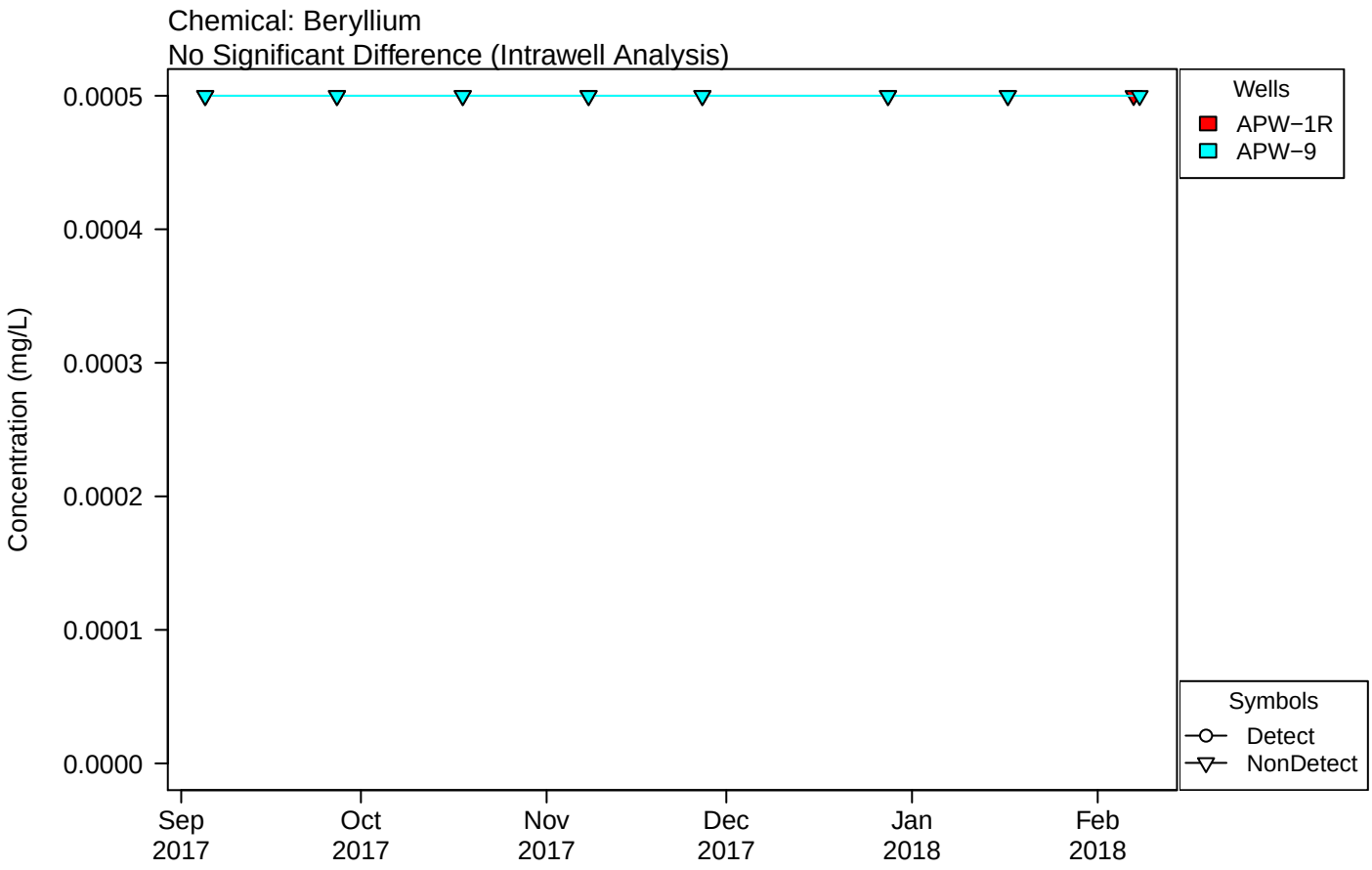
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:





Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:





Timeseries of Upgradient Wells
Unit: Grand Tower
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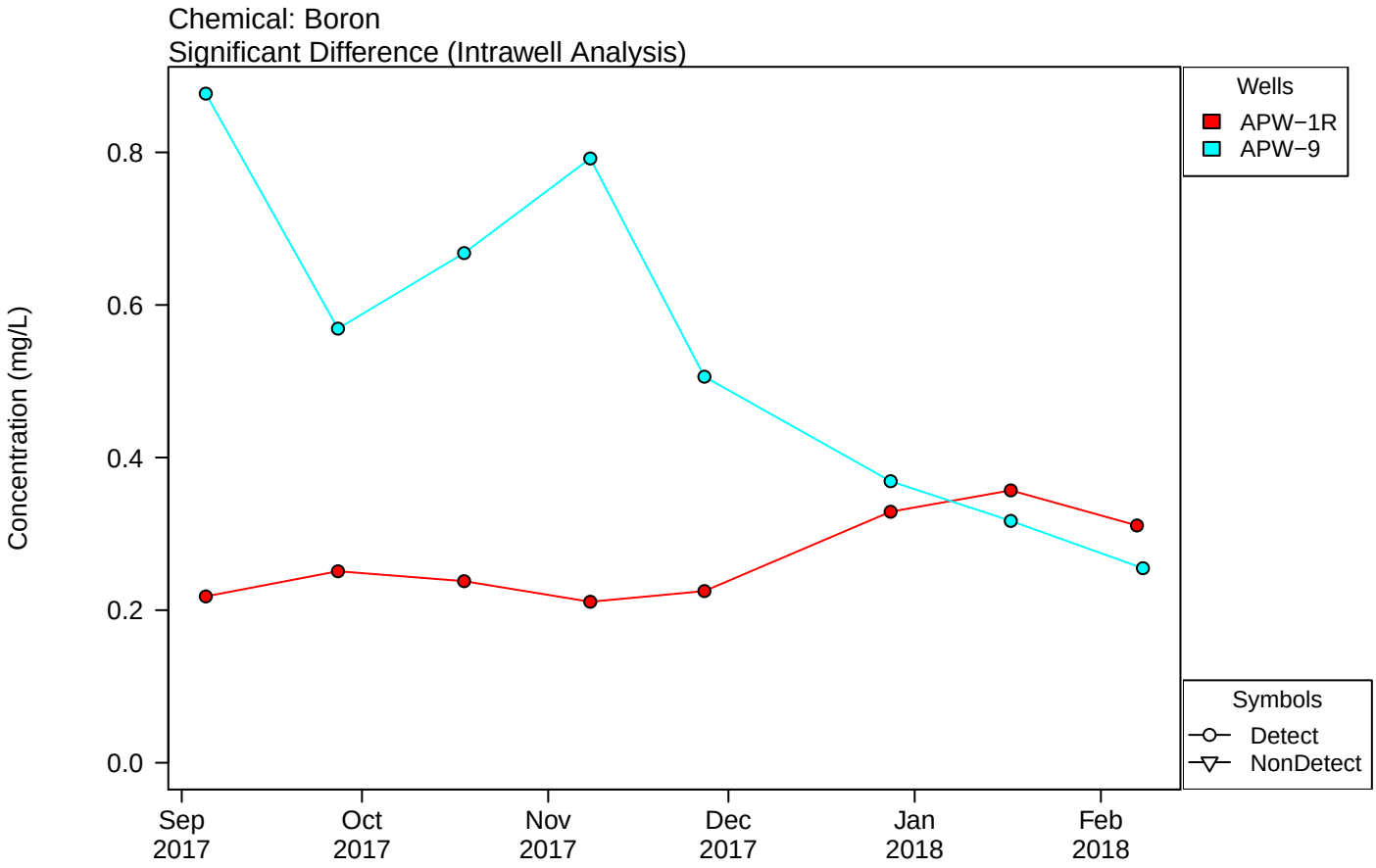
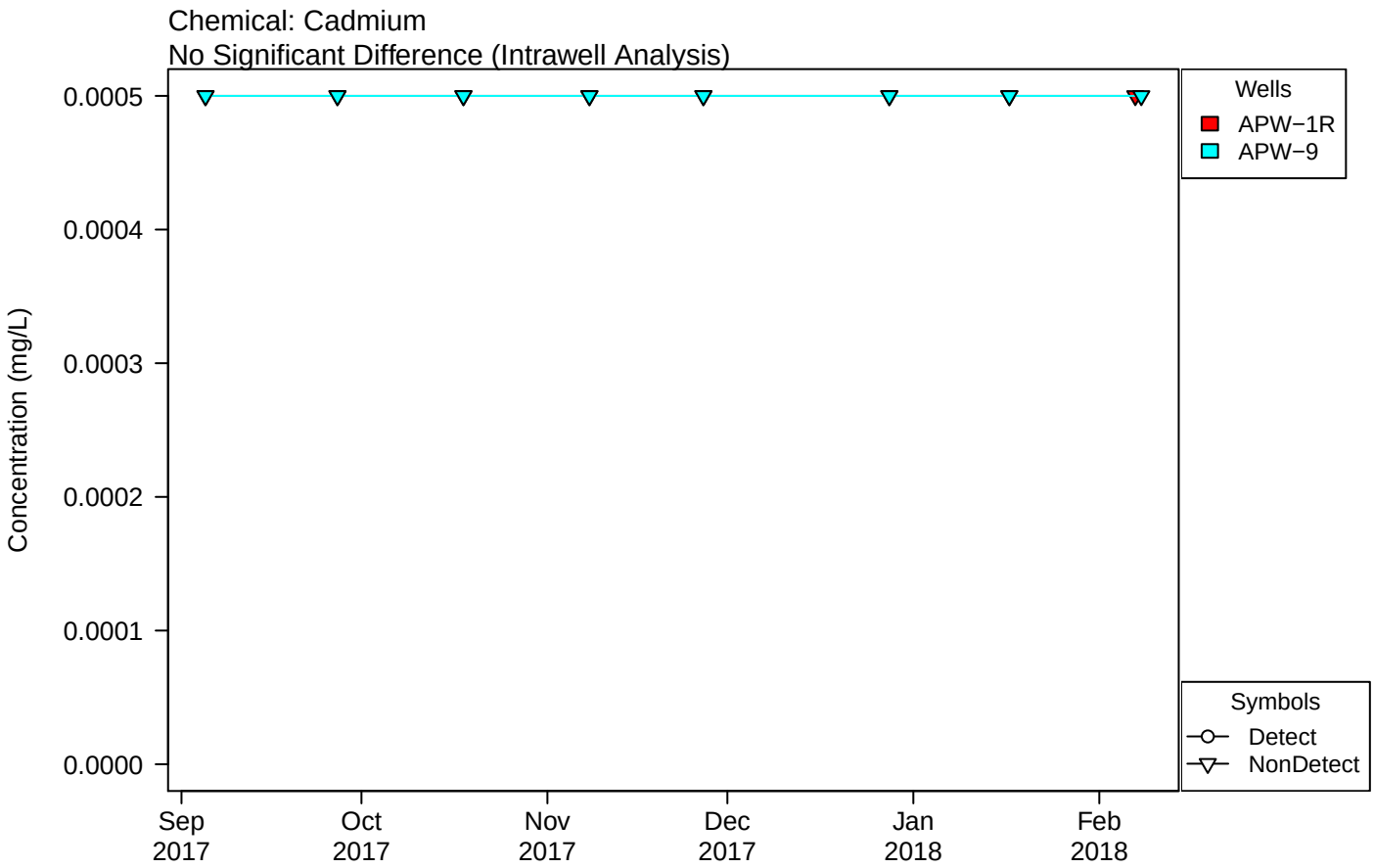
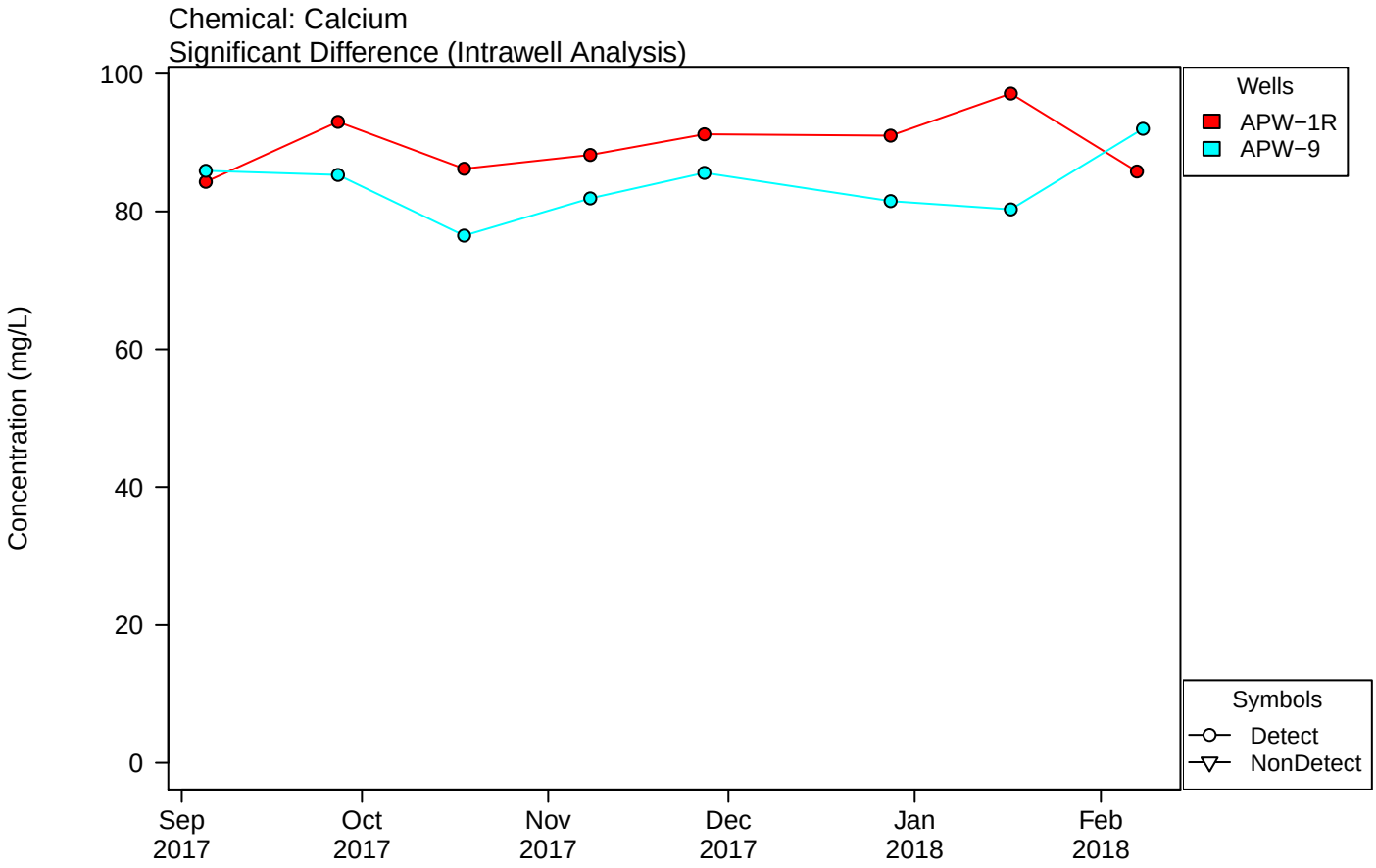
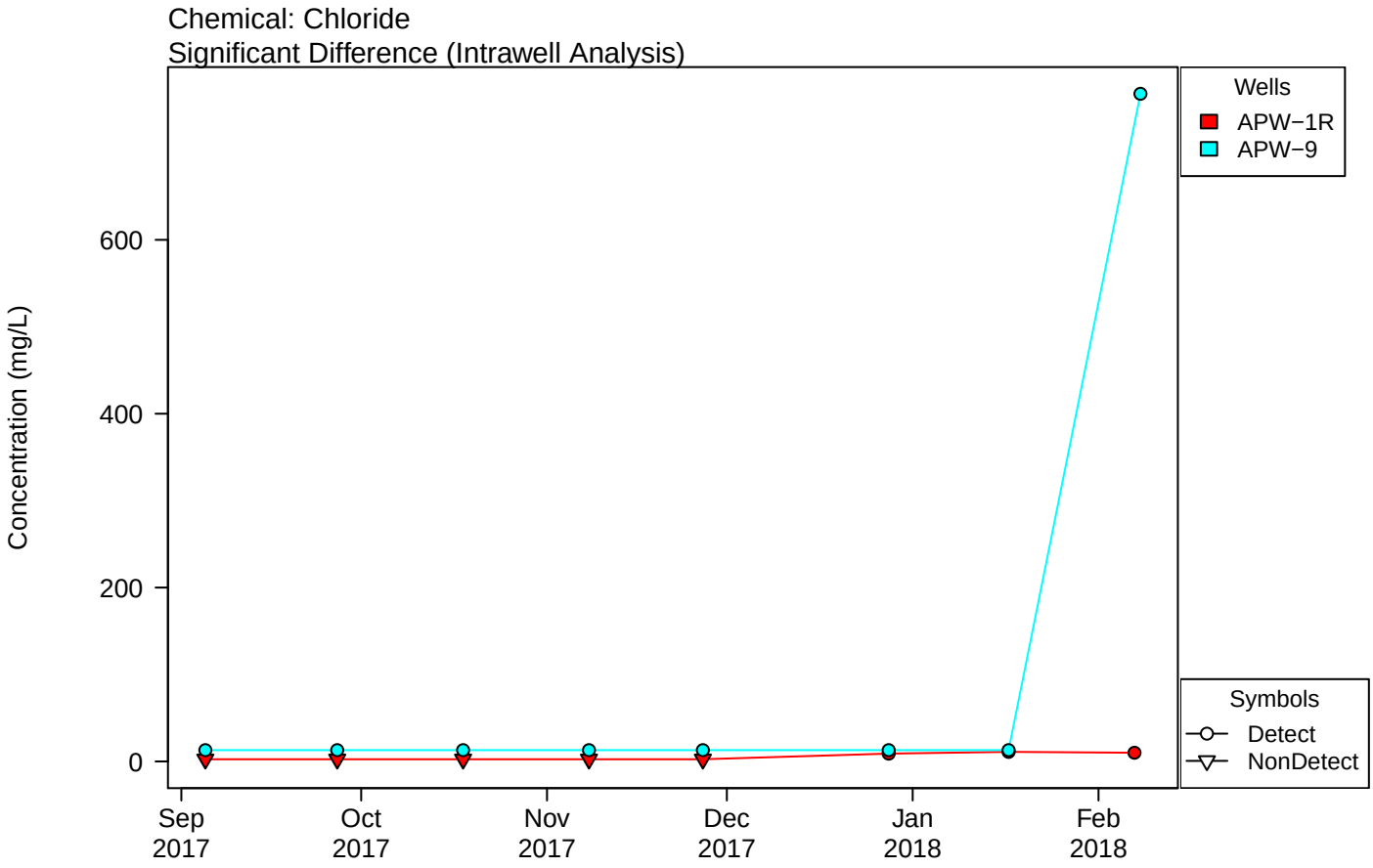


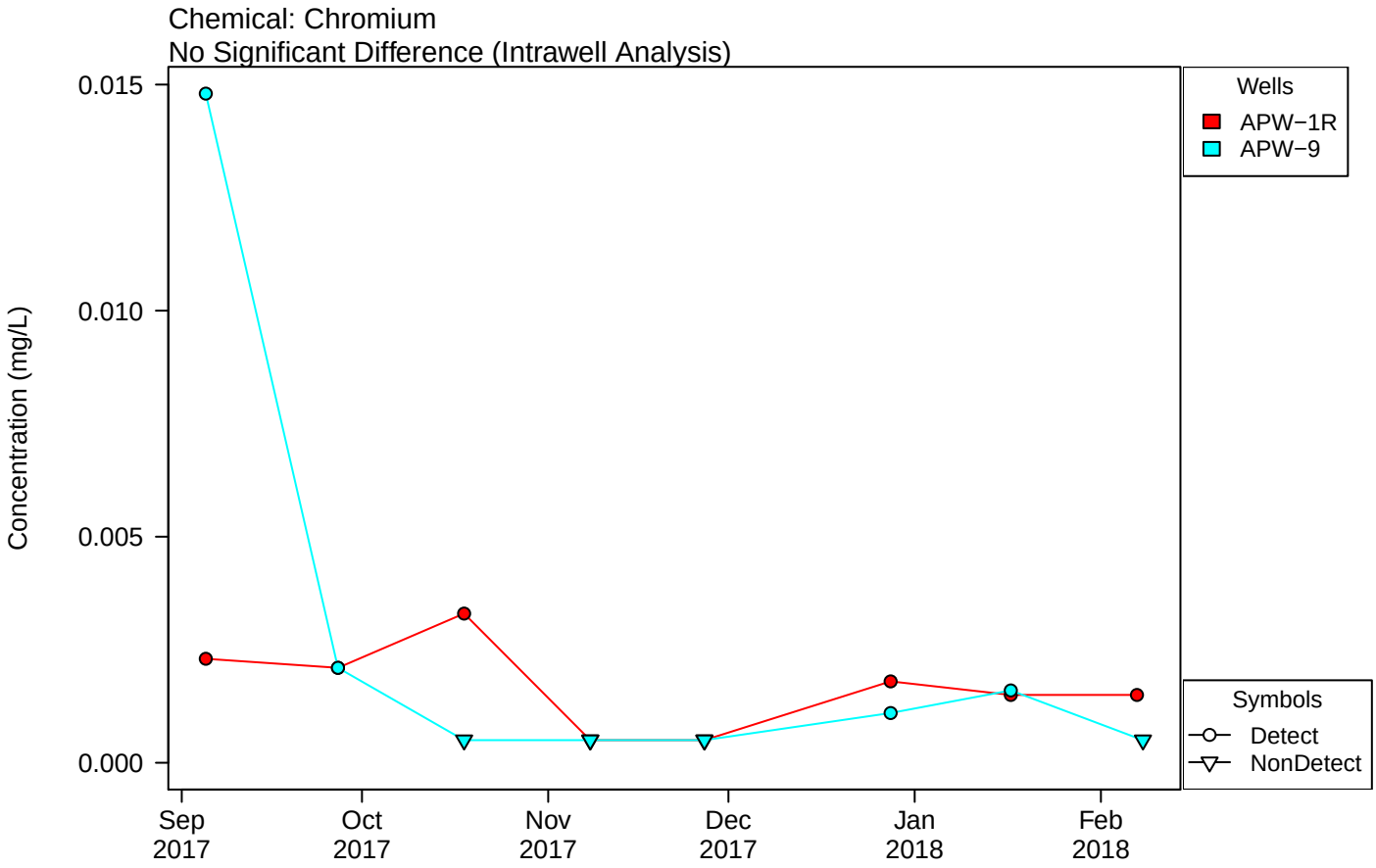


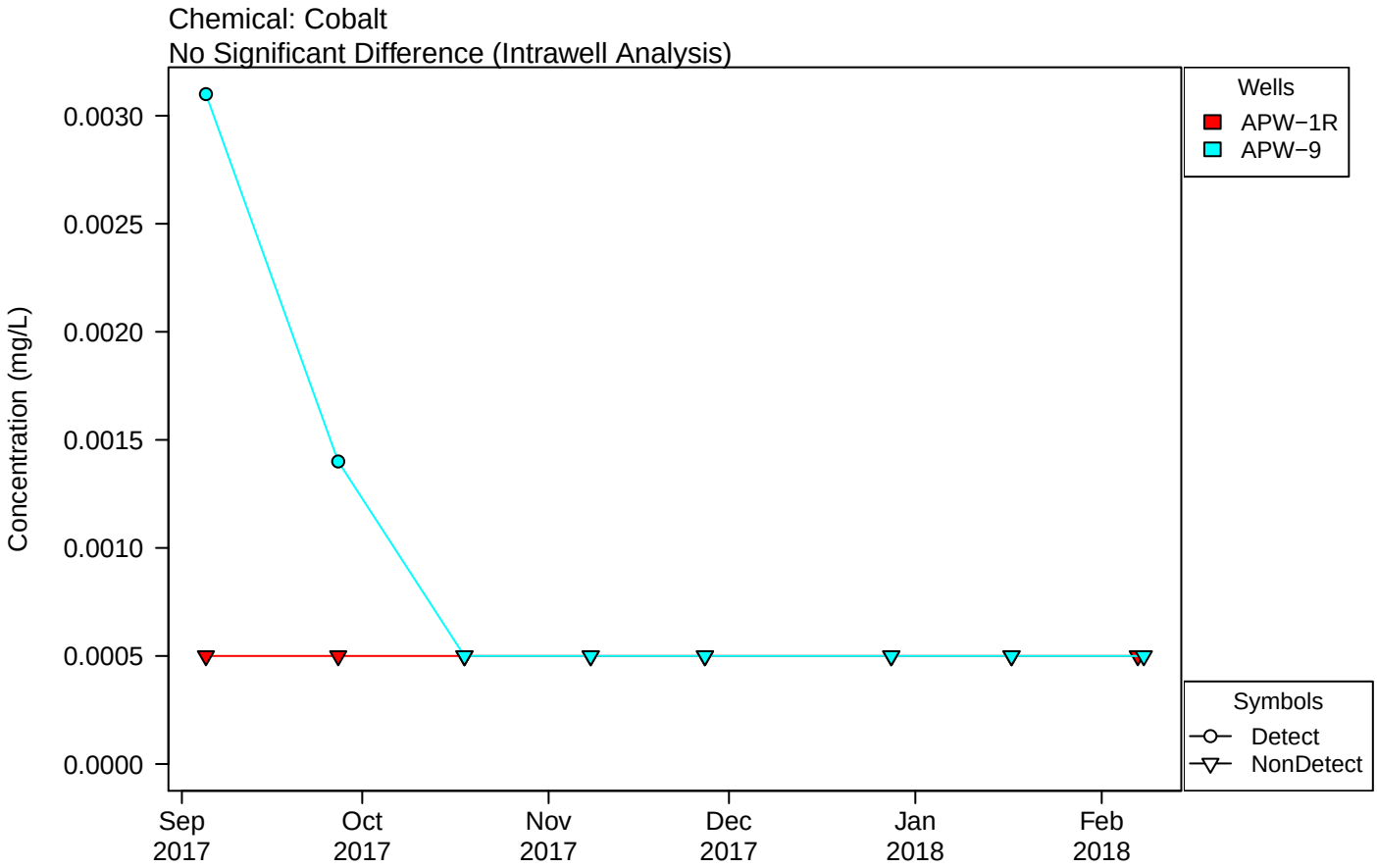
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:



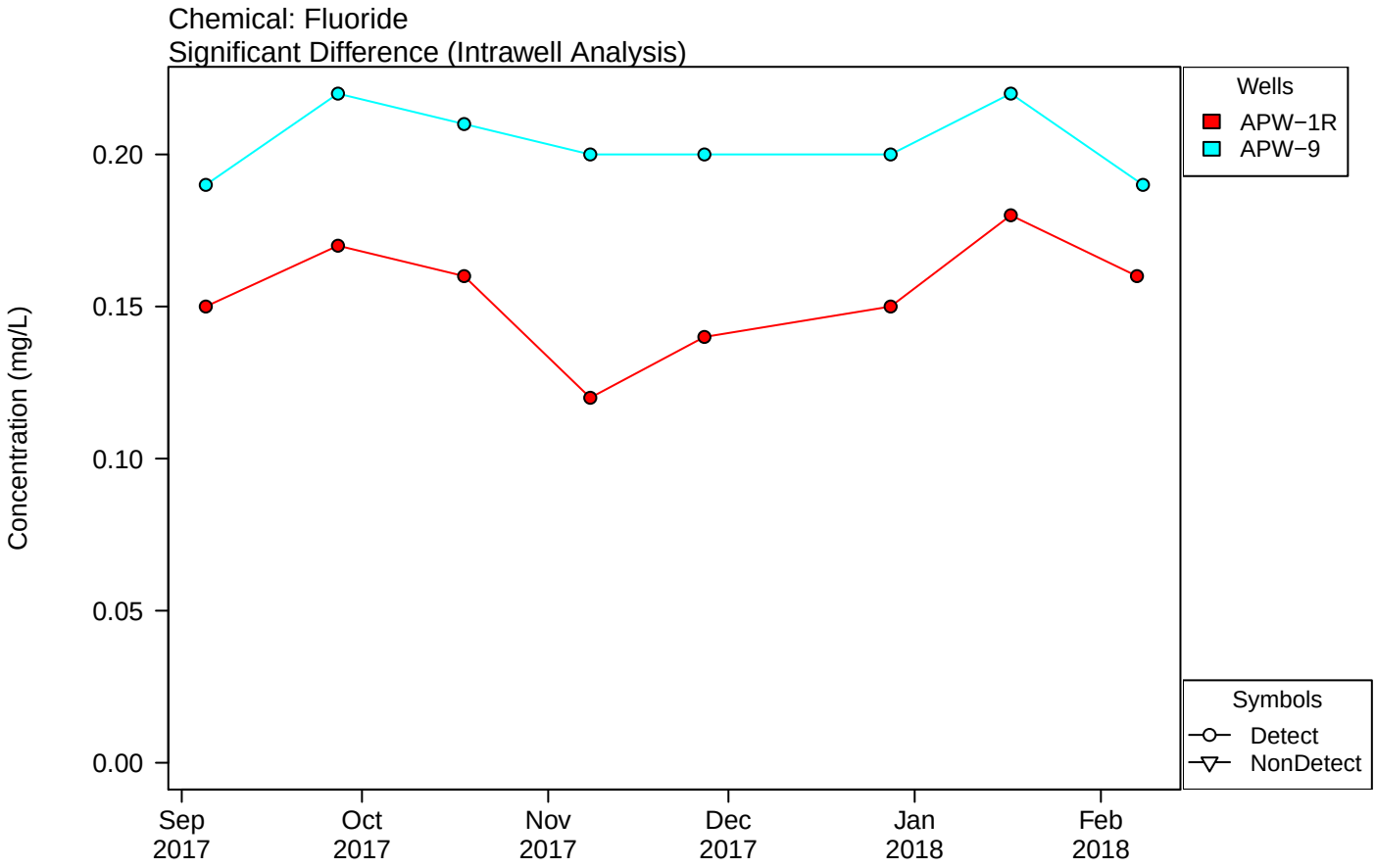


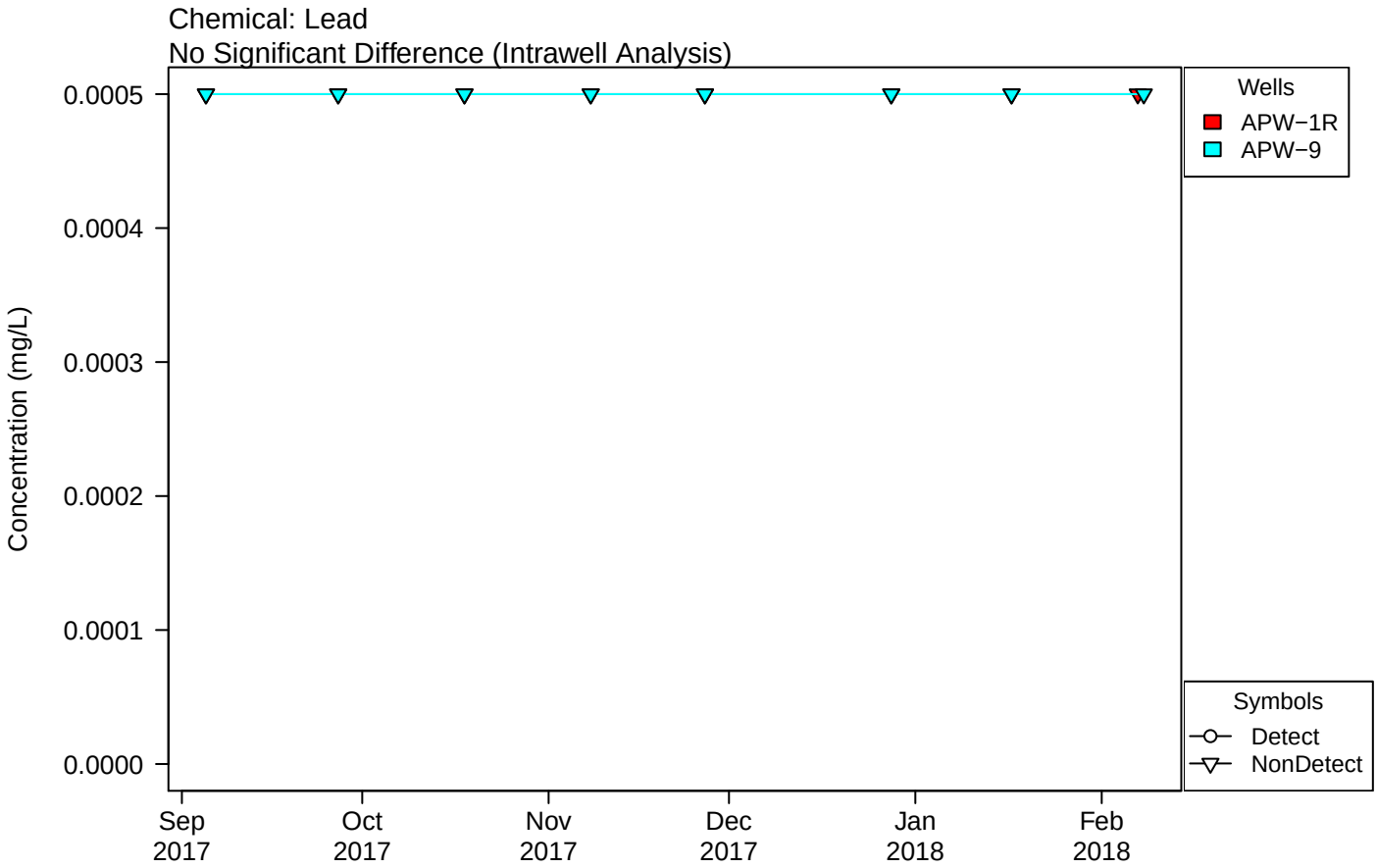
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:



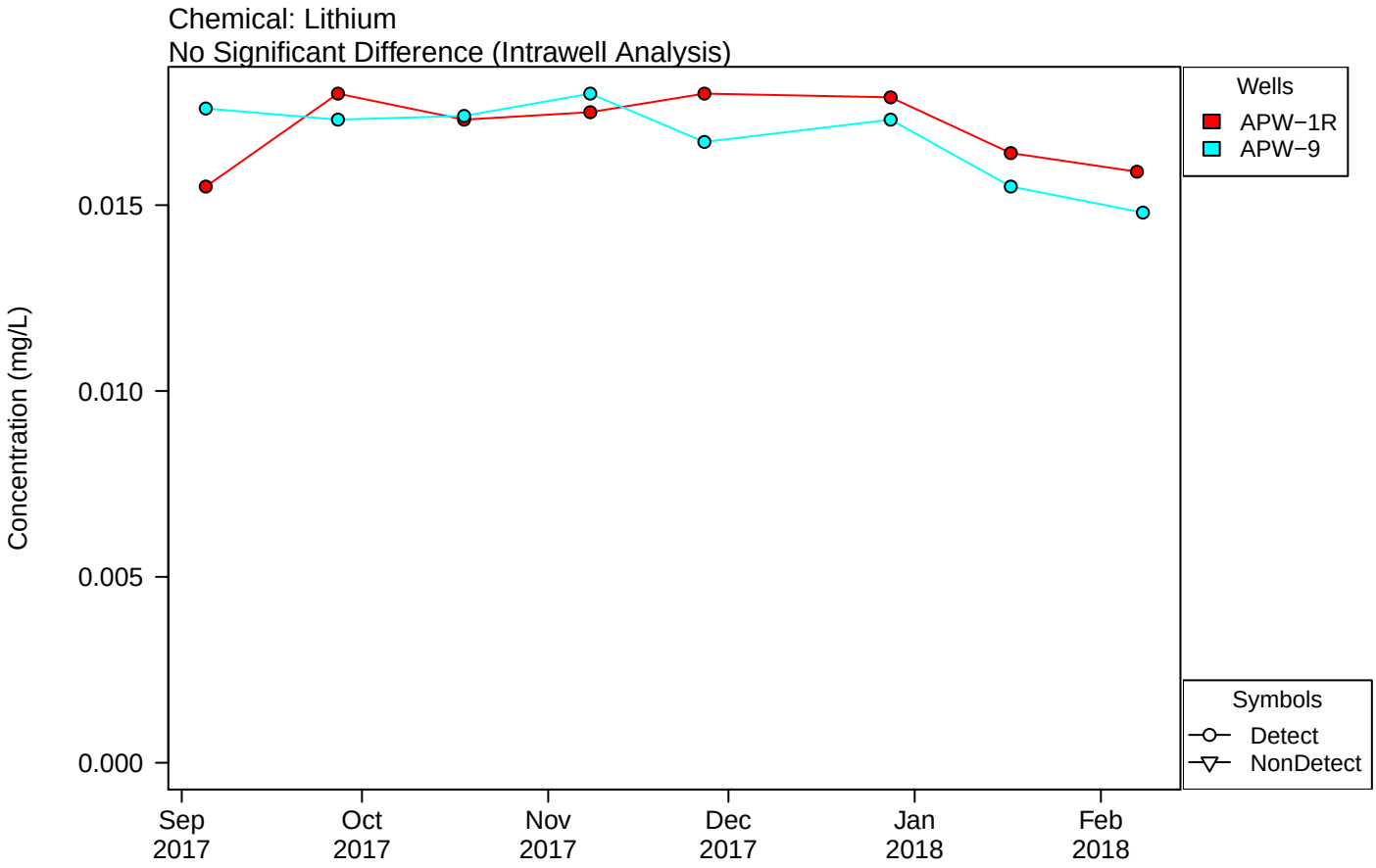


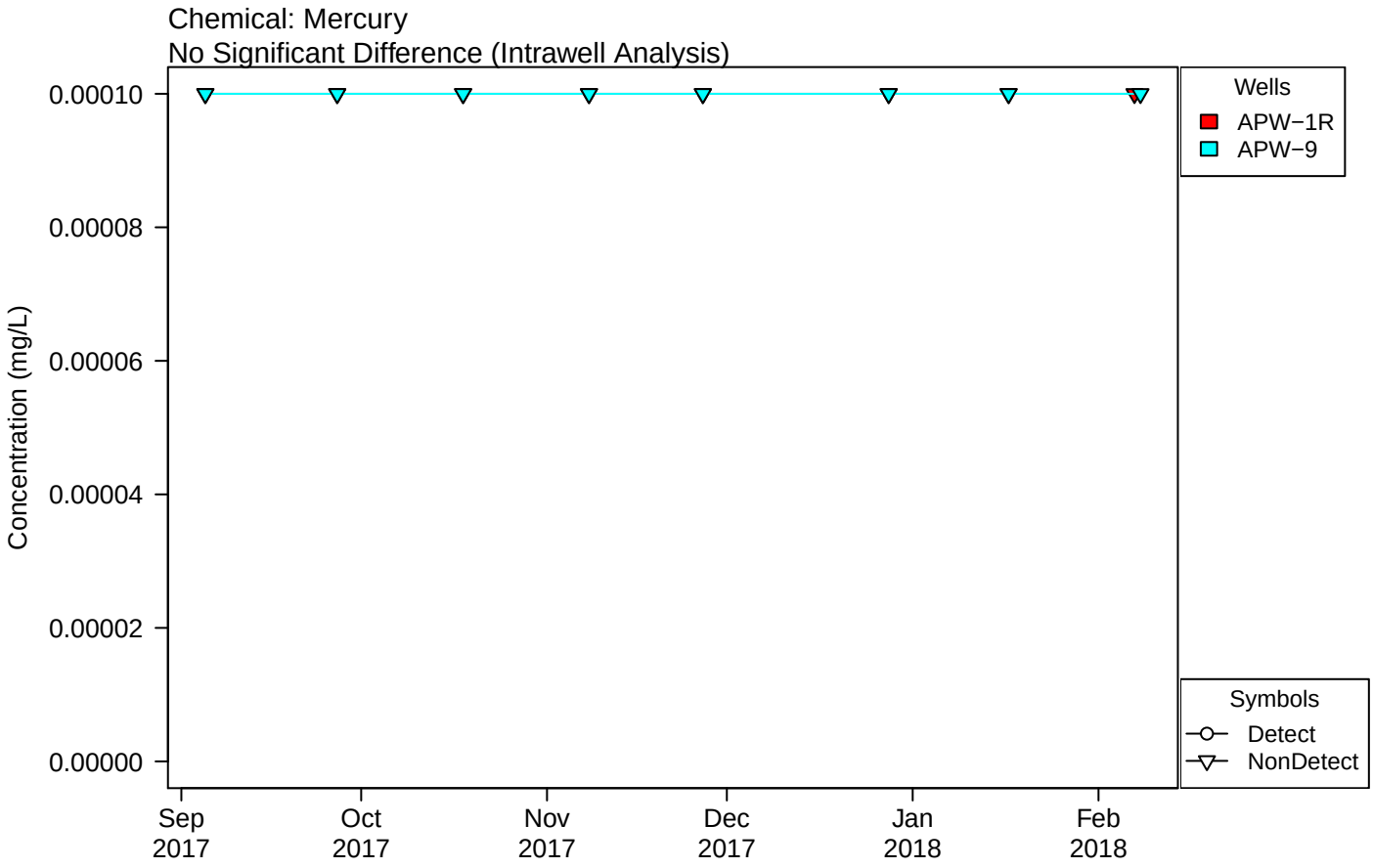
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:



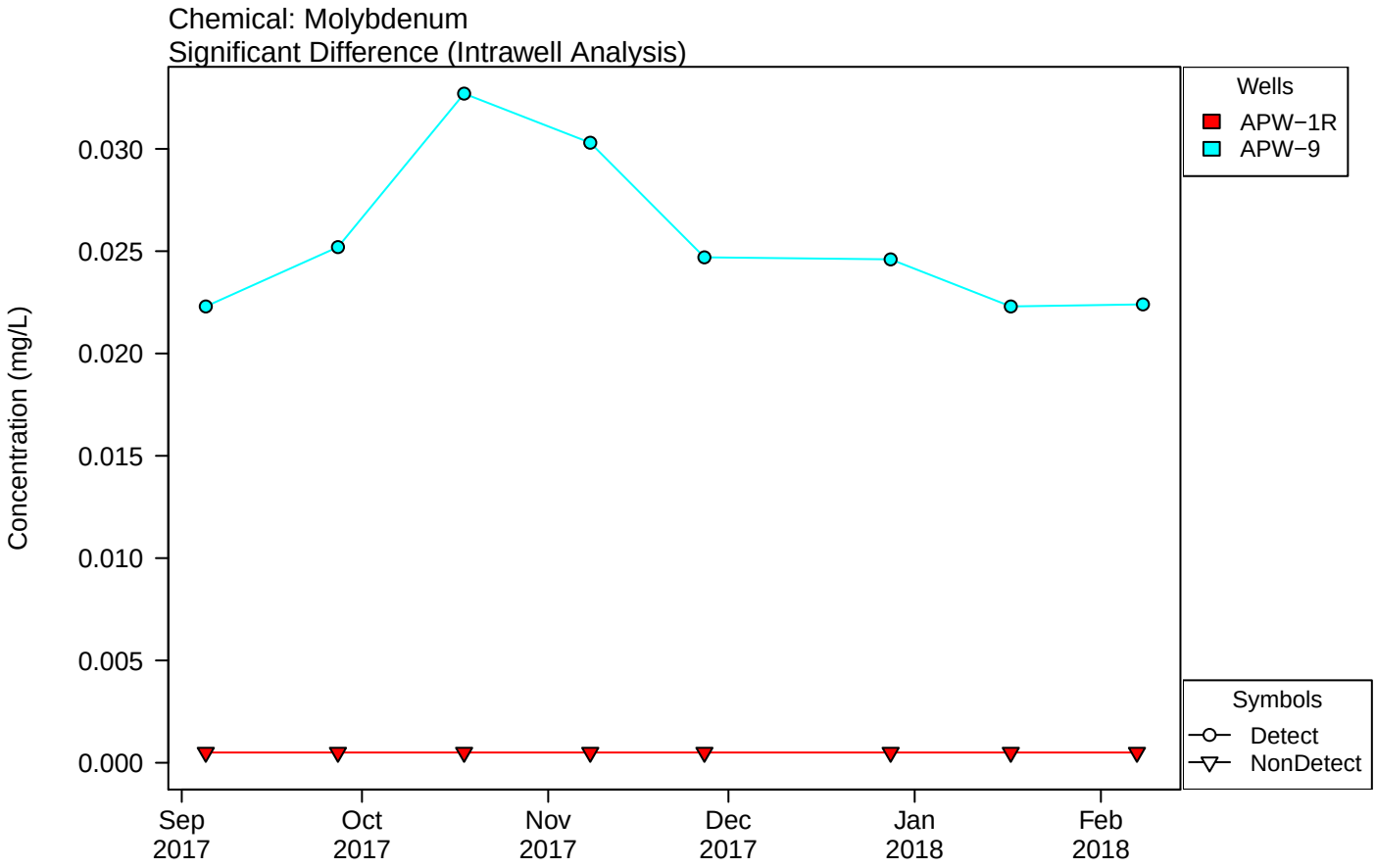


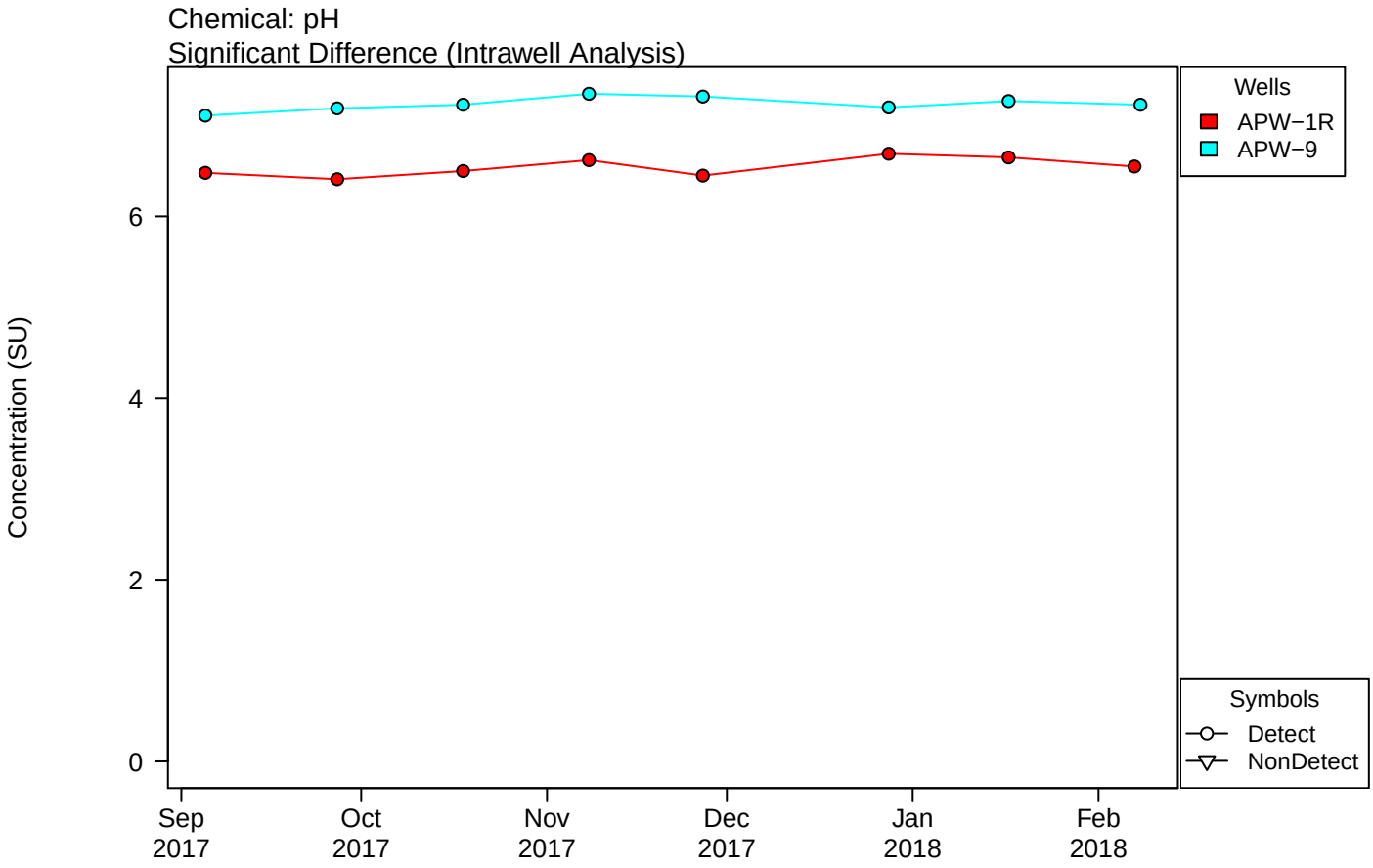
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:





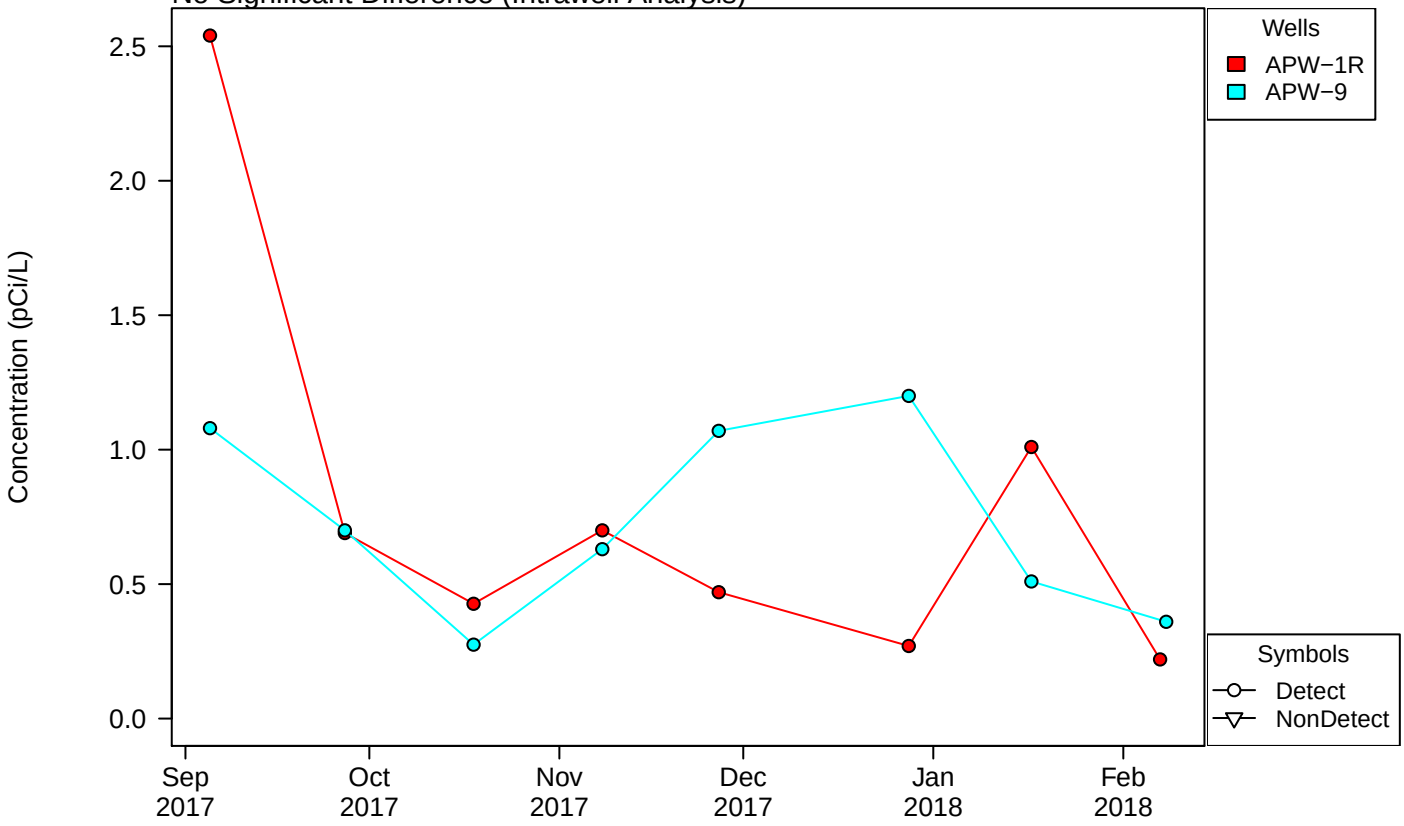
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:



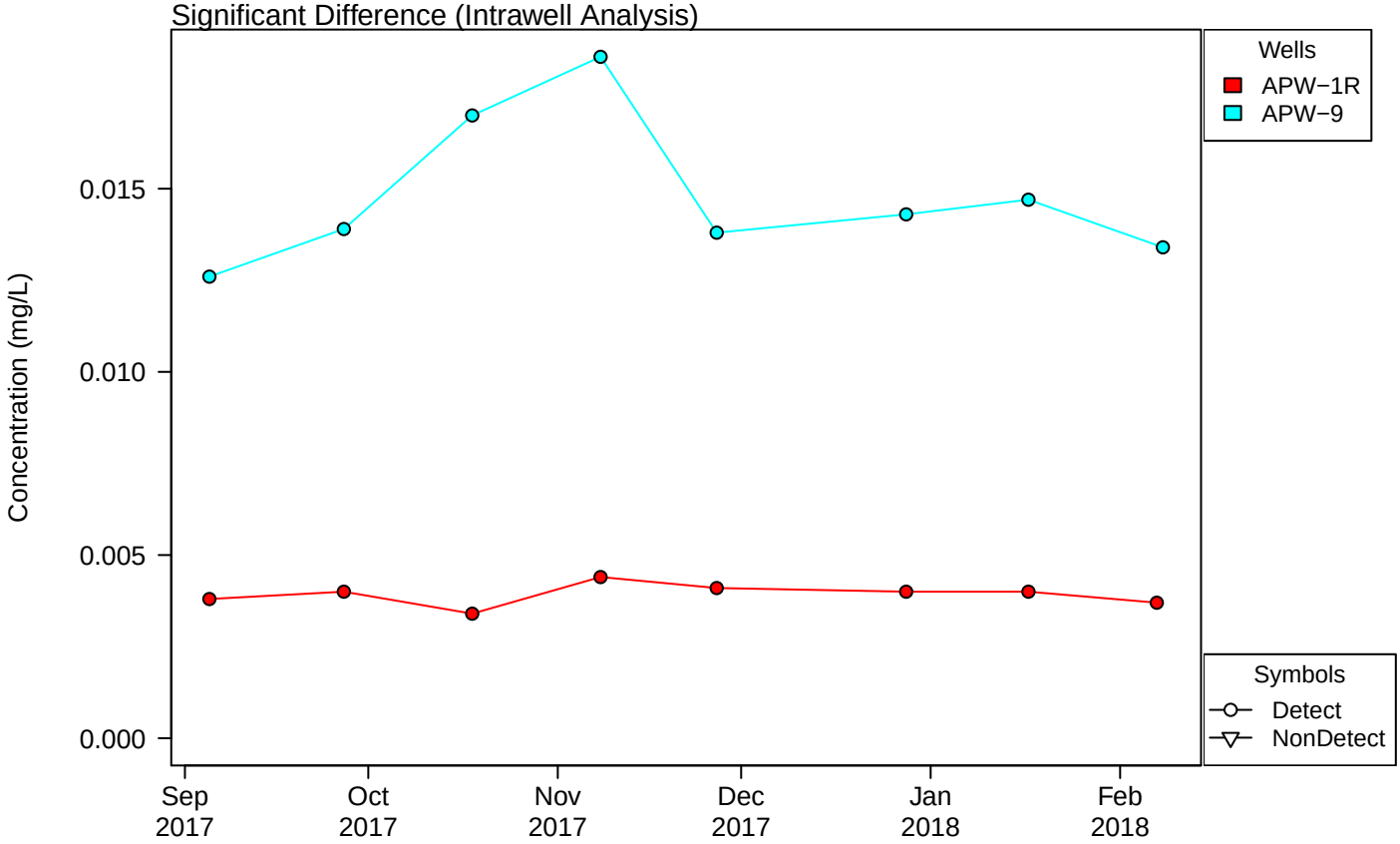


Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:

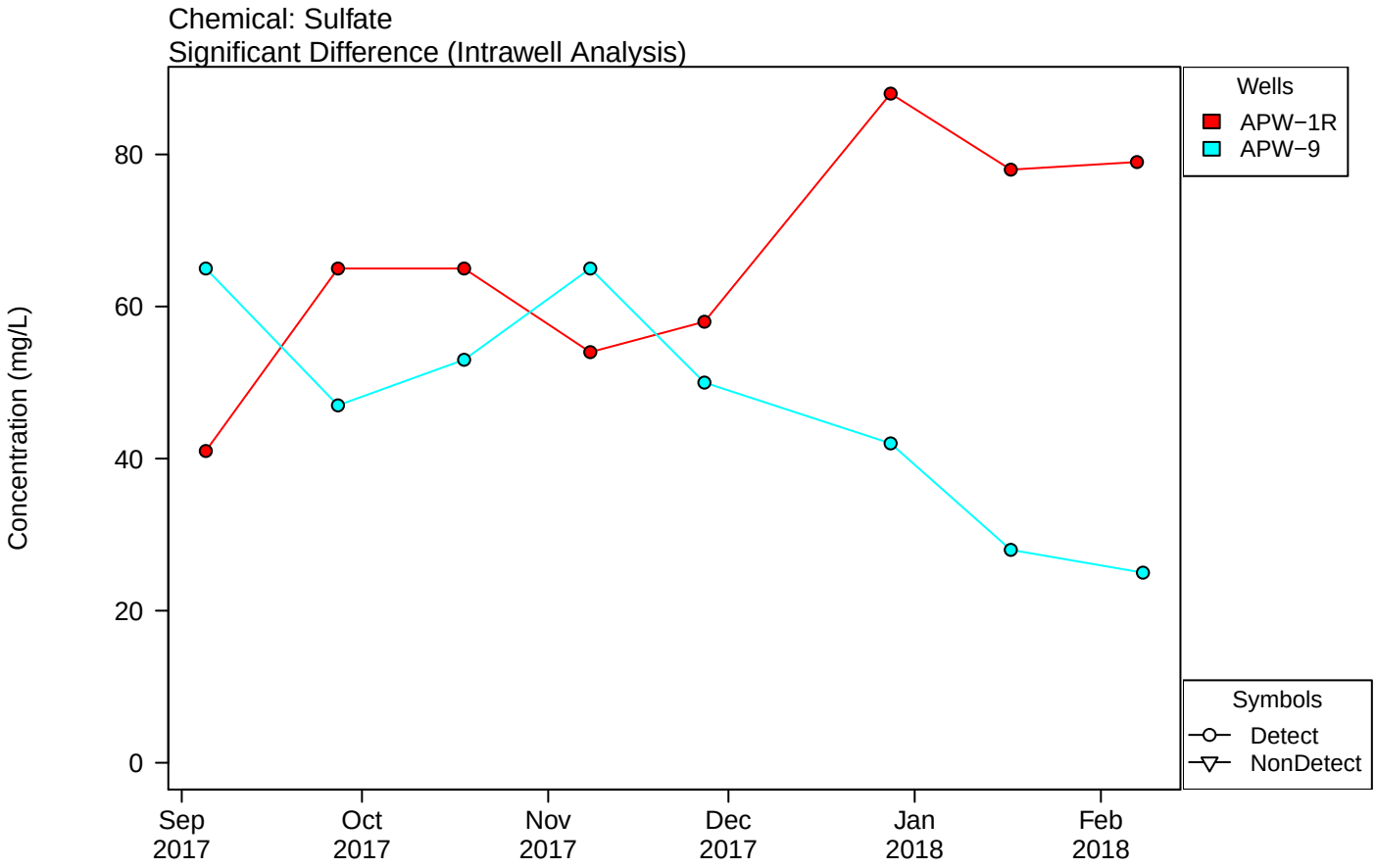
Chemical: Radium 226+228
No Significant Difference (Intrawell Analysis)

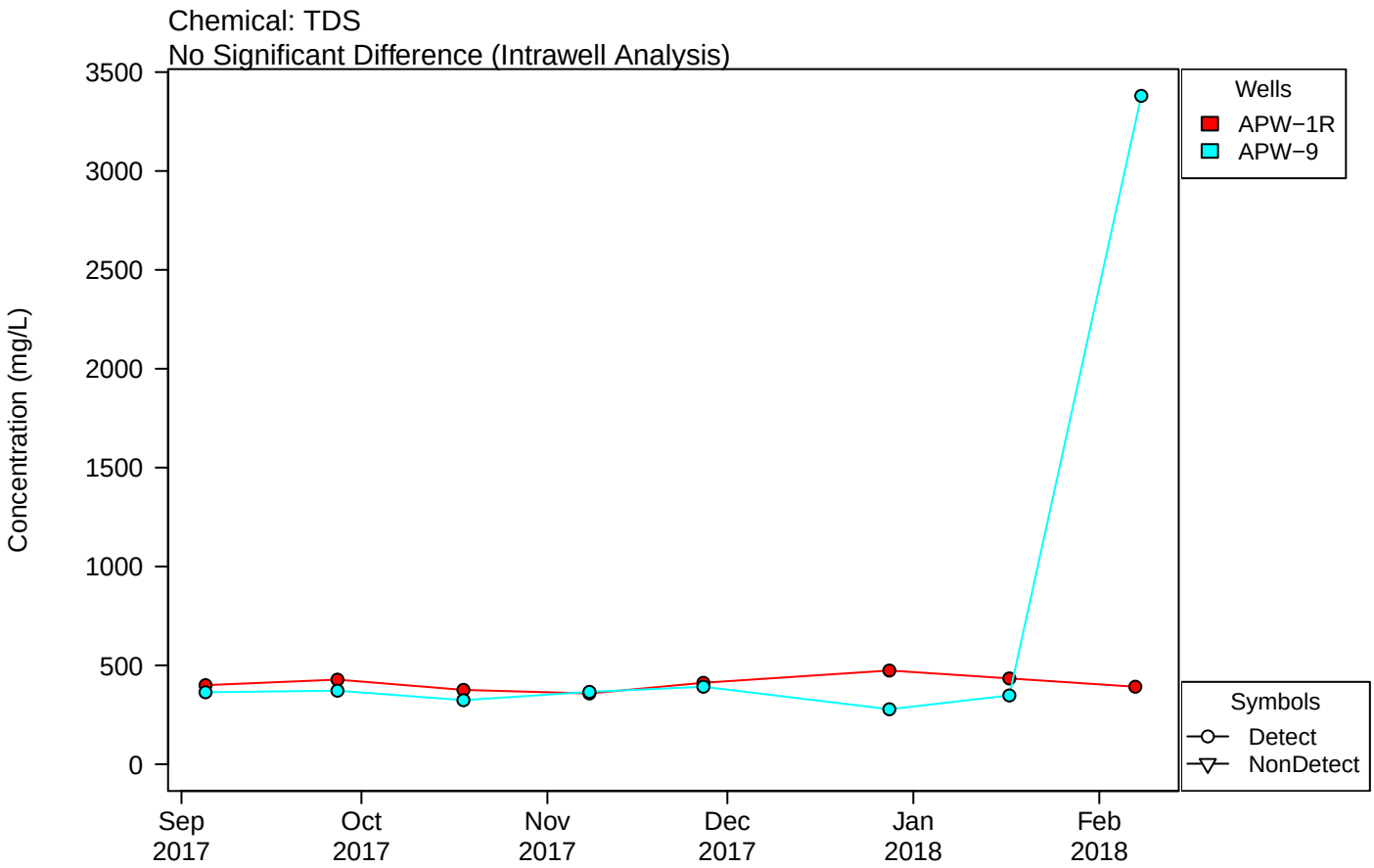


Chemical: Selenium
Significant Difference (Intrawell Analysis)

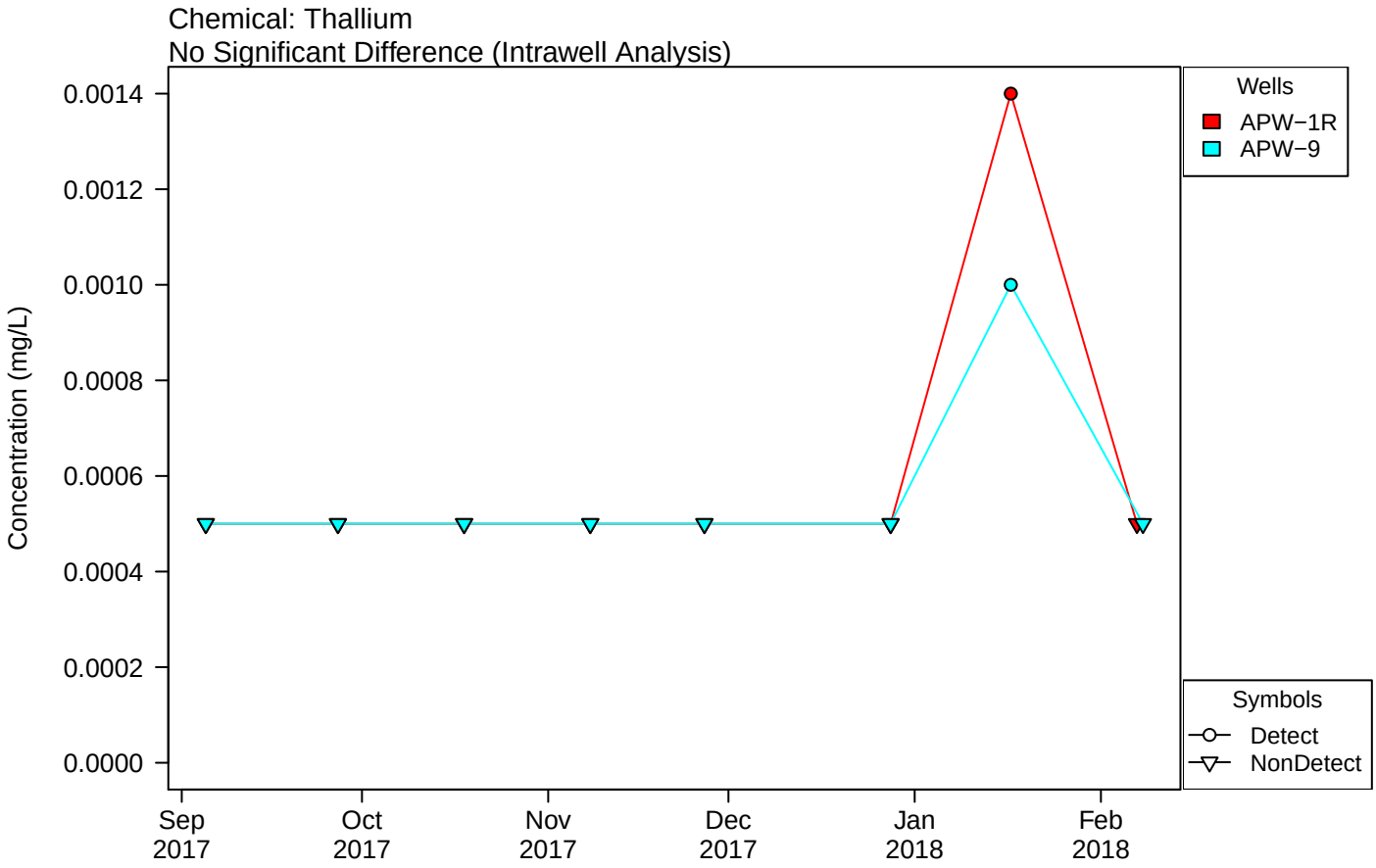


Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:

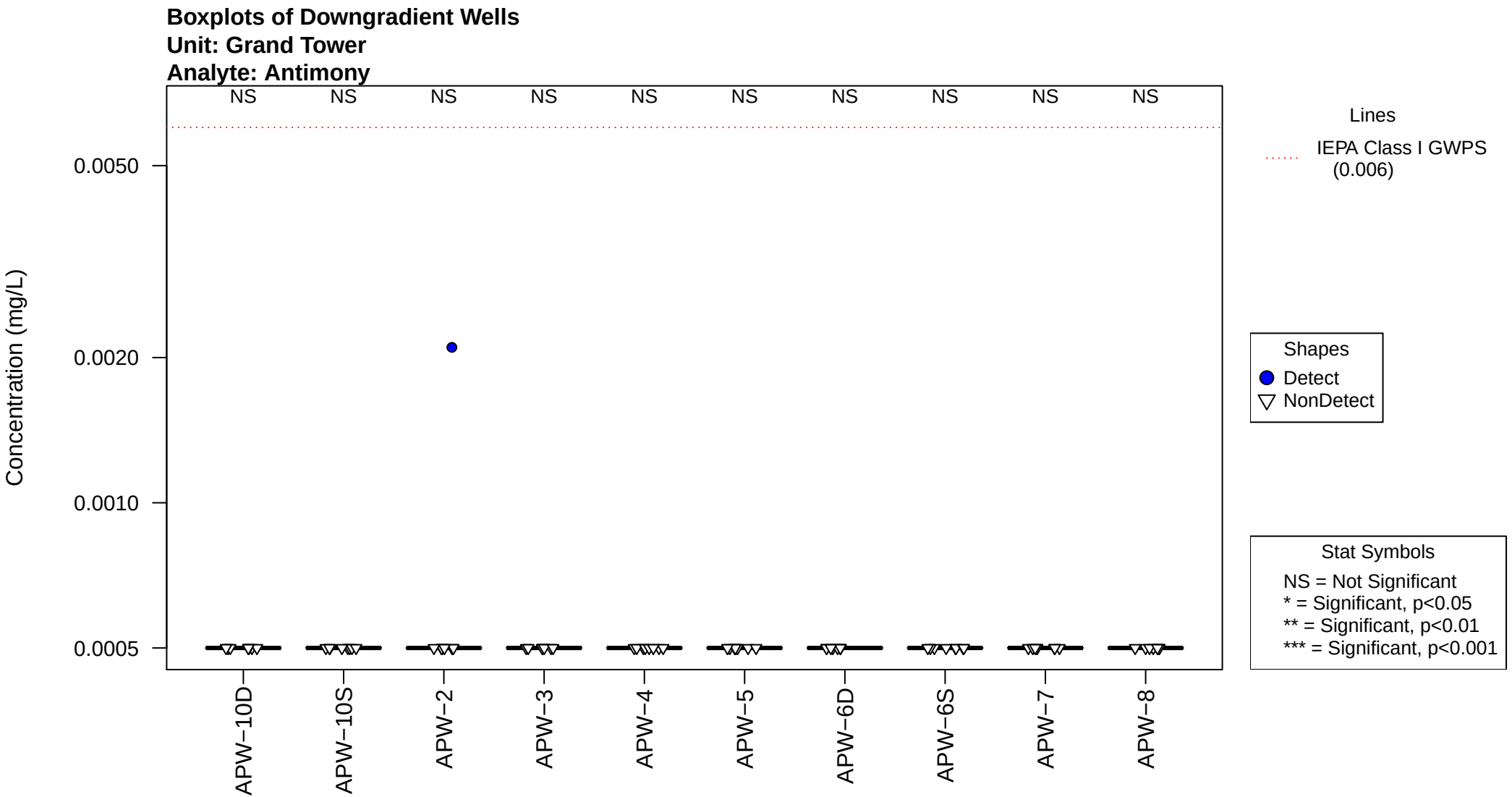


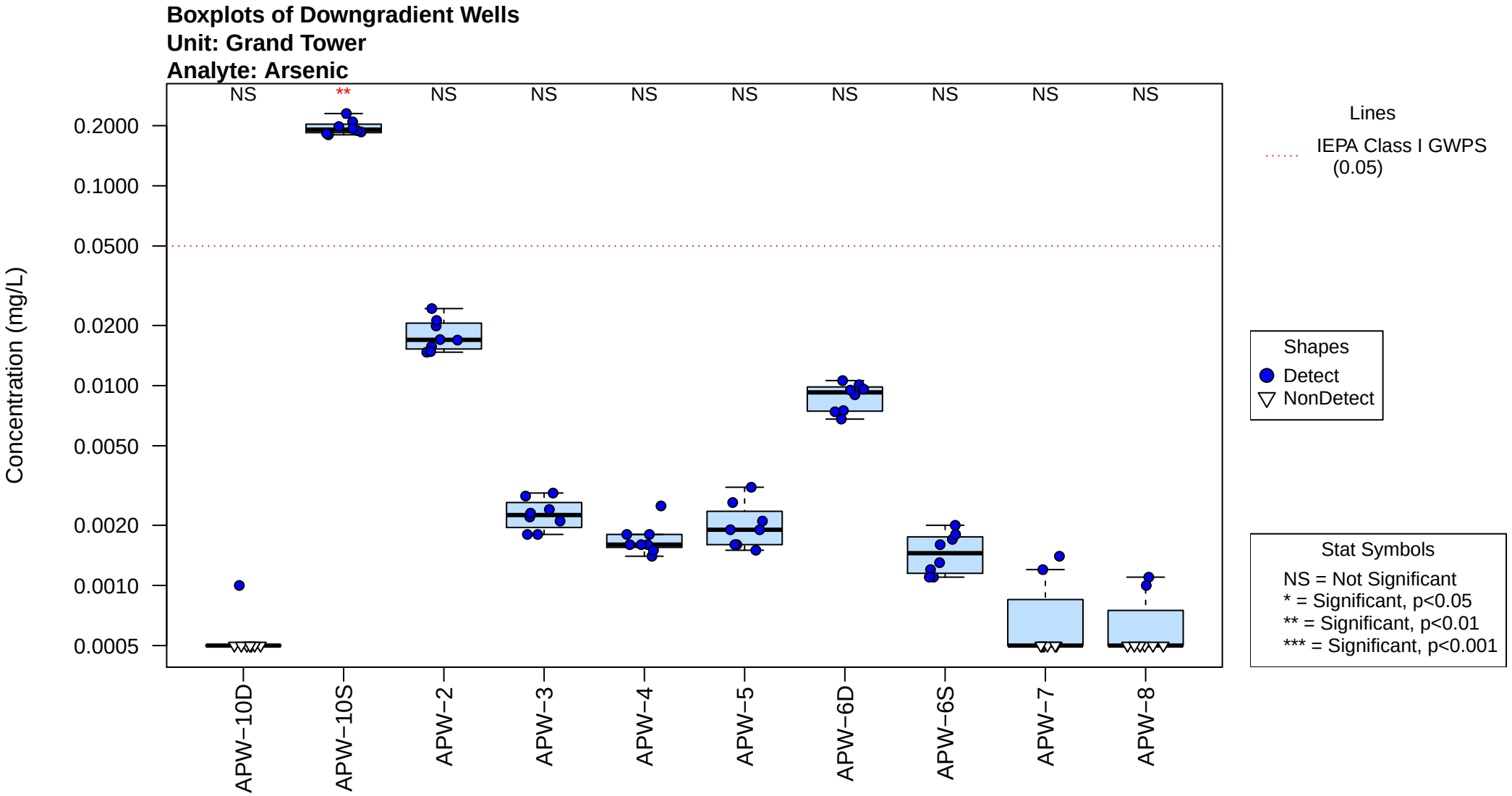


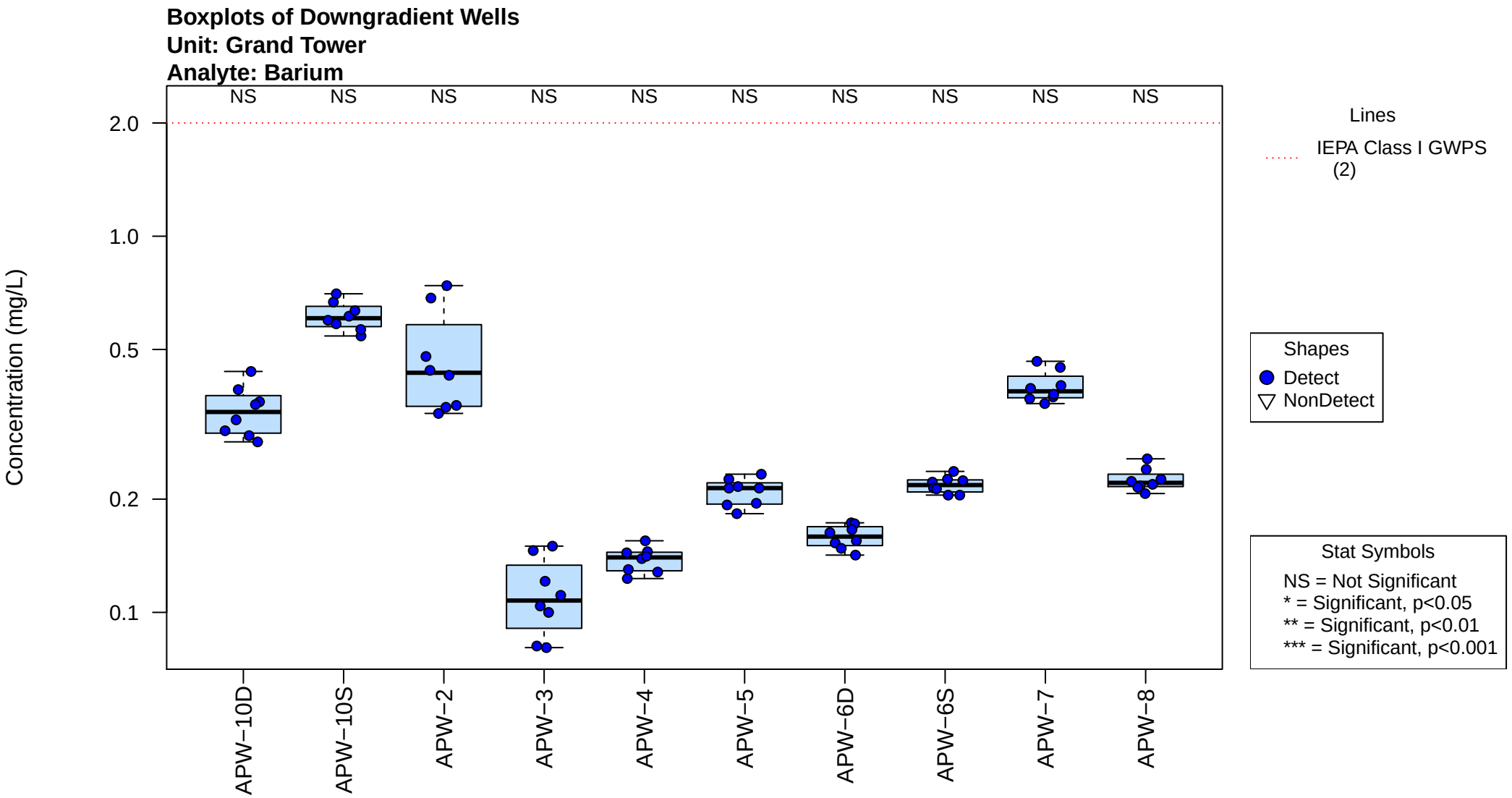
Timeseries of Upgradient Wells
Unit: Grand Tower
Geology:

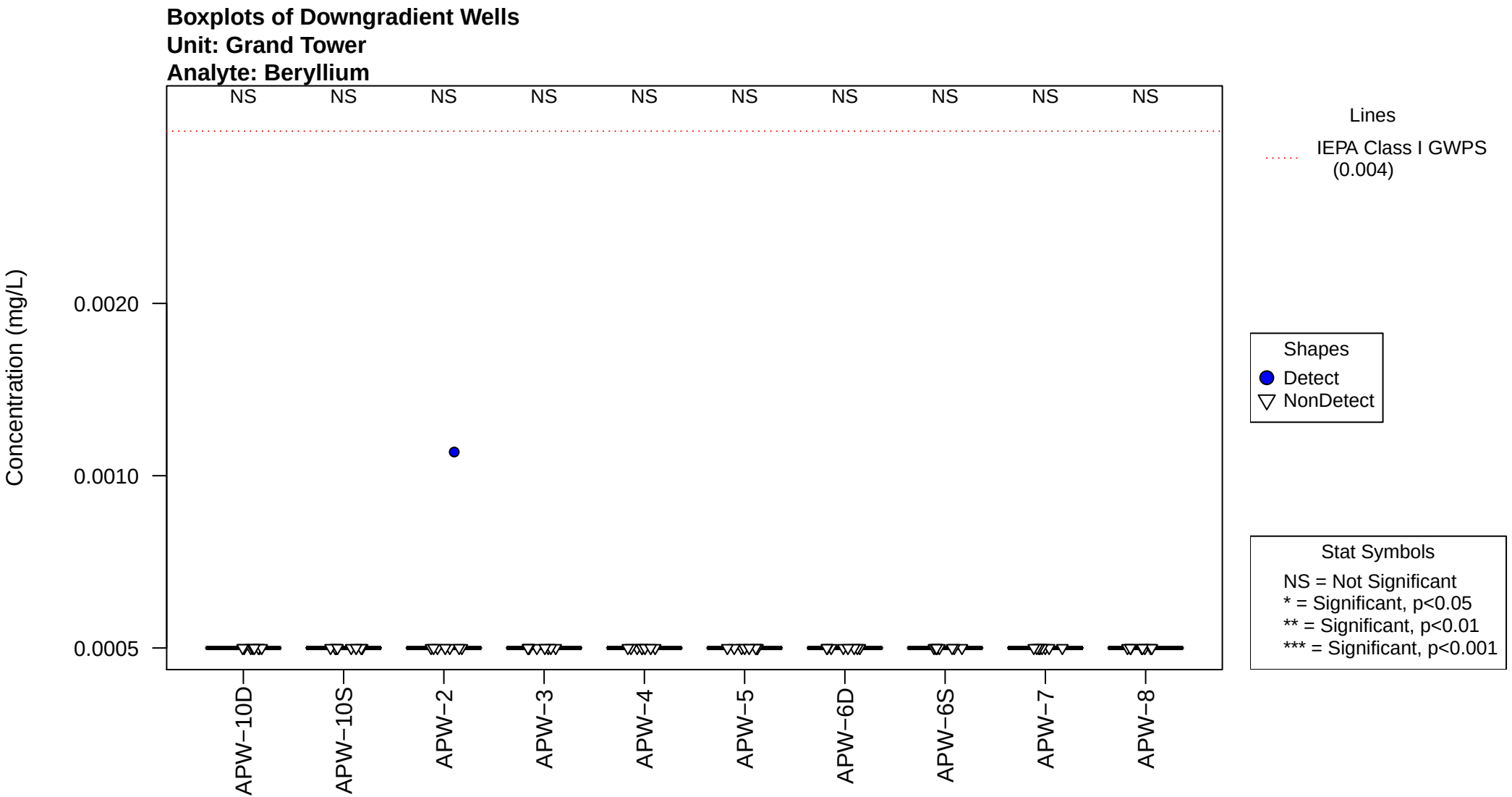


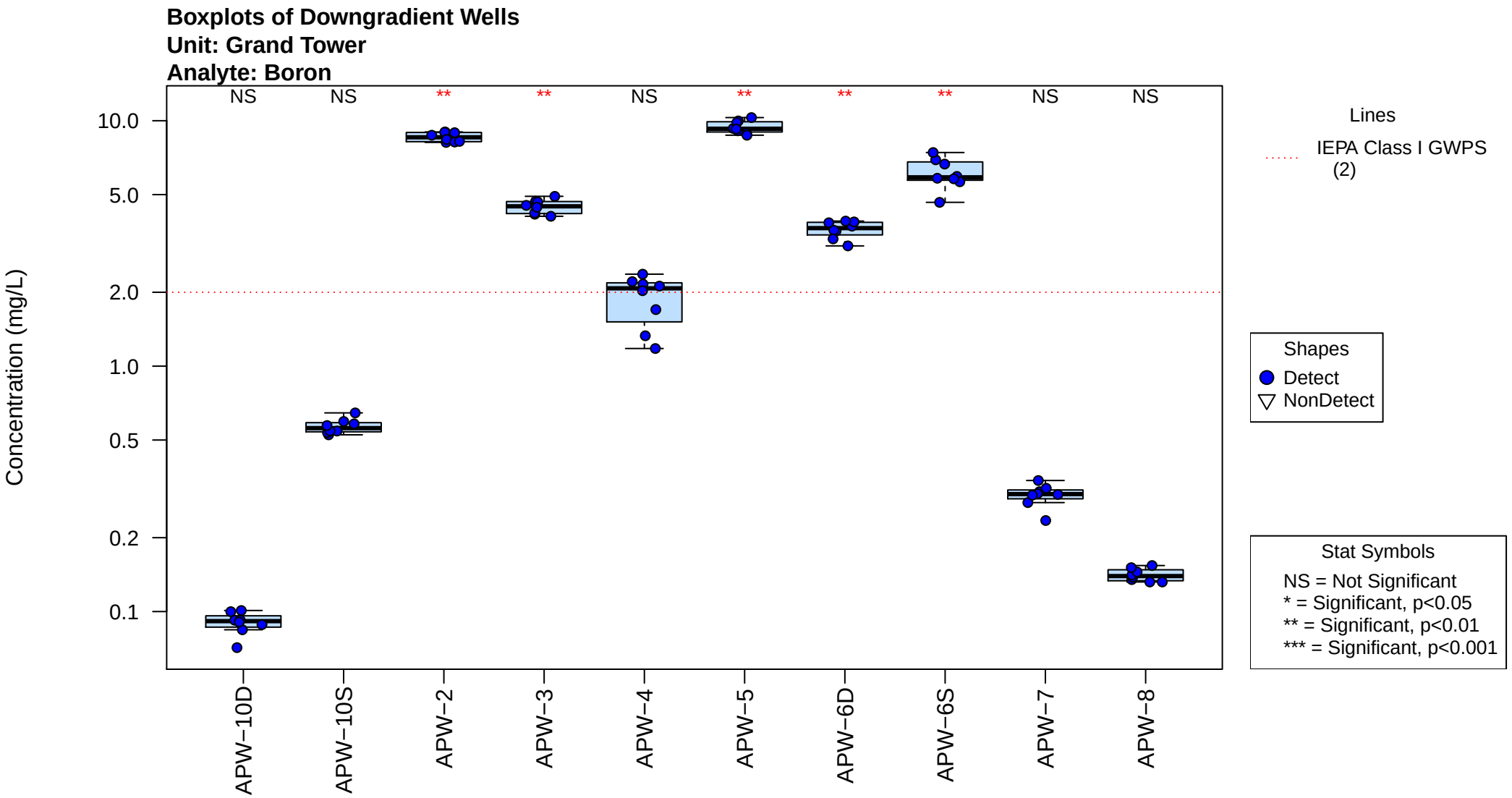
Boxplots of Downgradient Wells

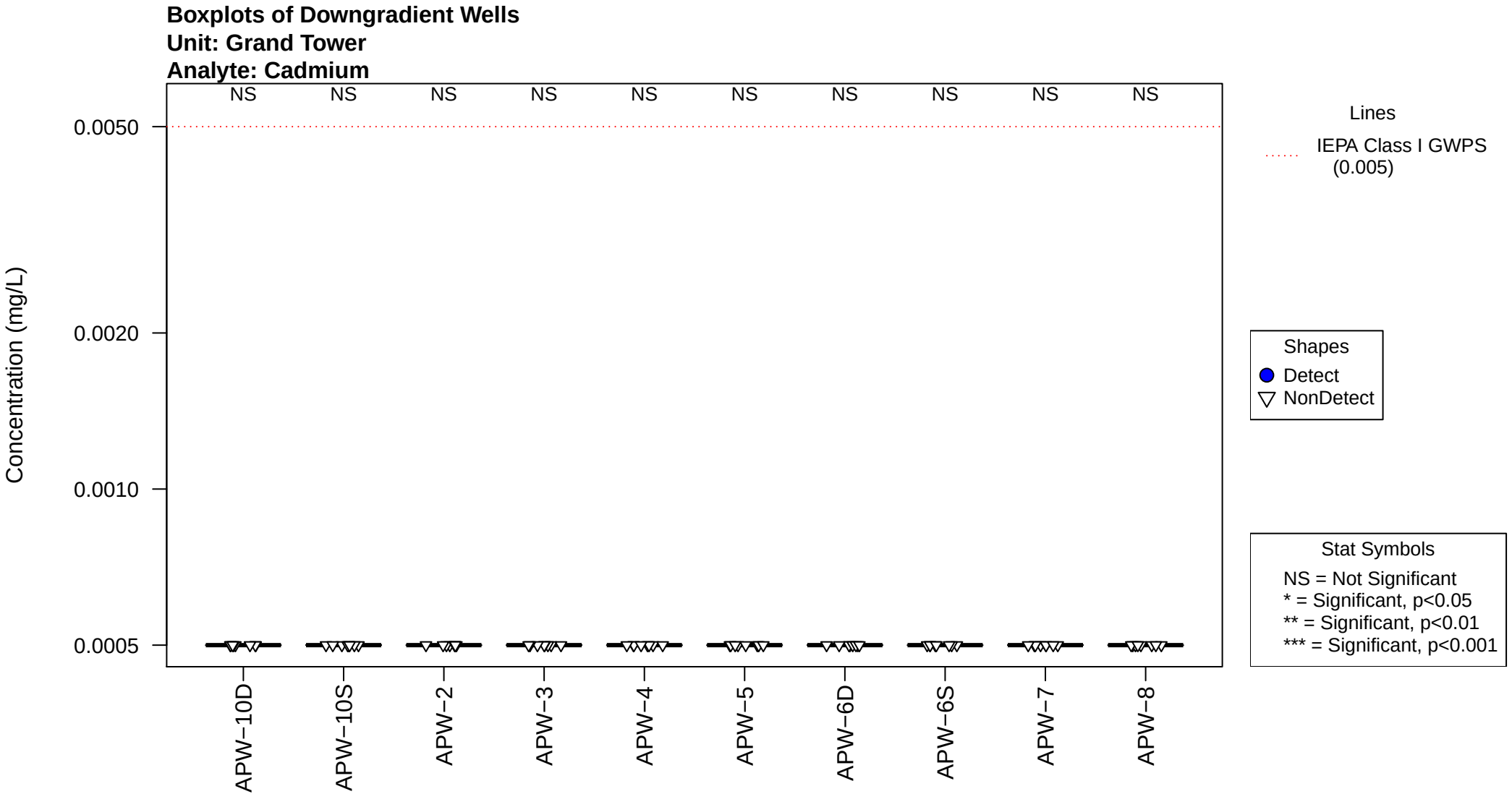

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Antimony
NS
NS
NS
NS
NS
NS
NS
NS
NS
NS
Concentration (mg/L)
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS
(0.006)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

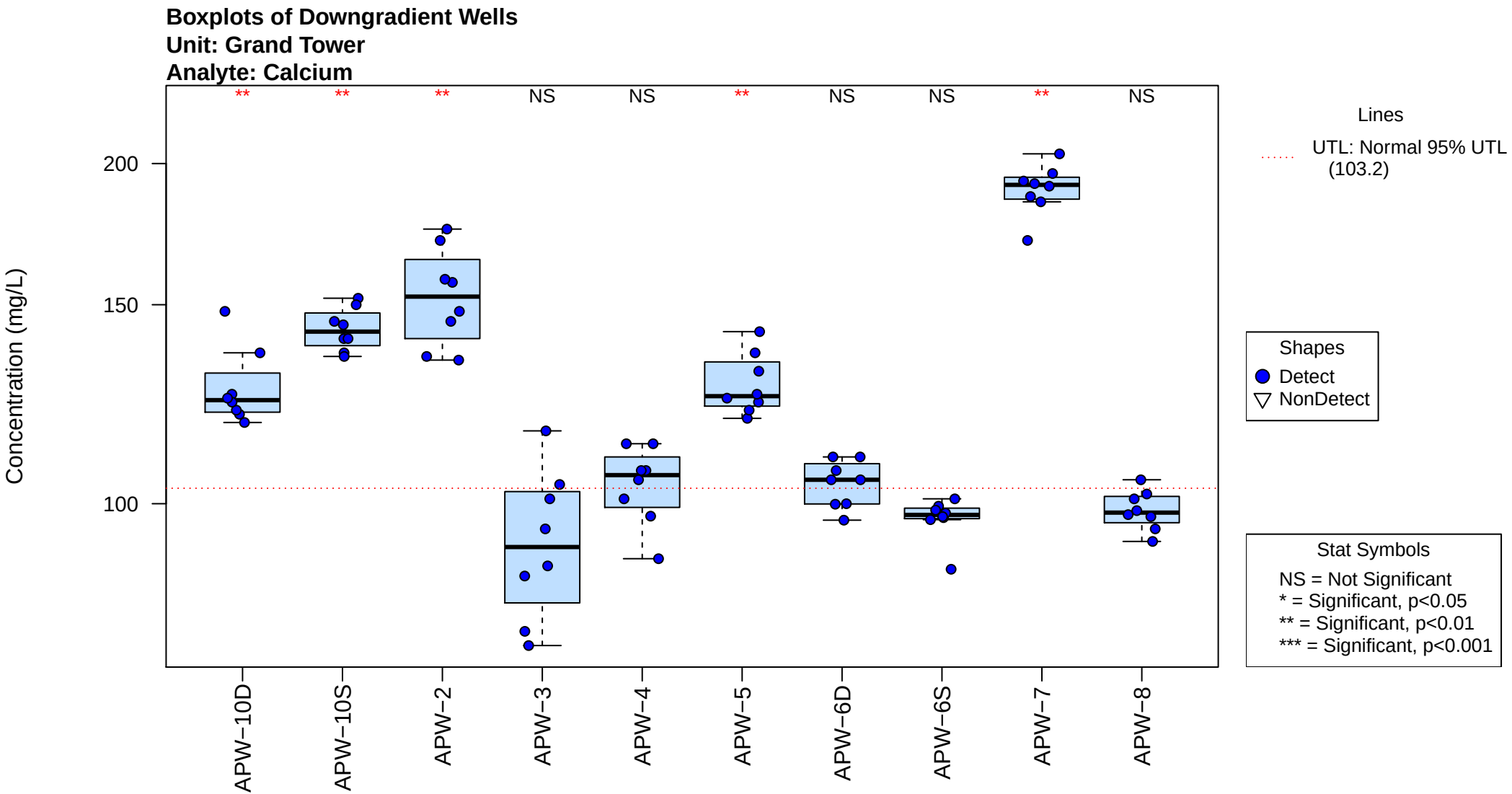

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Arsenic
NS
**
NS
NS
NS
NS
NS
NS
NS
NS
Concentration (mg/L)
0.2000
0.1000
0.0500
0.0200
0.0100
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (0.05)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

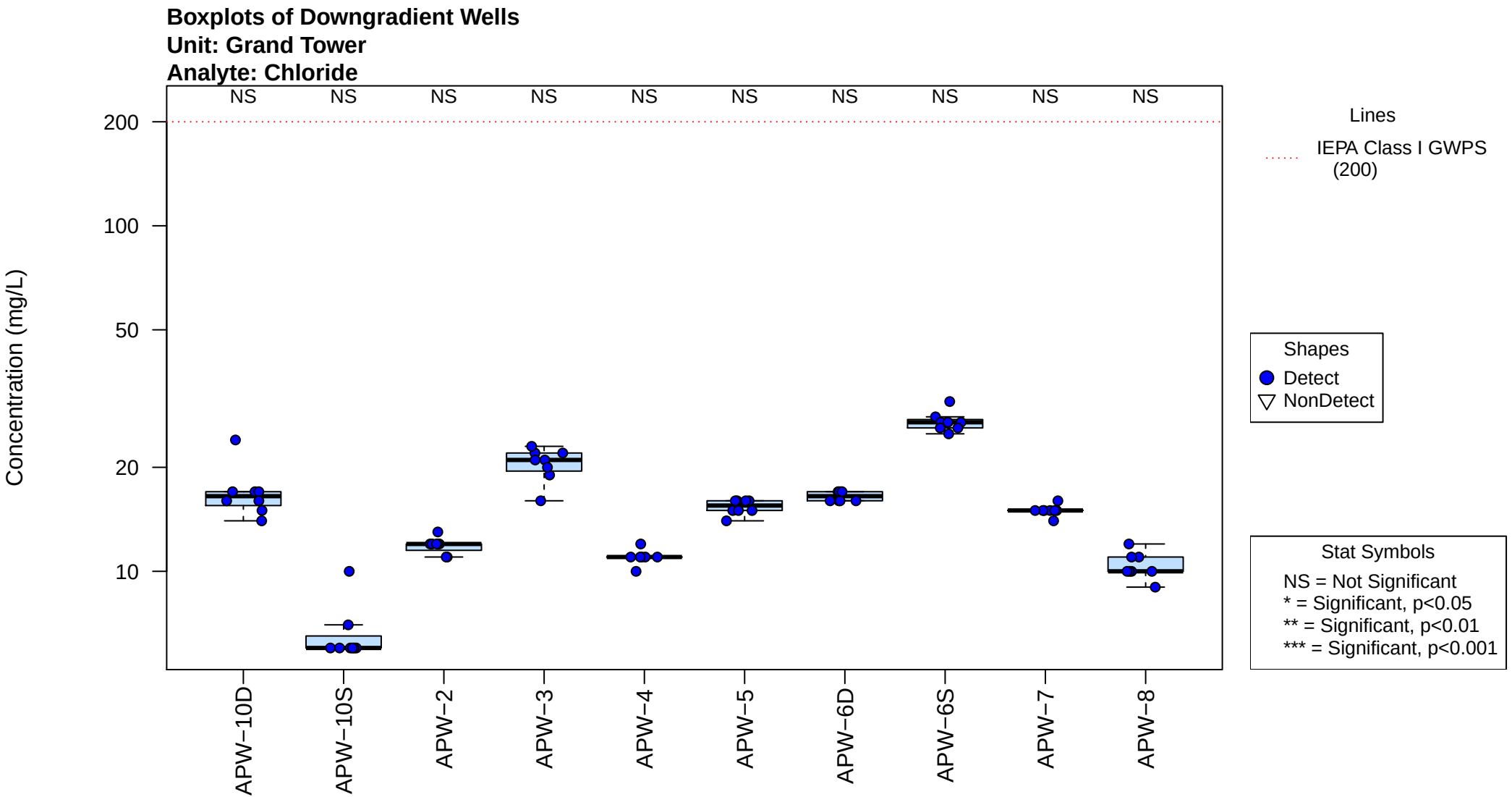

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Barium
NS
Concentration (mg/L)
2.0
1.0
0.5
0.2
0.1
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (2)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

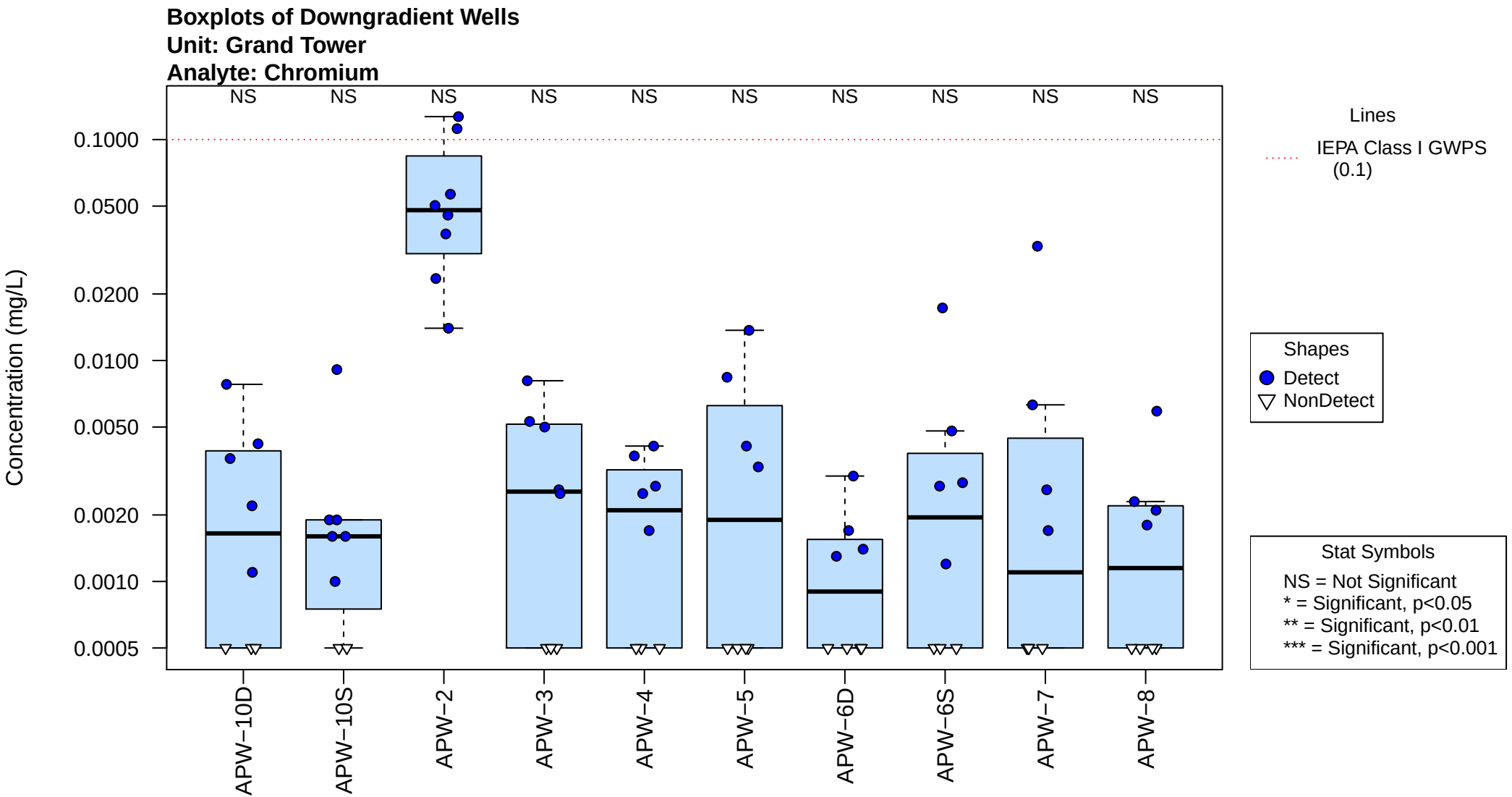

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Beryllium
NS
NS
NS
NS
NS
NS
NS
NS
NS
NS
Concentration (mg/L)
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS
(0.004)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

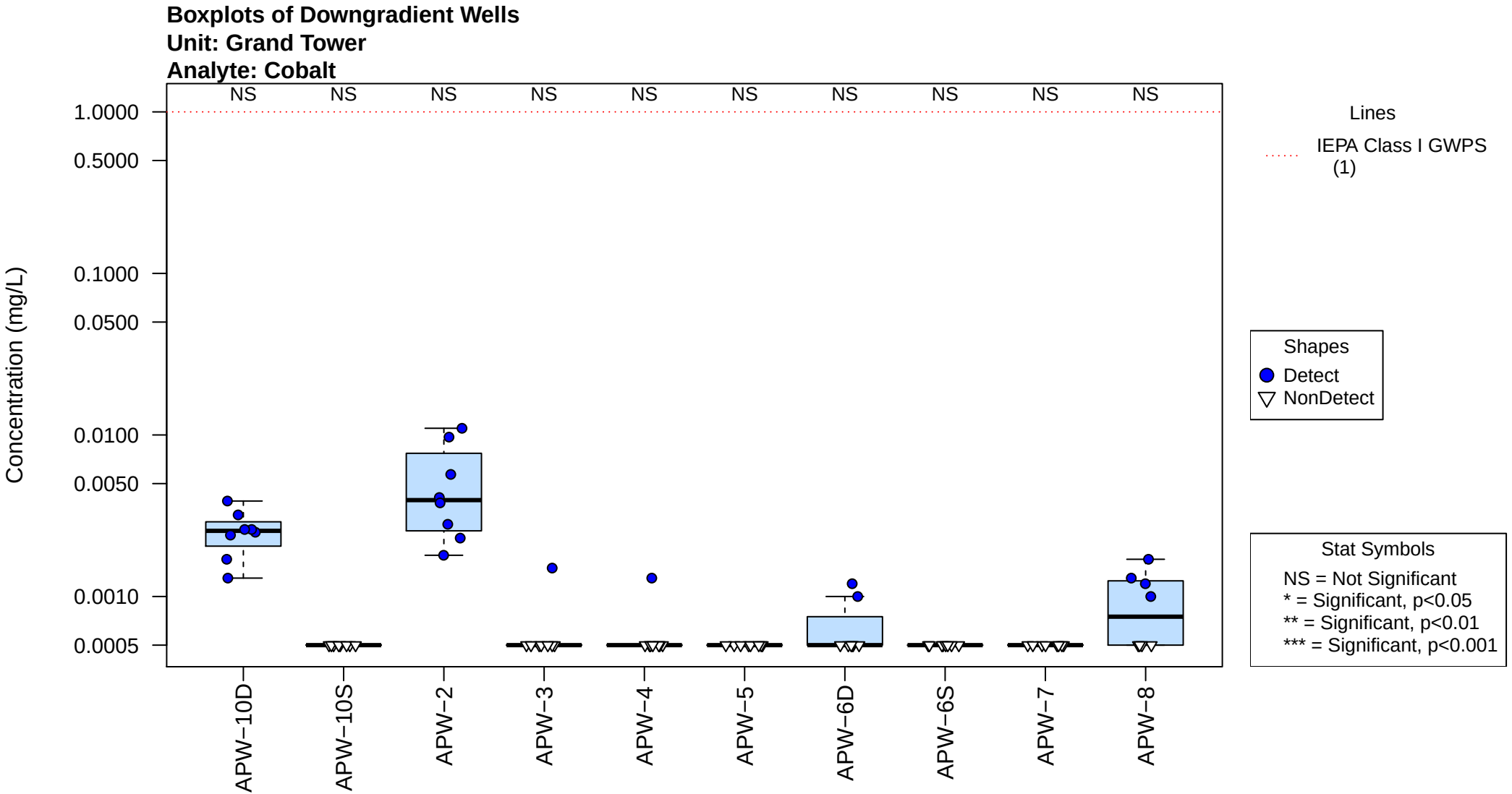

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Boron
NS
NS
**
**
NS
**
**
**
NS
NS
10.0
5.0
2.0
1.0
0.5
0.2
0.1
Concentration (mg/L)
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (2)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

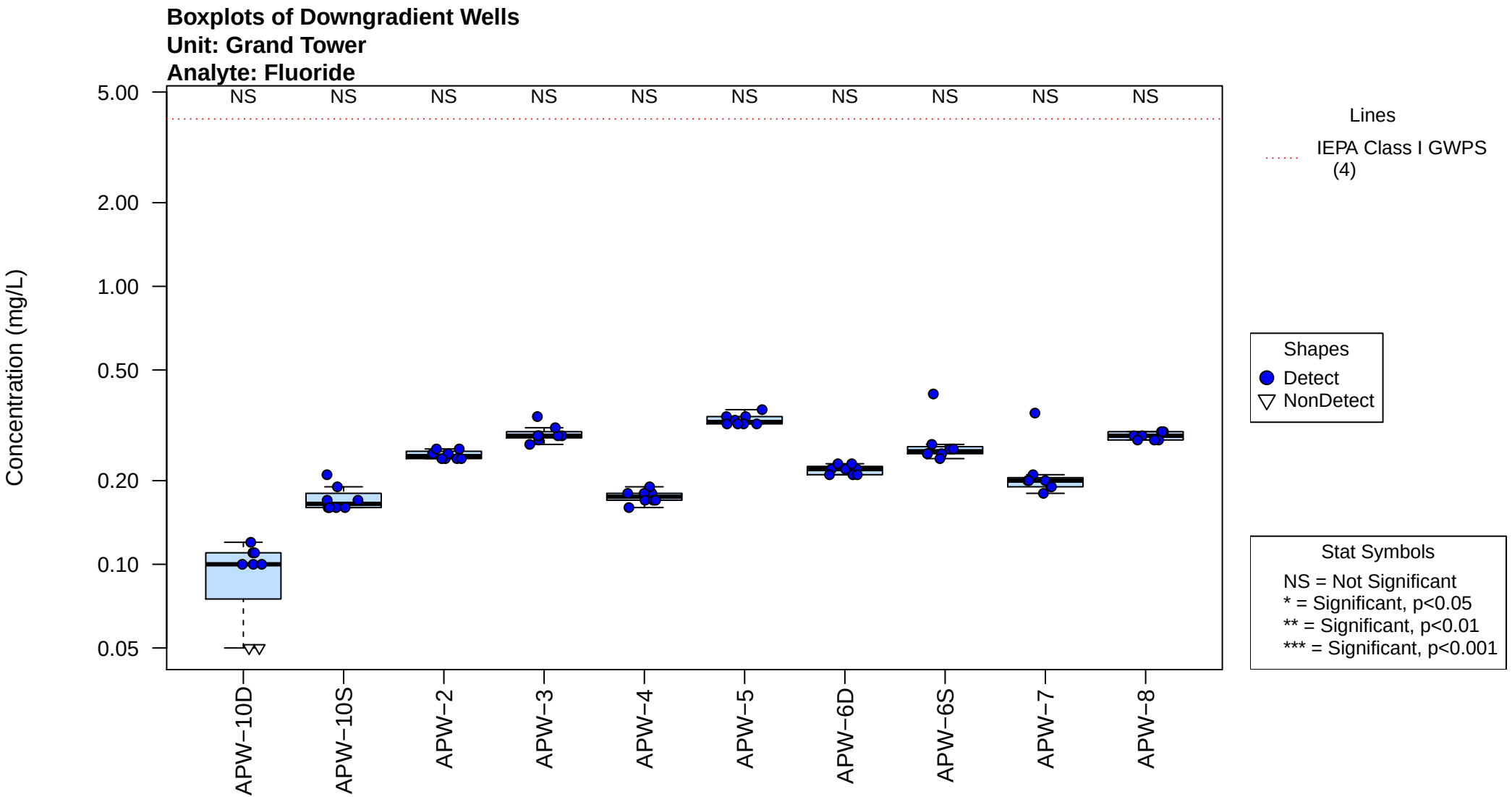

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Cadmium
NS
0.0050
0.0020
0.0010
0.0005
Concentration (mg/L)
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS
(0.005)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

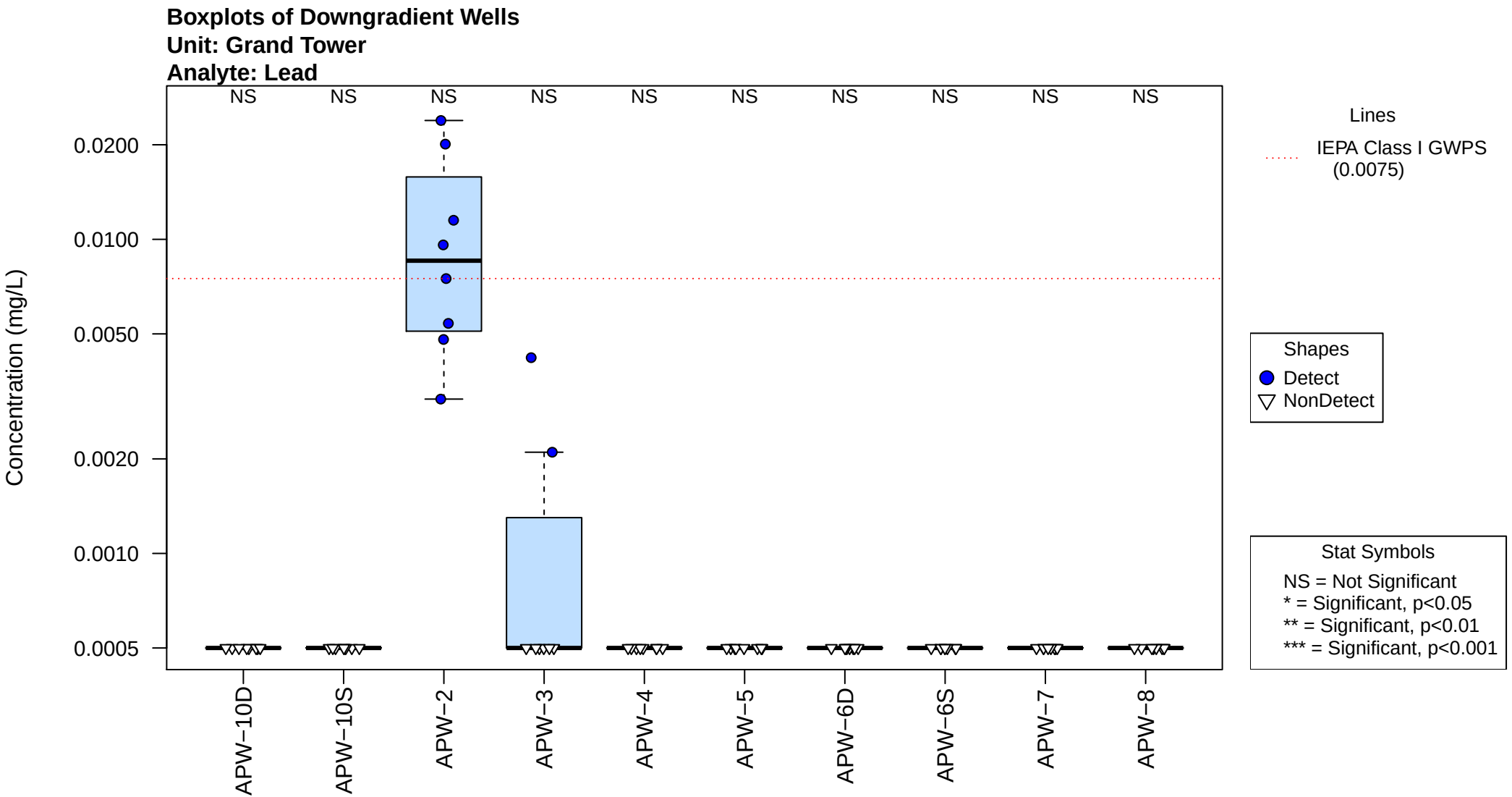

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Calcium
Concentration (mg/L)
200
150
100
**
**
**
NS
NS
**
NS
NS
**
NS
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
UTL: Normal 95% UTL (103.2)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

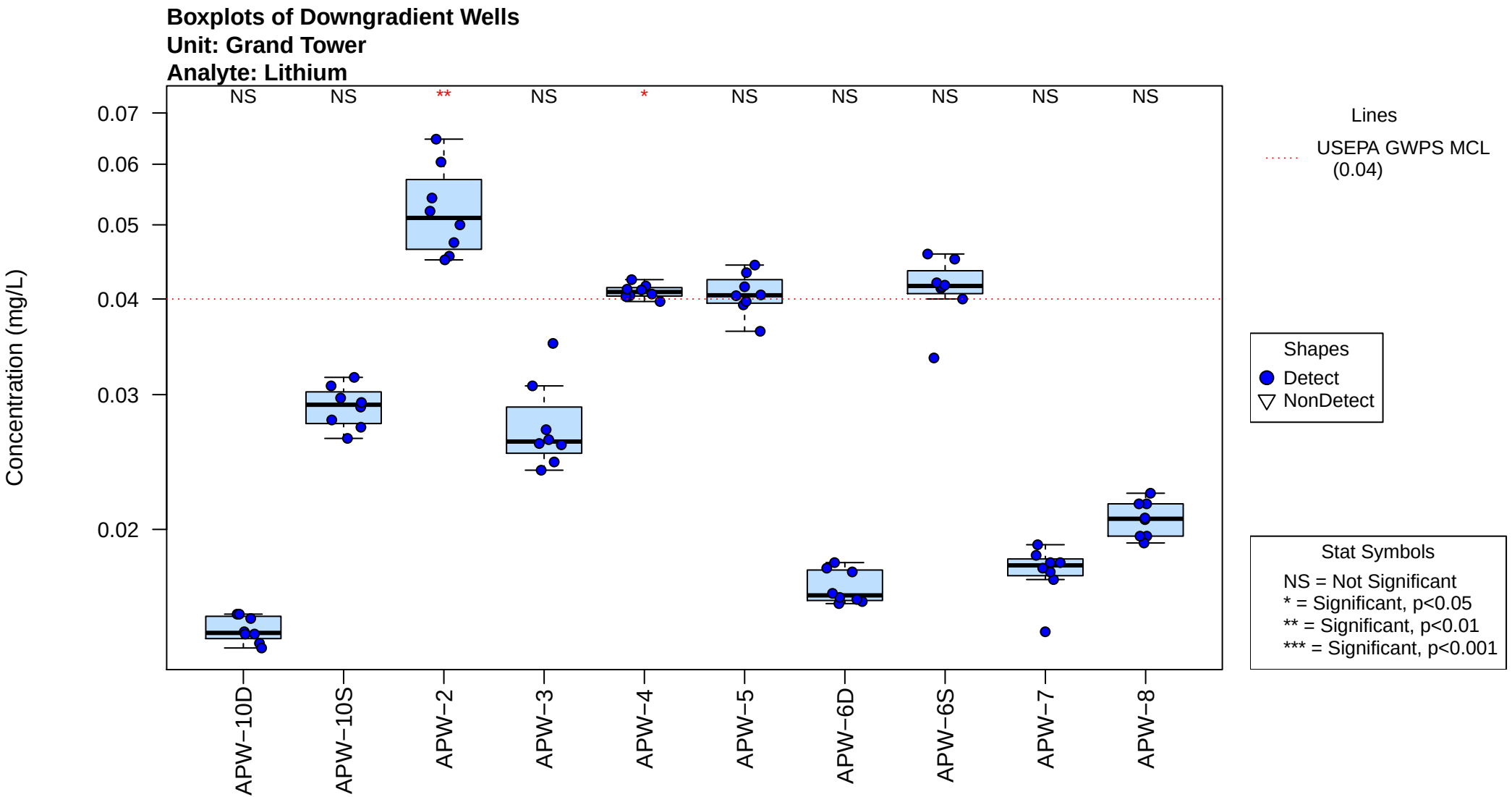

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Chloride
NS
Concentration (mg/L)
200
100
50
20
10
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (200)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

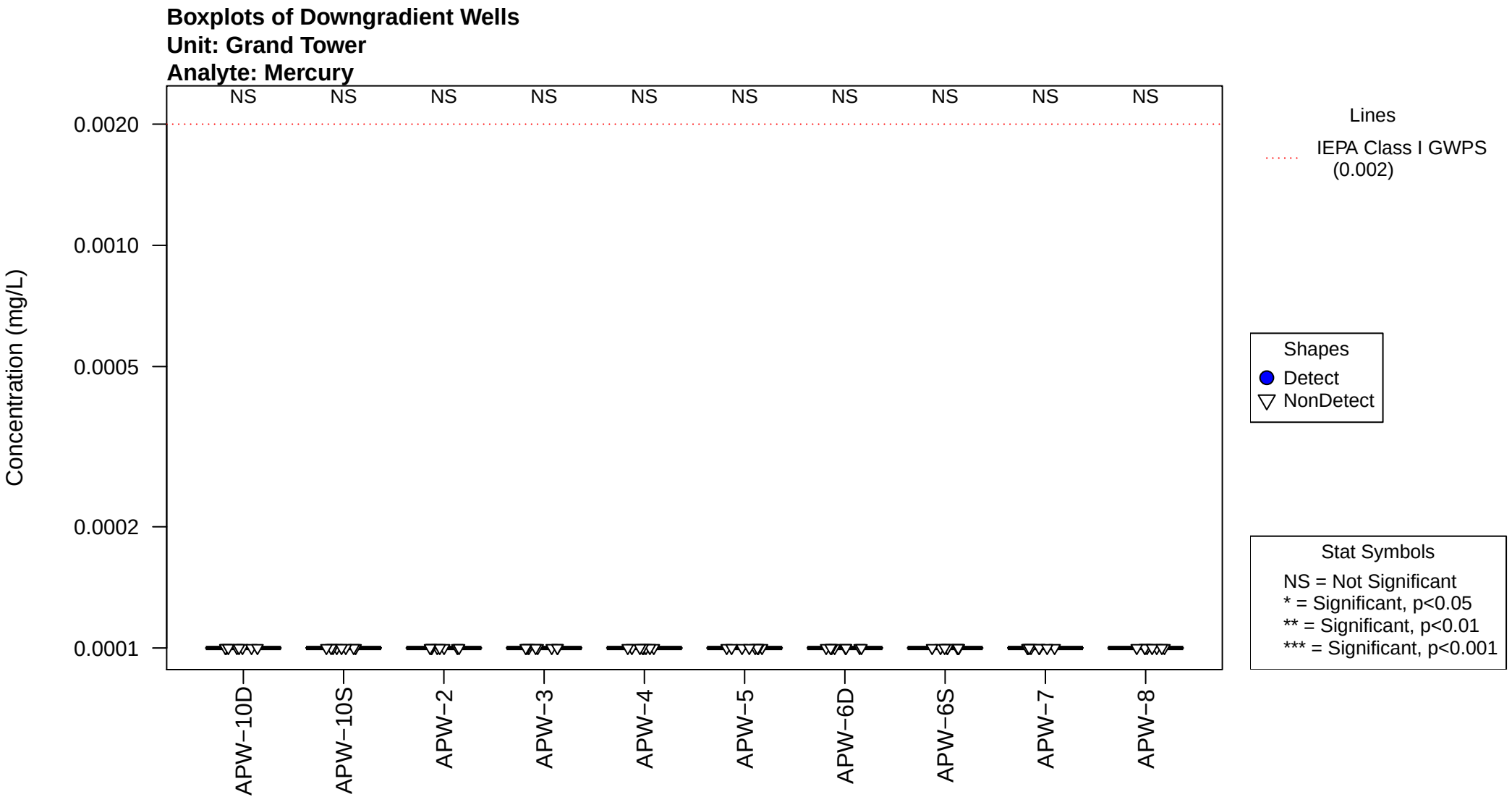

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Chromium
NS
Concentration (mg/L)
0.1000
0.0500
0.0200
0.0100
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (0.1)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

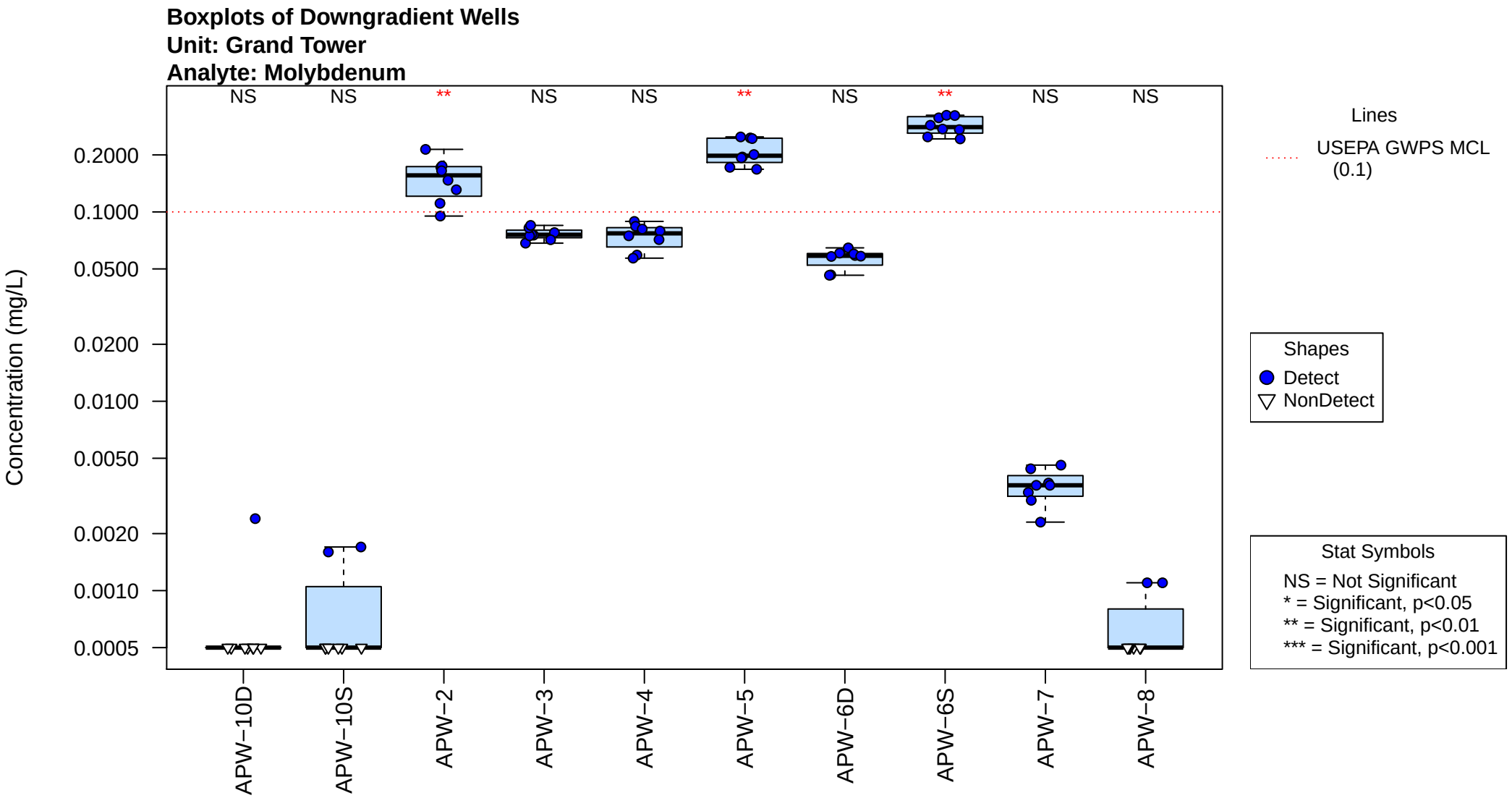

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Cobalt
NS
Concentration (mg/L)
1.0000
0.5000
0.1000
0.0500
0.0100
0.0050
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (1)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

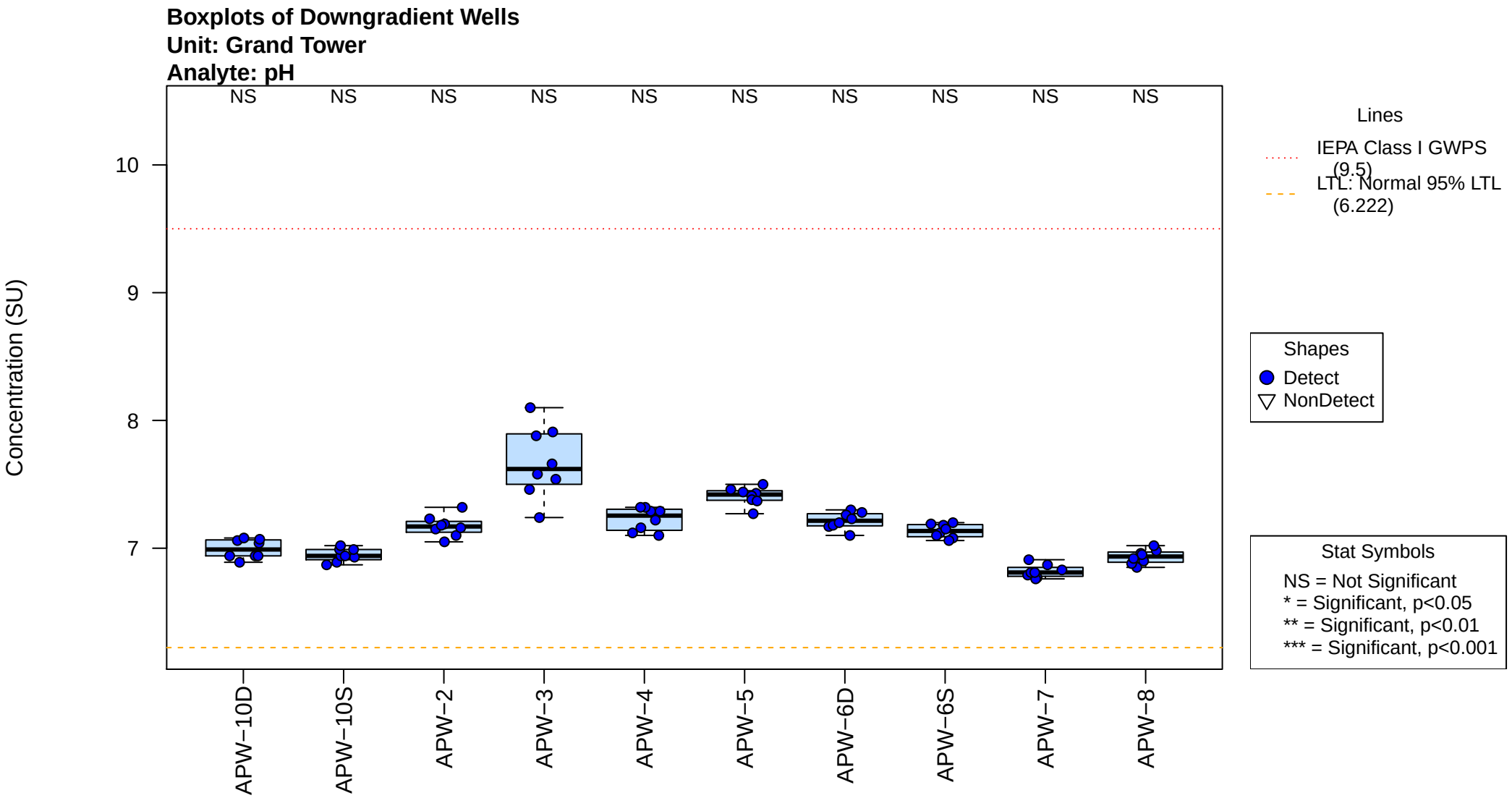

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Fluoride
Concentration (mg/L)
5.00
2.00
1.00
0.50
0.20
0.10
0.05
NS
APW-10D
APW-10S
APW-2
APW-3
APW-4
APW-5
APW-6D
APW-6S
APW-7
APW-8
Lines
IEPA Class I GWPS (4)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

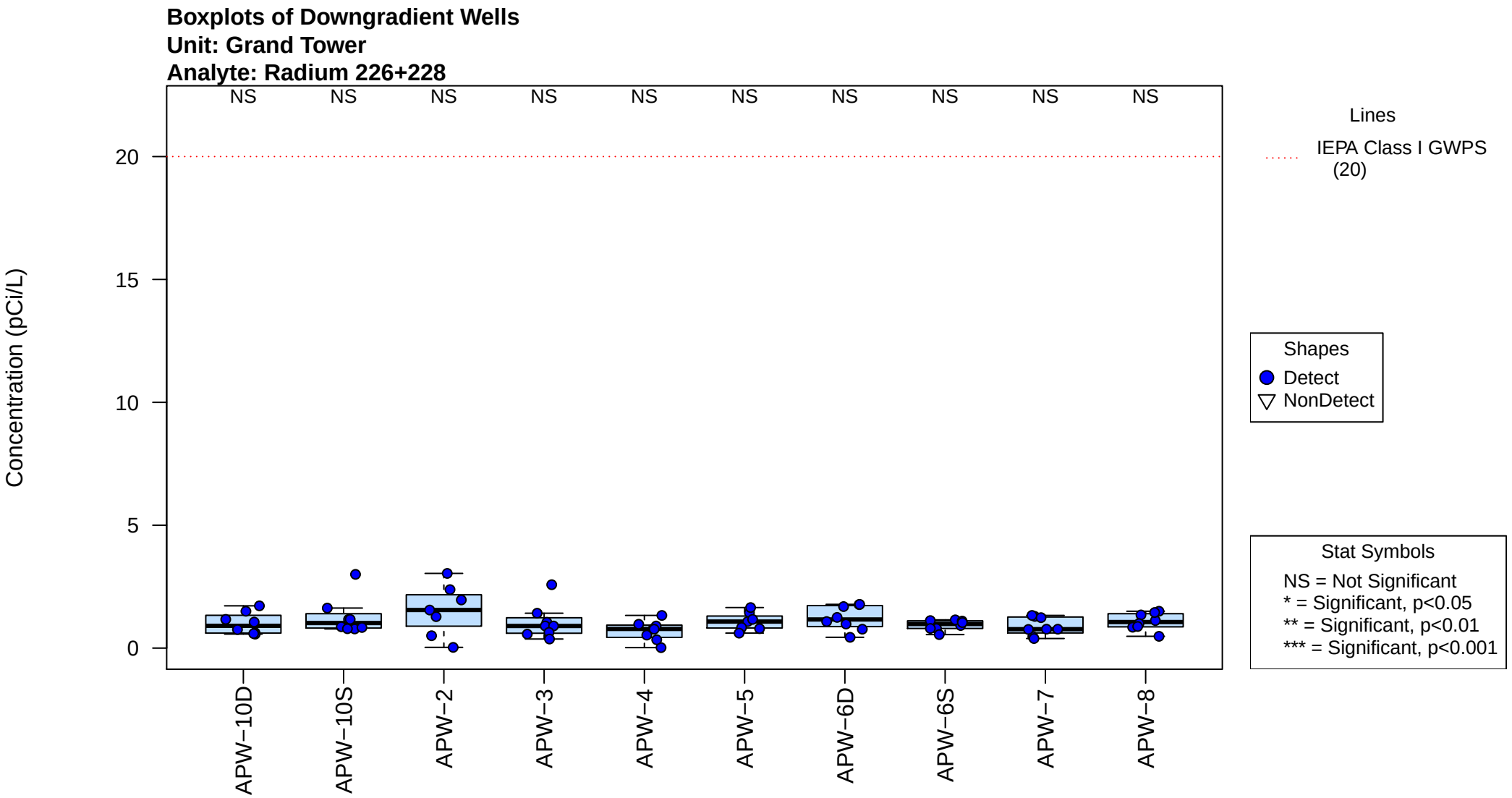

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Lead
NS
Concentration (mg/L)
0.0200
0.0100
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS
(0.0075)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

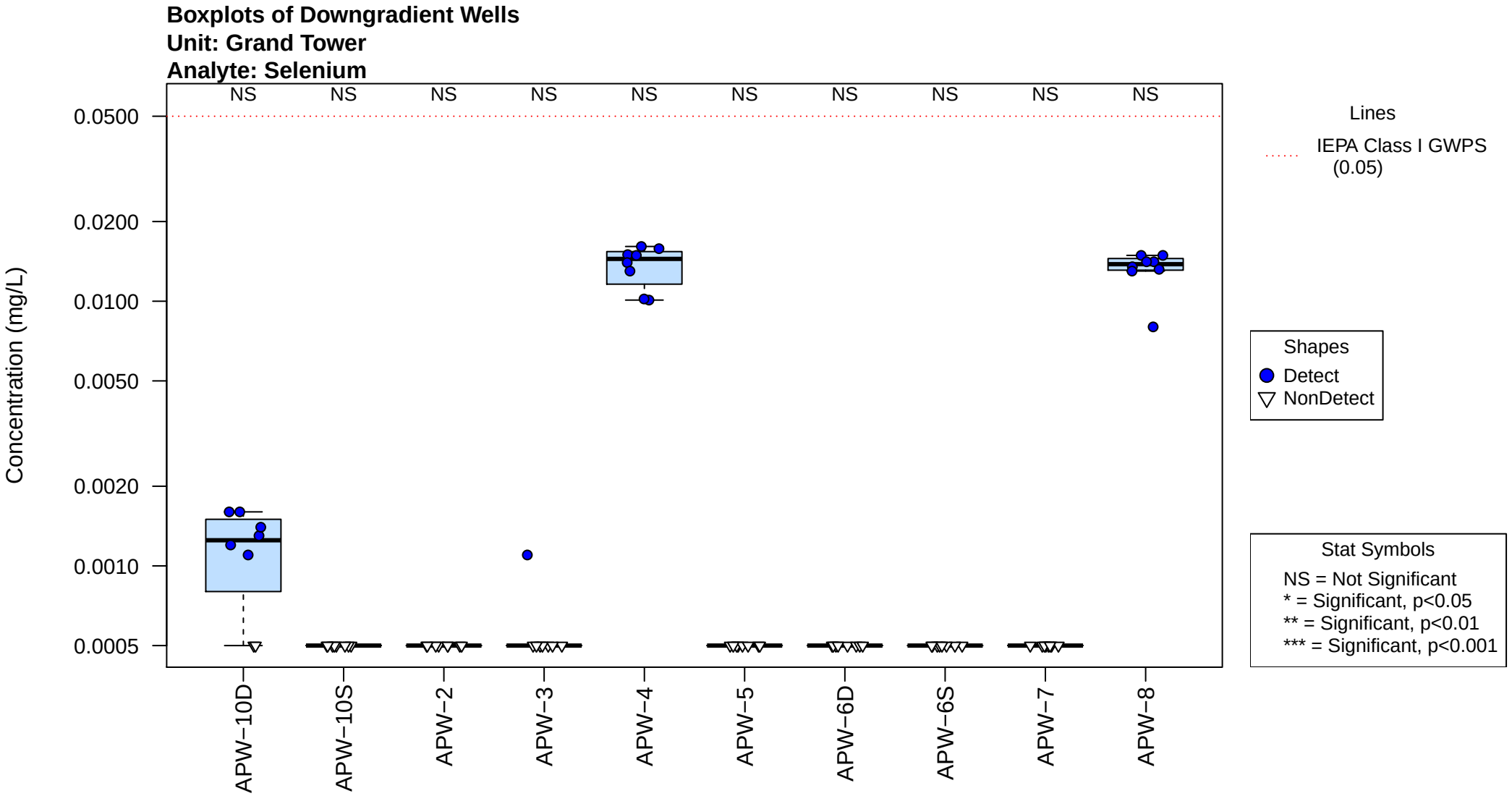

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Lithium
NS
NS
**
NS
*
NS
NS
NS
NS
NS
0.07
0.06
0.05
0.04
0.03
0.02
Concentration (mg/L)
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
USEPA GWPS MCL
(0.04)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

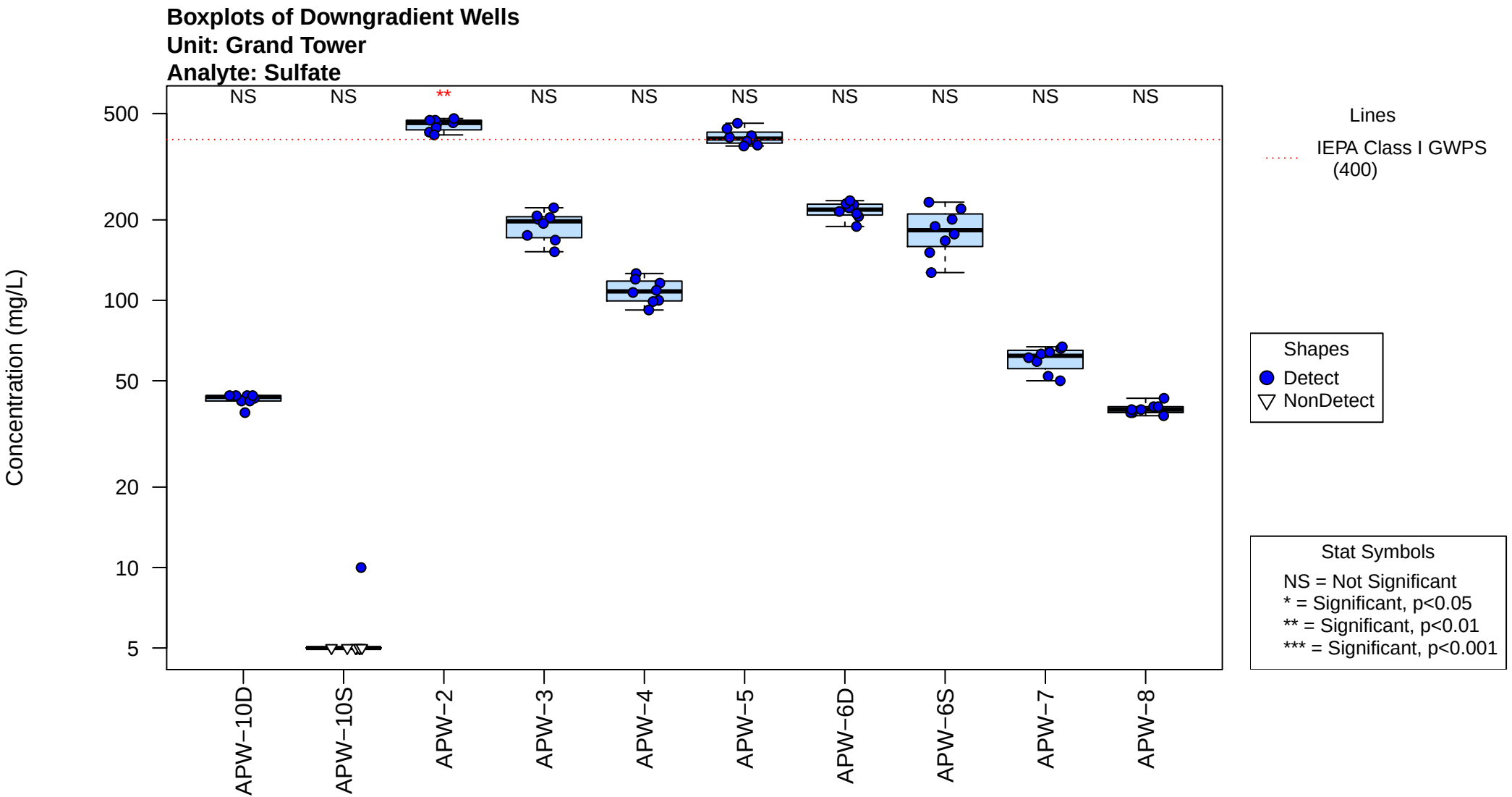

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Mercury
NS
Concentration (mg/L)
0.0020
0.0010
0.0005
0.0002
0.0001
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (0.002)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

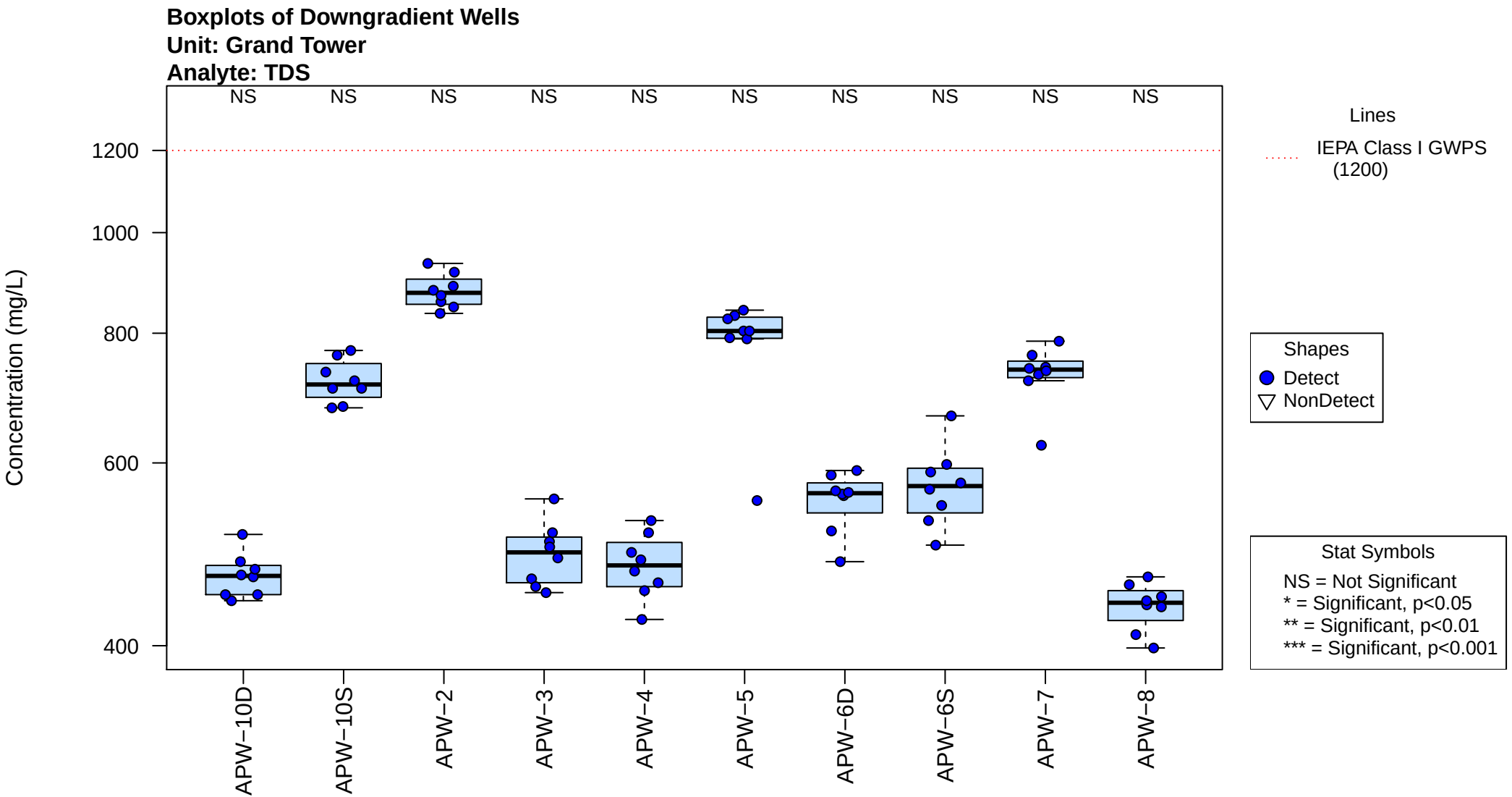

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Molybdenum
NS
NS
**
NS
NS
**
NS
**
NS
NS
Concentration (mg/L)
0.2000
0.1000
0.0500
0.0200
0.0100
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
USEPA GWPS MCL (0.1)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

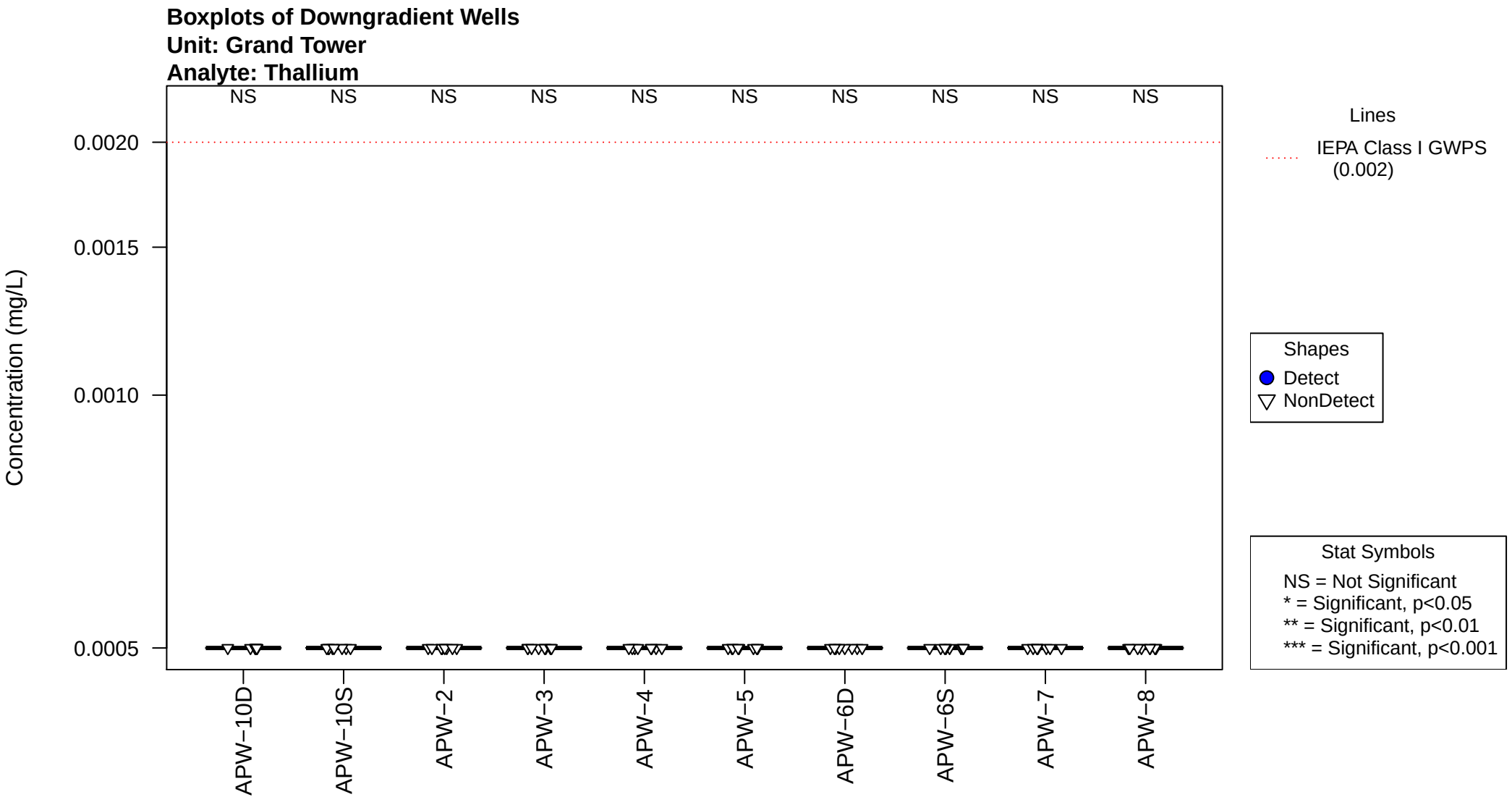

Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: pH
NS
Concentration (SU)
10
9
8
7
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (9.5)
LTL: Normal 95% LTL (6.222)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001


Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Radium 226+228
NS
Concentration (pCi/L)
0
5
10
15
20
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (20)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001


Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Selenium
NS
Concentration (mg/L)
0.0500
0.0200
0.0100
0.0050
0.0020
0.0010
0.0005
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (0.05)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001


Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Sulfate
Concentration (mg/L)
500
200
100
50
20
10
5
NS
NS
**
NS
NS
NS
NS
NS
NS
NS
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (400)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001


Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: TDS
NS
Concentration (mg/L)
1200
1000
800
600
400
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS (1200)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001


Boxplots of Downgradient Wells
Unit: Grand Tower
Analyte: Thallium
NS
NS
NS
NS
NS
NS
NS
NS
NS
NS
0.0020
0.0015
0.0010
0.0005
Concentration (mg/L)
APW−10D
APW−10S
APW−2
APW−3
APW−4
APW−5
APW−6D
APW−6S
APW−7
APW−8
Lines
IEPA Class I GWPS
(0.002)
Shapes
Detect
NonDetect
Stat Symbols
NS = Not Significant
* = Significant, p<0.05
** = Significant, p<0.01
*** = Significant, p<0.001

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Appendix 6

ERM Field Work and Laboratory Testing

AUGER PROBES
(A-1 through A-20)

				Thickness	Elevation			
Boring I.D.	**Northing**	**Easting**	**Ground Surface Elevation**	**Coal Ash**	**Base of Coal Ash**	**Boring Total Depth**	**Bottom of Boring**	Notes
A-1	360582.524	248687.308	372.28	20	352.3	38	334.3	Shelby tube sample collected A-1(28-30.5)
A-2	360610.971	2486425.294	372.27	22	350.3	24	348.3	
A-3	360229.106	2486438.368	375.05	24	351.1	33	342.1	
A-4	360266.044	2486649.835	376.01	24.5	351.5	28.5	347.5	Shelby tube sample collected A-4(26-28.5)
A-5	360227.140	2486851.241	374.40	23.2	351.2	24	350.4	
A-6	360107.897	2486798.213	373.82	21.6	352.2	25.5	348.3	Shelby tube sample collected A-6(23-25.5)
A-7	360111.664	2486600.504	374.34	23.9	350.4	27	347.3	
A-8	360080.525	2486396.540	374.47	25.6	348.9	35	339.5	
A-9	360080.027	2486990.0.23	372.14	18.0	354.1	20	352.1	Near berm
A-10	359900.231	2486861.754	381.73	31.6	350.1	34.5	347.2	Shelby tube sample collected A-10(32-34.5)
A-11	359931.221	2486662.047	372.62	23.7	348.9	26	346.6	
A-12	359904.580	2486445.280	372.18	23.5	348.7	24	348.2	
A-13	359805.209	2487057.697	366.43	13.5	352.9	15	351.4	Near berm
A-14	359657.611	2486919.283	366.93	14.6	352.3	15.5	351.4	
A-15	359713.331	2486702.585	374.29	24.0	350.3	34.5	339.8	Shelby tube sample collected A-15(26-28.5)
A-16	359720.637	2486475.828	376.76	27.5	349.3	32	344.8	
A-17	359595.265	2487063.104	371.39	14.0	357.4	15	356.4	Near berm
A-18	359499.240	2486907.601	371.43	20.8	350.6	23.5	347.9	
A-19	359514.270	248607.961	372.11	23.9	348.2	27.5	344.6	Shelby tube sample collected A-19(25-27.5)
A-20	359536.594	2486514.739	371.46	23.5	348.0	25.5	346.0	

Client:	Rockland Capital	**Boring ID:**	A-1
Project:	Grand Tower Energy Center	**Date Started:**	12/4/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/4/15
Project Number:	0297751	**Northing:**	360582.524
Logged By:	Michael Bates	**Easting:**	2486287.308

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20			SM	Olive black to greyish black silty SAND, moist, loose
	1/2/6/5	80	CL	Olive grey CLAY intermixed with fly ash, reworked
22			SM	Olive grey silty SAND, saturated
	0/0/0/2	55		
24				
	0/0/0/0	95	ASH	Olive grey silty FLY ASH, saturated
26				
	0/0/0/0	90		
28				
	0/0/1/1	95	-	Shelby Tube Collected
30				
	0/0/1/2	70	CL	Olive grey silty CLAY
32				
	0/0/1/2	50	SM	Very fine SAND
34			CL	Olive grey silty CLAY, with layers of clayey silt throughout
	0/0/0/1	55		
36				
	0/0/1/1	45		
38				
40				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	38'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.28
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-2
Project:	Grand Tower Energy Center	**Date Started:**	12/4/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/4/15
Project Number:	0297751	**Northing:**	360610.971
Logged By:	Michael Bates	**Easting:**	2486425.294

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22	2/2/4/5	85	GM	Olive black to greyish black silty SAND and GRAVEL, moist, loose
			CL	Olive grey silty CLAY, moist
24				
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	24'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.27
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-3
Project:	Grand Tower Energy Center	**Date Started:**	12/4/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/4/15
Project Number:	0297751	**Northing:**	360229.106
Logged By:	Michael Bates	**Easting:**	2486438.368

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18	3/5	110	ASH	Olive grey silty FLY ASH
			SM	Grey to greyish black silty SAND, hard
			-	Blind Drill
20	1/0/1/1	95	ASH	Olive grey silty FLY ASH, with layers of olive black fly ash
22	0/0/0/0	100	ASH	Olive grey FLY ASH
24			-	Blind Drill
26				
28	0/2/2/4	90	SC	Greyish olive clayey SILT
30			-	Blind Drill
32	0/0/4/5	95	CL	Yellowish brown silty CLAY, with layers of olive clayey silt
			CL	CLAY
34				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	33'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	375.05
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-4
Project:	Grand Tower Energy Center	**Date Started:**	12/4/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/4/15
Project Number:	0297751	**Northing:**	360226.044
Logged By:	Michael Bates	**Easting:**	2486649.835

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22	0/1/1/2	100	ASH	Olive grey silty FLY ASH
24	1/2/4/7	80	CL	Olive grey silty CLAY
			CL	Yellowish brown silty CLAY, firm
26			-	Shely Tube Collected
28				
30				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	28.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	376.01
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-5
Project:	Grand Tower Energy Center	**Date Started:**	12/4/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/4/15
Project Number:	0297751	**Northing:**	360227.14
Logged By:	Michael Bates	**Easting:**	2486851.241

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
18	1/0/1/0	0		No Recovery
20	0/0/0/0	80	ASH	Olive grey silty FLY ASH, very moist to saturated
22	1/0/0/2	90	SC	Yellowish brown to olive grey clayey SILT, moist, firm
24				
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	24'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	374.4
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-6
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	360107.897
Logged By:	Michael Bates	**Easting:**	2486798.231

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
			ASH	Olive grey FLY ASH
22	0/0/4/6	90	CL	Yellowish brown silty CLAY
				Shelby Tube Collected
24			-	
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	373.82
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-7
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	360111.664
Logged By:	Michael Bates	**Easting:**	2486600.504

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22				
24	0/2/3/6	80	ASH	Olive grey silty FLY ASH
			SC	Olive grey to brown clayey SILT
26	1/3/4/6	95		
28				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	27'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	374.34
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-8
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	360080.525
Logged By:	Michael Bates	**Easting:**	2486396.54

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22				
24				
			ASH	Olive grey silty FLY ASH
26	1/2/3/4	90	SC	Olive to black silty CLAY, pockets of fly ash (reworked)
28	0/2/2/4	85	ASH	Olive to grey FLY ASH
30	0/1/1/2	95		
32	0/0/3/4	90		
34	0/0/0/4	85	SC	Olive to grey clayey SILT, moist, firm
36				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	35'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	374.47
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-9
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	360080.027
Logged By:	Michael Bates	**Easting:**	2486990.023

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				Olive grey silty FLY ASH, very moist
16	1/0/1/0	95	ASH	
17			-	Blind Drill
18				Pale yellowish brown silty CLAY, moist, firm
19	2/4/4/5	70	CL	
20				
21				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	20'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.14
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-10
Project:	Grand Tower Energy Center	**Date Started:**	12/2/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/2/15
Project Number:	0297751	**Northing:**	359900.231
Logged By:	Michael Bates	**Easting:**	2486861.754

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				Olive grey silty FLY ASH
	0/3/2/1	70		
22	1/0/0/0	90	ASH	
24	1/1/5/2	75		Light olive grey silty FLY ASH
26	0/0/2/3	95		
28	0/0/3/12	95	ASH	
30	0/3/1/2	95		
32			CL	Yellowish brown CLAY, moist, firm Shelby Tube Collected
34			-	
36				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	34.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	381.73
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-11
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	359931.221
Logged By:	Michael Bates	**Easting:**	2486662.047

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20	0/0/0/3	100	ASH	Olive grey silty FLY ASH
22	0/0/1/4	100		
24	1/3/4/6	90	CL	Olive grey silty CLAY, firm, plastic, moist
			CL	Yellowish brown silty CLAY, moist, firm
26				
28				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	26'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.62
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-12
Project:	Grand Tower Energy Center	**Date Started:**	12/3/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/3/15
Project Number:	0297751	**Northing:**	359904.58
Logged By:	Michael Bates	**Easting:**	2486445.28

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20	0/0/0/0	95	ASH	Olive grey silty FLY ASH, saturated
22	0/0/0/3	90		
24			CL	Olive grey silty CLAY, moist, firm
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	24'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.18
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-13
Project:	Grand Tower Energy Center	**Date Started:**	12/1/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/1/15
Project Number:	0297751	**Northing:**	359805.209
Logged By:	Michael Bates	**Easting:**	2487057.697

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
1				
2				
3				
4	0/0/0	53	ASH	Olive to black silty FLY ASH, saturated, very soft
5			-	Blind Drill
6				
7				
8				
9	0/4/1	67	ASH	Olive to black silty FLY ASH, saturated, very soft
10			-	Blind Drill
11				
12				
13				
14	1/3/4	100	CL	Dark yellowish brown to olive grey CLAY
15				
16				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	15'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	366.43
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-14
Project:	Grand Tower Energy Center	**Date Started:**	12/1/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/1/15
Project Number:	0297751	**Northing:**	359657.611
Logged By:	Michael Bates	**Easting:**	2486919.283

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
1				
2				
3				
4				
5				
6				
7				
8				
9				
10	0/1/1	100	ASH	Olive grey silty FLY ASH
11	0/1/1	100		
12				
13	0/0/0	100		
14	1/2/5	100		
15			CL	Yellowish brown to light olive grey CLAY, firm
16				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	15.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	366.93
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-15
Project:	Grand Tower Energy Center	**Date Started:**	12/2/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/2/15
Project Number:	0297751	**Northing:**	359716.331
Logged By:	Michael Bates	**Easting:**	2486702.585

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20				
22	0/0/0/0	100	ASH	Olive grey silty FLY ASH, saturated
24	0/4/5/6	90	CL	Olive grey to yellowish brown silty CLAY, firm
26			-	Shelby Tube Collected
28				
30				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	34.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	374.29
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-16
Project:	Grand Tower Energy Center	**Date Started:**	12/2/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/2/15
Project Number:	0297751	**Northing:**	359720.637
Logged By:	Michael Bates	**Easting:**	2486475.828

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20	1/2/3/6	80	ASH	Olive black silty FLY ASH, moist
22	0/2/7/4	100		
24	1/0/1/0	90	ASH	Olive black silty FLY ASH, dry
26	0/0/7/6	95		
28	0/0/3/5	80	CL	Olive grey silty CLAY
30	0/2/2/3	85	CL	Olive grey silty CLAY, plant fibers and voids filled with sandy grit
32				
34				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	32'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	376.76
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-17
Project:	Grand Tower Energy Center	**Date Started:**	12/1/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/1/15
Project Number:	0297751	**Northing:**	359595.265
Logged By:	Michael Bates	**Easting:**	2487063.104

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14	1/3/6	87	ASH	Olive grey silty FLY ASH, saturated
			CL	Olive to black silty CLAY, very firm
15				
16				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	15'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	371.39
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-18
Project:	Grand Tower Energy Center	**Date Started:**	12/1/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/1/15
Project Number:	0297751	**Northing:**	359499.24
Logged By:	Michael Bates	**Easting:**	2486907.601

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12	0/0/0	0		No Recovery
14	0/0/1	67	ASH	Olive to black silty FLY ASH, saturated
	0/0/0	100		
16	0/0/0	100		
18	0/0/0	0		No Recovery
	0/0/0	100	ASH	Olive to black silty FLY ASH, saturated
20			ASH	Olive grey clayey SILT
				No Recovery
	0/0/0	100	CL	Greyish black silty CLAY, with olive grey clay
22	0/4/4	100	CL	Greyish black sandy CLAY
24				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	23.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	371.43
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-19
Project:	Grand Tower Energy Center	**Date Started:**	12/2/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/2/15
Project Number:	0297751	**Northing:**	359514.27
Logged By:	Michael Bates	**Easting:**	2486707.961

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
	1/0/2	0		No Recovery
16	0/0/0	0		No Recovery
18	0/0/0	100	ASH	Olive grey silty FLY ASH, saturated, loose
	0/1/1	100		
20				No Recovery
22	0/0/0/0	100	ASH	Olive grey silty FLY ASH, saturated, loose
24	0/2/3/5		CL	Yellowish brown to olive grey CLAY, moist, firm
26			-	Shelby Tube Collected
28				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	27.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.11
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	A-20
Project:	Grand Tower Energy Center	**Date Started:**	12/2/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/2/15
Project Number:	0297751	**Northing:**	359536.594
Logged By:	Michael Bates	**Easting:**	2486514.739

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			ASH	ASH
2				
4				
6				
8				
10				
12				
14				
16				
18				
20	0/1/2/3	100	ASH	Grey silty FLY ASH, saturated
22	0/0/0/0	0		
24	1/3/4/5	0	CL	Olive grey CLAY, firm
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	371.46
Borehole Diameter:	3.25"		

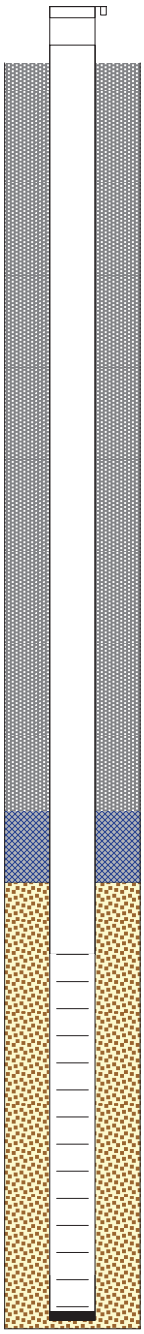
ERM

PIEZOMETER (OBSERVATION WELL) INSTALLATION
(P-1 THROUGH P-6)

				Thickness	Elevation		
Boring I.D.	**Northing**	**Easting**	**Ground Surface Elevation**	**Coal Ash**	**Base of Coal Ash**	**Boring Total Depth**	**Bottom of Boring**
P-1	360270.669	2487086.965	368.80	NE	NE	35.5	333.3
P-2	359292.599	2487062.643	361.25	NE	NE	35.5	325.8
P-3	359428.143	2486383.486	360.97	NE	NE	25.75	335.2
P-4	359867.522	2486281.418	363.81	NE	NE	25.4	338.4
P-5	360236.222	2486185.446	363.19	NE	NE	25.1	338.1
P-6	360743.922	2486125.071	362.16	NE	NE	25.5	336.7

Client:	Rockland Capital	**Boring ID:**	P-1
Project:	Grand Tower Energy Center	**Date Started:**	12/9/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/10/15
Project Number:	0297751	**Northing:**	360270.669
Logged By:	Michael Bates	**Easting:**	2487086.965

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
2				
0				Ground Surface
			-	Blind Drill
2				
4	2/4/7	60	CL	Dark yellow to brown silty CLAY, moist
6				Blind Drill
			-	
8				
10	2/3/4	87	CL	Dark yellow to brown silty CLAY, moist
				Blind Drill
12			-	
14	1/3/4	73	SM	Yellowish brown silty SAND
16				Blind Drill
			-	
18				
20	1/4/3	60	SM	Yellowish brown silty SAND
				Blind Drill
22			-	
24	0/1/1	87	SM	Yellowish brown silty SAND
26				Blind Drill
			-	
28				
30	0/0/0	100	SM	Yellowish brown silty SAND
				Blind Drill
32			-	
34	0/0/2	100	SM	Olive black to black sandy SILT
36				



Well Construction Details

Above Grade Locking Cap

8.25" Diameter Borehole

2" Sch. 40 PVC Casing

Bentonite Seal

Well Sand Filter Pack

2" Sch. 40 PVC 0.010" Slot Screen

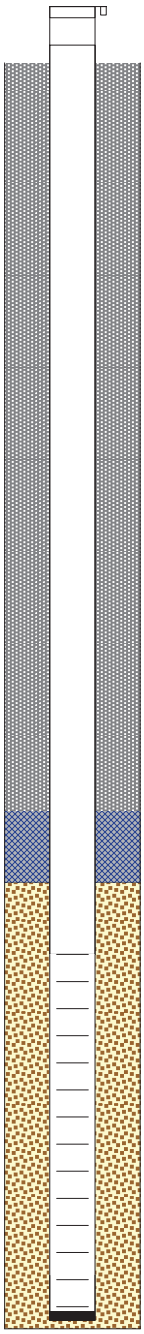
End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	35.5'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	25-35'
Borehole Diameter:	8.25"	**Elevation (msl):**	368.8

ERM

Client:	Rockland Capital	**Boring ID:**	P-2
Project:	Grand Tower Energy Center	**Date Started:**	12/9/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/9/15
Project Number:	0297751	**Northing:**	359292.599
Logged By:	Michael Bates	**Easting:**	2487062.643

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
2				
0				Ground Surface
				Blind Drill
2			-	
4	1/2/3	67	CL	Olive grey silty CLAY
6				Blind Drill
8			-	
			CL	Olive grey silty CLAY
10	1/3/3	100	CL	Yellowish brown silty CLAY
				Blind Drill
12			-	
14	1/3/4	100	CL	Yellowish brown silty CLAY
16				Blind Drill
18			-	
20	1/2/3	93	CL	Yellowish brown silty CLAY, moist, firm
				Blind Drill
22			-	
24	0/2/3	80	CL	Yellowish brown silty CLAY, moist, firm
			SM	Light olive grey sandy SILT, saturated
26				Blind Drill
28			-	
30	2/1/3	93	SM	Olive grey sandy SILT, saturated
			SC	Clayey SILT, moist
				Blind Drill
32			-	
34	1/2/3	13	SM	Olive black to black sandy SILT
36				



Well Construction Details

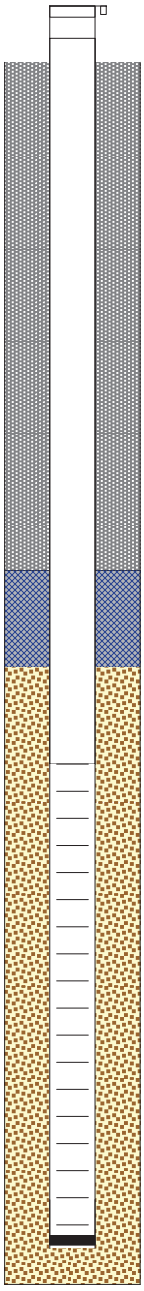
- Above Grade Locking Cap
- 8.25" Diameter Borehole
- 2" Sch. 40 PVC Casing
- Bentonite Seal
- Well Sand Filter Pack
- 2" Sch. 40 PVC 0.010" Slot Screen
- End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	35.5'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	25-35'
Borehole Diameter:	8.25"	**Elevation (msl):**	361.25

ERM

Client:	Rockland Capital	**Boring ID:**	P-3
Project:	Grand Tower Energy Center	**Date Started:**	12/7/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/7/15
Project Number:	0297751	**Northing:**	359428.143
Logged By:	Michael Bates	**Easting:**	2486383.486

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
2				
0				Ground Surface Blind Drill
2			-	
4	0/3/5	73	SC	Yellowish brown to olive grey clayey SILT, moist, firm
6				Blind Drill
8			-	
10	2/3/3	33	SC SM	Yellowish brown to olive grey clayey SILT, moist, firm Grey SAND, saturated, firm
12				Blind Drill
14			-	
16	2/2/2	53	SM CL	Grey SAND, saturated, firm Olive grey silty CLAY, moist
18				Blind Drill
20			-	
22	1/2/2	60	SC	Olive grey clayey SILT
24	0/1/2	87		
26				



Well Construction Details

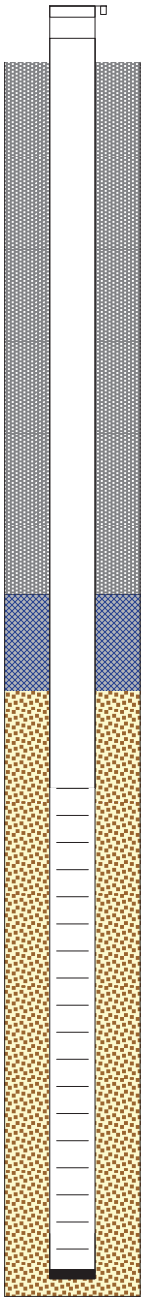
- Above Grade Locking Cap
- 8.25" Diameter Borehole
- 2" Sch. 40 PVC Casing
- Bentonite Seal
- Well Sand Filter Pack
- 2" Sch. 40 PVC 0.010" Slot Screen
- End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.75'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	14.5-24.5'
Borehole Diameter:	8.25"	**Elevation (msl):**	360.97

ERM

Client:	Rockland Capital	**Boring ID:**	P-4
Project:	Grand Tower Energy Center	**Date Started:**	12/8/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/8/15
Project Number:	0297751	**Northing:**	359867.522
Logged By:	Michael Bates	**Easting:**	2486281.418

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
			-	Ground Surface Blind Drill
4	0/3/9	73	SC	Yellowish brown clayey SILT, moist, friable
			-	Blind Drill
9	1/2/2	33	SC	Yellowish brown clayey SILT, moist, friable
10			SM	Yellowish brown SAND, moist
			-	Blind Drill
14	0/1/1	53	SM	Yellowish brown SAND, moist
15			CL	Olive grey silty CLAY, firm
			-	Blind Drill
19	0/1/2	87	CL	Olive grey silty CLAY
			-	Blind Drill
24	0/1/2	87	SC	Olive grey clayey SILT



Well Construction Details

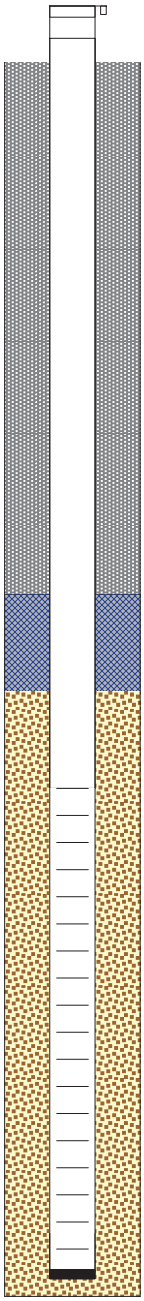
- Above Grade Locking Cap
- 8.25" Diameter Borehole
- 2" Sch. 40 PVC Casing
- Bentonite Seal
- Well Sand Filter Pack
- 2" Sch. 40 PVC 0.010" Slot Screen
- End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.4'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	15-25'
Borehole Diameter:	8.25"	**Elevation (msl):**	363.81

ERM

Client:	Rockland Capital	**Boring ID:**	P-5
Project:	Grand Tower Energy Center	**Date Started:**	12/8/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/8/15
Project Number:	0297751	**Northing:**	360236.222
Logged By:	Michael Bates	**Easting:**	2486185.446

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
2				
0				Ground Surface
			-	Blind Drill
2				
4	1/4/5	67	CL	Yellowish brown sandy CLAY
6			-	Blind Drill
8				
10	1/1/1	0		No Recovery
			-	Blind Drill
12				
14	1/1/1	80	CL	Olive grey silty CLAY, moist, firm, plastic
16			-	Blind Drill
18				
20	1/1/2	100	SC	Olive grey clayey SILT, moist, soft
22			-	Blind Drill
24	0/0/1	80	SM	Olive grey SILT, saturated
			SC	Olive grey clayey SILT, moist, firm
26				



Well Construction Details

Above Grade Locking Cap

8.25" Diameter Borehole

2" Sch. 40 PVC Casing

Bentonite Seal

Well Sand Filter Pack

2" Sch. 40 PVC 0.010" Slot Screen

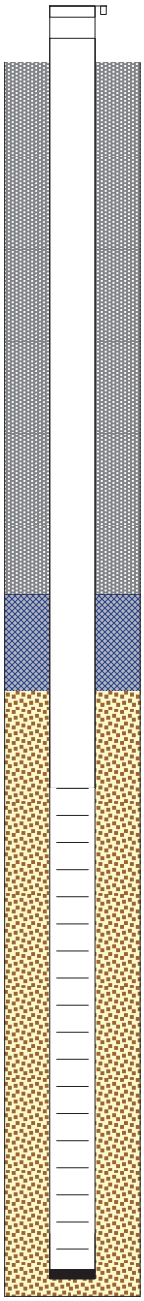
End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.1'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	15-25'
Borehole Diameter:	8.25"	**Elevation (msl):**	363.19

ERM

Client:	Rockland Capital	**Boring ID:**	P-6
Project:	Grand Tower Energy Center	**Date Started:**	12/8/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/9/15
Project Number:	0297751	**Northing:**	360743.922
Logged By:	Michael Bates	**Easting:**	2486125.071

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
2				
0				Ground Surface
				Blind Drill
2			-	
4	3/8/6	27	SC	Olive grey clayey SILT
			ASH	BOTTOM ASH, moist, friable
6				Blind Drill
			-	
8				
10	1/1/1	60	SC	Yellowish brown to olive grey clayey SILT, saturtated
				Blind Drill
12			-	
14	0/0/0	73	SC	Yellowish brown to olive grey clayey SILT, saturtated
16				Blind Drill
			-	
18				
			CL	Olive grey silty CLAY, moist, soft
20	0/0/1	100	SC	Olive grey clayey SILT, moist, soft
				Blind Drill
22			-	
24	0/0/1	27	SC	Olive grey clayey SILT, moist, soft
26				



Well Construction Details

- Above Grade Locking Cap
- 8.25" Diameter Borehole
- 2" Sch. 40 PVC Casing
- Bentonite Seal
- Well Sand Filter Pack
- 2" Sch. 40 PVC 0.010" Slot Screen
- End Cap

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Screened Interval:**	15-25'
Borehole Diameter:	8.25"	**Elevation (msl):**	362.16

ERM

SOIL TEST BORINGS
(B-1 THROUGH B-3)

				Thickness	Elevation		
Boring I.D.	**Northing**	**Easting**	**Ground Surface Elevation**	**Coal Ash**	**Base of Coal Ash**	**Boring Total Depth**	**Bottom of Boring**
B-1	360288.009	2486237.987	373.39	NE	NE	25.5	347.9
B-2	360025.802	2486296.648	372.43	NE	NE	25.5	346.9
B-3	359637.992	2486384.422	372.02	NE	NE	25.5	346.5

Client:	Rockland Capital	**Boring ID:**	B-1
Project:	Grand Tower Energy Center	**Date Started:**	12/10/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/10/15
Project Number:	0297751	**Northing:**	360288.009
Logged By:	Michael Bates	**Easting:**	2486237.987

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			-	Blind Drill
2				
4	1/3/4	47	ASH	Dark grey clayey SILT
6			-	Blind Drill
8				
10	1/1/2	47	CL	Grey to yellowish brown silty CLAY, trace fly ash, reworked
12			-	Blind Drill
14	0/1/1	27	ASH	Yellowish brown BOTTOM ASH, intermixed with yellowish brown silt with trace clay
16			-	Blind Drill
18				
20	0/0/0	80	SC	Yellowish brown clayey SILT, with bottom ash intermixed throughout
22			-	Blind Drill
24	1/2/2	27	SM	Olive grey SILT
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	373.39
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	B-2
Project:	Grand Tower Energy Center	**Date Started:**	12/10/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/10/15
Project Number:	0297751	**Northing:**	360025.802
Logged By:	Michael Bates	**Easting:**	2486296.648

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			-	Blind Drill
2				
4	2/5/10	40	SC	Olive to black clayey SILT, firm
6			-	Blind Drill
8				
10	5/5/6	13	CL	Grey to yellowish brown silty CLAY, trace fly ash, reworked
12			-	Blind Drill
14	3/6/12	73	SM	Olive grey clayey SILT, very firm
16			-	Blind Drill
18				
20	1/0/2	73	SC	Olive to black clayey SILT, moist
22			-	Blind Drill
24	0/1/2	100	CL	Olive grey silty CLAY, firm
			SM	Olive grey silty SAND
			SC	Olive grey clayey SILT
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.43
Borehole Diameter:	3.25"		

ERM

Client:	Rockland Capital	**Boring ID:**	B-3
Project:	Grand Tower Energy Center	**Date Started:**	12/10/15
Site Location:	Grand Tower, IL	**Date Completed:**	12/10/15
Project Number:	0297751	**Northing:**	359637.992
Logged By:	Michael Bates	**Easting:**	2486384.422

Depth	Blow Count	Recovery Percentage	Lithology	Lithologic Description
0			-	Blind Drill
2				
4	1/2/4	67	ASH	Yellowish brown silty FLY ASH, with bottom ash
6			-	Blind Drill
8				
10	2/5/6	80	CL	Dark grey silty CLAY, moist, very firm
12			-	Blind Drill
14	1/5/8	73	SC	Olive grey to light olive grey clayey SILT
16			-	Blind Drill
18				
20	2/5/8	80	SC	Olive grey clayey SILT, firm
			ASH	BOTTOM ASH
			SC	Olive grey clayey SILT, firm
22			-	Blind Drill
24	1/1/2	93	CL	Olive grey silty CLAY, firm
			SM	Olive grey silty fine SAND, saturated
			SC	Olive grey clayey SILT, moist
26				

Drilling Contractor:	Geotechnics	**Total Depth (ft):**	25.5'
Drilling Method:	Hollow Stem Auger	**Elevation (msl):**	372.02
Borehole Diameter:	3.25"		

ERM

GEOTECHNICAL LABORATORY TESTING
UNDISTURBED COEFFICIENT OF PERMEABILITY TESTING
STANDARD PROCTOR MOISTURE DENSITY RELATIONSHIP

ROCKLAND, GRAND TOWER ENERGY CENTER
ASH BASIN, CLAY LINER TESTING RESULTS

The following are laboratory testing results for coefficient of permeability testing performed on undisturbed soil samples retrieved at the bottom of deposited ash at A-# boring locations

BORING #	DEPTH BELOW GROUND SURFACE	COEFFICIENT OF PERMEABILITY (k), (CM/SEC)
A-1	28 - 30.5 FT	1.6×10^{-5} cm/sec
A-4	26 - 28.5 FT	8.5×10^{-8} cm/sec
A-6	23 - 25.5 FT	9.3×10^{-6} cm/sec
A-10	32 - 34.5 FT	1.0×10^{-6} cm/sec
A-15	26 - 28.5 FT	8.4×10^{-8} cm/sec
A-19	25 - 27.5 FT	5.9×10^{-8} cm/sec

Laboratory Testing performed by Klingler, Hannibal, MO

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Silt (ML), Gray, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-1** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **28-30.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **39.6%** INITIAL DRY DENSITY **83.8 P.C.F.**

FINAL WATER CONTENT **37.6%** FINAL DRY DENSITY **84.6 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
7:25		0.2	7.950	41.360		1.37	8.39	35.10	140.6		175.70		
7:25	7:31	0.2	7.950	41.360	360	6.36	3.28	-15.40	140.6	1.02	125.20	1.81E-05	1.72E-05
7:31	7:34	0.2	7.950	41.360	180	8.10	1.51	-32.95	140.6	1.02	107.65	1.61E-05	1.54E-05
7:34	7:37	0.2	7.950	41.360	180	9.52	0.08	-47.20	140.6	1.01	93.40	1.52E-05	1.45E-05
													1.61E-05

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=1.61 E-05 CM/SEC

REMARKS: 12/9/2015

TESTED BY: **BJS**

COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Fat Clay (CH), Light Brown mottled Gray, Brown Oxidation, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-4** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **26-28.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **38.2%** INITIAL DRY DENSITY **81.1 P.C.F.**

FINAL WATER CONTENT **40.1%** FINAL DRY DENSITY **79.7 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
11:01		0.2	7.600	42.116		1.56	7.52	29.80	210.9		240.70		
11:01	12:39	0.2	7.600	42.116	5880	2.26	6.78	22.60	210.9	1.06	233.50	9.32E-08	8.88E-08
12:39	14:47	0.2	7.600	42.116	7680	3.11	5.90	13.95	210.9	1.04	224.85	8.87E-08	8.45E-08
14:47	15:58	0.2	7.600	42.116	4260	3.55	5.45	9.50	210.9	1.02	220.40	8.47E-08	8.07E-08
													8.50E-08

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=8.50 E-08 CM/SEC

REMARKS: 12/10/2015

TESTED BY: **BJS**

COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Lean Clay (CL), Light Brown mottled Light Gray, Brown Oxidation, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-6** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **23-25.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **27.7%** INITIAL DRY DENSITY **93.9 P.C.F.**

FINAL WATER CONTENT **28.8%** FINAL DRY DENSITY **93.7 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
15:30		0.2	7.346	40.715		0.04	9.84	49.00	140.6		189.60		
15:30	15:37	0.2	7.346	40.715	420	3.85	5.88	10.15	140.6	1.04	150.75	9.85E-06	9.39E-06
15:37	15:45	0.2	7.346	40.715	480	7.27	2.44	-24.15	140.6	1.01	116.45	9.70E-06	9.25E-06
15:45	15:52	0.2	7.346	40.715	420	9.59	0.09	-47.50	140.6	1.01	93.10	9.61E-06	9.16E-06
													9.26E-06

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=9.26 E-06 CM/SEC

REMARKS: 12/11/2015

TESTED BY: **BJS**

COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Silty Clay (CL-ML), Light Brown mottled Light Gray, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-10** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **32-34.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **27.3%** INITIAL DRY DENSITY **96.9 P.C.F.**

FINAL WATER CONTENT **25.8%** FINAL DRY DENSITY **98.0 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
14:13		0.2	7.874	40.783		0.13	9.56	47.15	140.6		187.75		
14:13	14:47	0.2	7.874	40.783	2040	2.10	7.58	27.40	140.6	1.01	168.00	1.05E-06	1.00E-06
14:47	15:54	0.2	7.874	40.783	4020	5.57	4.10	-7.35	140.6	1.00	133.25	1.11E-06	1.06E-06
15:54	16:54	0.2	7.874	40.783	3600	8.02	1.64	-31.90	140.6	1.00	108.70	1.09E-06	1.04E-06
													1.04E-06

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=1.04 E-06 CM/SEC

REMARKS: 12/14/2015

TESTED BY: **BJS**

COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Fat Clay (CH), Light Brown mottled Gray, Silty, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-15** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **26-28.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **31.3%** INITIAL DRY DENSITY **85.9 P.C.F.**

FINAL WATER CONTENT **38.7%** FINAL DRY DENSITY **81.5 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
10:03		0.2	8.026	41.941		0.74	8.69	39.75	140.6		180.35		
10:03	11:57	0.2	8.026	41.941	6840	1.32	8.11	33.95	140.6	1.00	174.55	9.15E-08	8.72E-08
11:57	13:02	0.2	8.026	41.941	3900	1.63	7.80	30.85	140.6	1.00	171.45	8.79E-08	8.38E-08
13:02	14:34	0.2	8.026	41.941	5520	2.04	7.39	26.75	140.6	1.00	167.35	8.39E-08	8.00E-08
													8.39E-08

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=8.39 E-08 CM/SEC

REMARKS: 12/15/2015

TESTED BY: **BJS**

COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

Geotechnics Form No. 17-FW

PERMEABILITY TEST REPORT
ASTM D 5084-10

PROJECT No. **15-1091**

PROJECT **Grand Tower , IL CCR Impoundment** LOCATION **Grand Tower, IL**
CLIENT **Environmental Resources Management, Inc.** SAMPLING DATE **12/2/2015**

SAMPLE DESCRIPTION **Fat Clay (CH), Light Brown mottled Light Gray, Moist**

LIQUID LIMIT PLASTIC LIMIT P.I.

BORING NO. **A-19** SAMPLE NO.

SAMPLE TYPE **ST** DEPTH **25-27.5 ft.**

SPECIFIC GRAVITY, Gs TEST METHOD **ASTM D 5084-10**

INITIAL WATER CONTENT **37.0%** INITIAL DRY DENSITY **83.7 P.C.F.**

FINAL WATER CONTENT **37.1%** FINAL DRY DENSITY **83.2 P.C.F.**

t_1	t_2	a	L	A	t	head	tail	h_w	h_a	dt/dh	h_a+h_w	k	k_{20}
16:35		0.2	7.950	41.883		2.37	6.78	22.05	210.9		232.95		
16:35	17:04	0.2	7.950	41.883	1740	2.50	6.65	20.75	210.9	1.00	231.65	6.10E-08	5.82E-08
17:04	17:29	0.2	7.950	41.883	1500	2.61	6.54	19.65	210.9	1.00	230.55	6.02E-08	5.74E-08
17:29	17:55	0.2	7.950	41.883	1560	2.73	6.42	18.45	210.9	1.00	229.35	6.35E-08	6.05E-08
													5.88E-08

COEFFICIENT OF VERTICAL PERMEABILITY
K_{20}=5.88 E-08 CM/SEC

REMARKS: 12/16/2015

TESTED BY: **BJS**

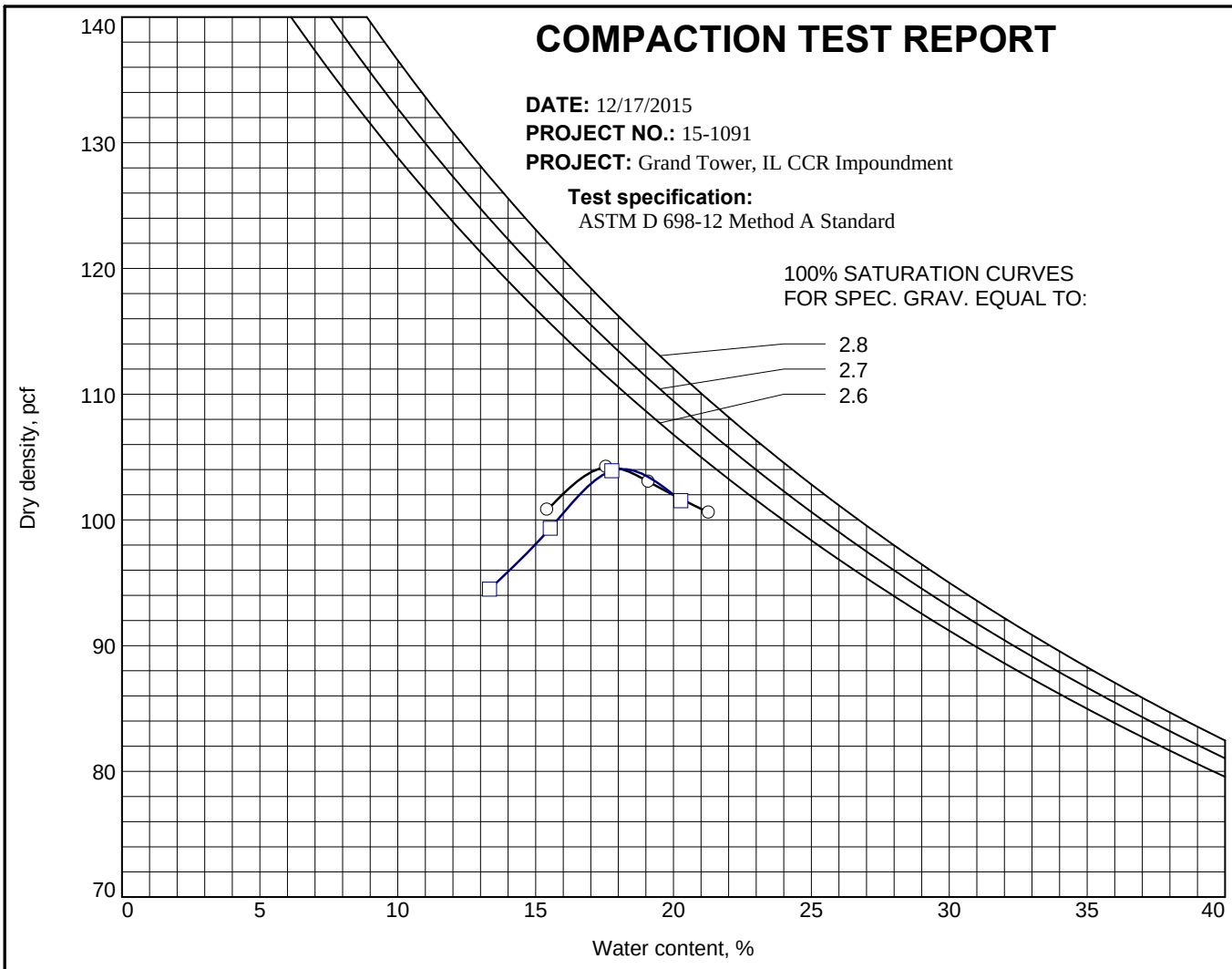
COMPUTED BY: **BJS**

GEOTECHNICS
Soil & Material Testing
4510 Paris Gravel Road
Hannibal, MO 63401
573-221-7714 Fax 573-221-7762

COMPACTION TEST REPORT

DATE: 12/17/2015
PROJECT NO.: 15-1091
PROJECT: Grand Tower, IL CCR Impoundment

Test specification:
ASTM D 698-12 Method A Standard



	No.	LOCATION AND DESCRIPTION	REMARKS
○	1	**Location:** Boring B-1 **Depth:** 0-25 ft. **Sample Number:** 1 Lean Clay with Sand (CL), Light Brown mottled Yellow Brown, Silty, Moist	Natural Moisture = 27.5%
□	2	**Location:** Boring B-3 **Depth:** 0-25 ft. **Sample Number:** 2 Lean Clay with Sand (CL), Brown mottled Light Brown, Silty, Moist	Natural Moisture = 25.7%

	No.	USCS	LL	PI	NAT. MOIST.	OVERSIZE	%< No.200	MAX. DRY DEN.	OPT. MOIST.
○	1	(CL)			27.5			104.2	17.7 %
□	2	(CL)			25.7			104.0	18.1 %

Figure

GEOTECHNICS

Tested By: BJS **Checked By:** BJS

FIELD TESTING
PERMEABILITY SLUG TESTING

Bouwer and Rice Slug Test Analysis for Fully Penetrating Wells
GTEC - Grand Tower, IL

		K (Ft/Day)	K (Cm/Sec)
P-1	Rising Head Test 1	0.25	8.82E-05
	Rising Head Test 2	0.25	8.82E-05
	Falling Head Test 1	0.54	1.91E-04
	Falling Head Test 2	0.64	2.26E-04
P-2	Rising Head Test 1	23	8.11E-03
	Rising Head Test 2	22	7.76E-03
	Rising Head Test 3	22	7.76E-03
	Falling Head Test 1	26	9.17E-03
	Falling Head Test 2	23	8.11E-03
	Falling Head Test 3	22	7.76E-03
P-3	Rising Head Test 1	0.21	7.41E-05
	Rising Head Test 2	0.23	8.11E-05
	Falling Head Test 1	0.25	8.82E-05
	Falling Head Test 2	0.26	9.17E-05
P-4	Rising Head Test 1	0.17	6.00E-05
	Rising Head Test 2	0.2	7.06E-05
	Falling Head Test 1	0.31	1.09E-04
	Falling Head Test 2	0.26	9.17E-05
P-5	Rising Head Test 1	1.3	4.59E-04
	Rising Head Test 2	1.4	4.94E-04
	Falling Head Test 1	1.2	4.23E-04
	Falling Head Test 2	1.2	4.23E-04
P-6	Rising Head Test 1	0.65	2.29E-04
	Rising Head Test 2	0.62	2.19E-04
	Falling Head Test 1	0.58	2.05E-04
	Falling Head Test 2	0.66	2.33E-04

WELL ID: P-1 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 18:49

INPUT

Construction:

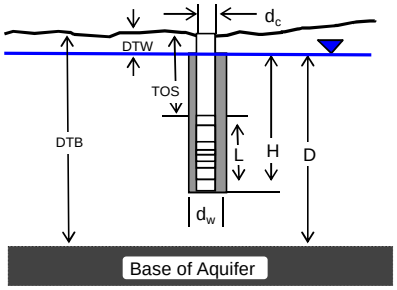
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	27.45	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

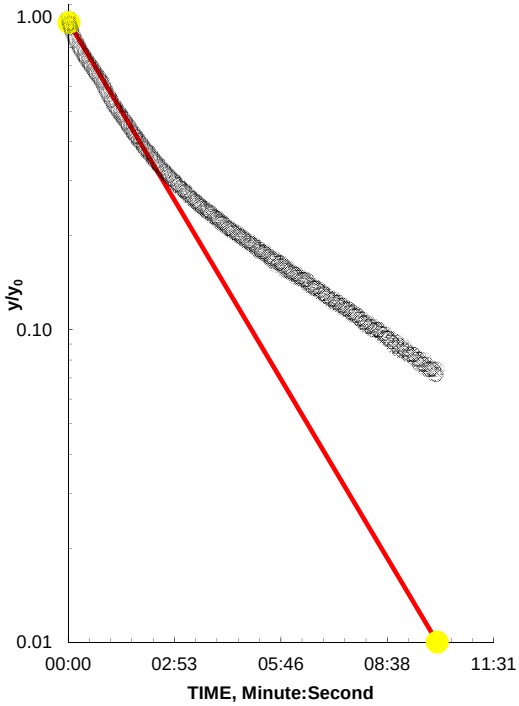
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.28	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.43	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.353	
Re =	3.61	Feet
Slope =	0.003316	$\log_{10}$/sec
$t_{90\%}$ recovery =	302	sec

K =	0.54	Feet/Day
K =	1.91E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	18:49:55.0	13.84
2	18:50:08.0	13.61
3	18:50:21.0	13.48
4	18:50:34.0	13.40
5	18:50:47.0	13.31
6	18:51:00.0	13.22
7	18:51:13.0	13.14
8	18:51:26.0	13.08
9	18:51:39.0	13.02
10	18:51:52.0	12.98
11	18:52:05.0	12.94
12	18:52:18.0	12.90
13	18:52:31.0	12.87
14	18:52:44.0	12.84
15	18:52:57.0	12.82
16	18:53:10.0	12.80
17	18:53:23.0	12.78
18	18:53:36.0	12.75
19	18:53:49.0	12.74
20	18:54:02.0	12.73
21	18:54:15.0	12.71
22	18:54:28.0	12.70
23	18:54:41.0	12.69
24	18:54:54.0	12.68
25	18:55:07.0	12.66
26	18:55:20.0	12.65
27	18:55:33.0	12.64
28	18:55:46.0	12.63
29	18:55:59.0	12.63
30	18:56:12.0	12.62
31	18:56:25.0	12.61
32	18:56:38.0	12.60
33	18:56:51.0	12.59
34	18:57:04.0	12.59
35	18:57:17.0	12.58
36	18:57:30.0	12.57
37	18:57:43.0	12.57
38	18:57:56.0	12.56
39	18:58:09.0	12.55
40	18:58:22.0	12.55
41	18:58:35.0	12.54
42	18:58:48.0	12.54
43	18:59:01.0	12.53
44	18:59:14.0	12.53
45	18:59:27.0	12.52

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

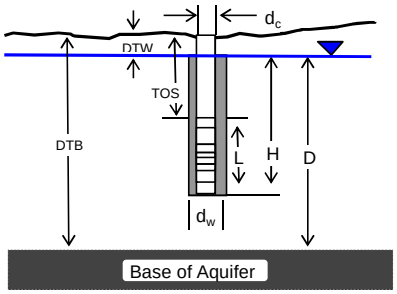
Depth of Base of Aquifer is assumed to be 100 feet (DTB)
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-1 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 19:41

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	16.17	Feet
top of screen (TOS)	27.45	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

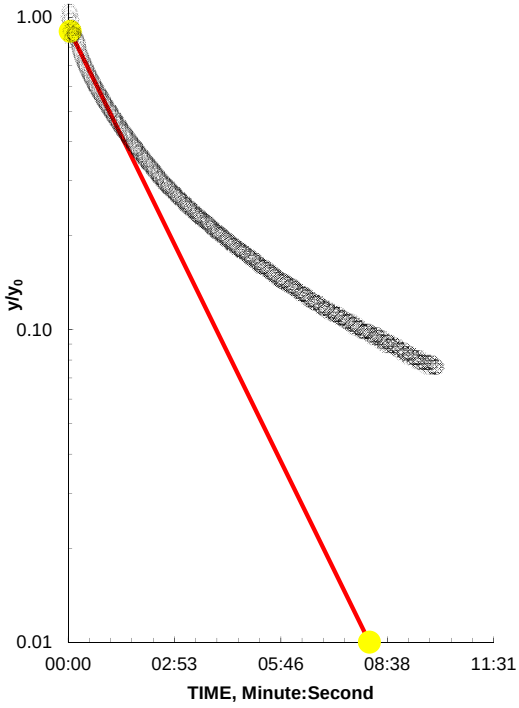


COMPUTED

L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.28	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.54	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.353	
Re =	3.61	Feet
Slope =	0.004021	$\log_{10}$/sec
$t_{90\%}$ recovery =	249	sec

K =	0.65	Feet/Day
K =	2.29E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	19:41:29.0	13.89
2	19:41:42.0	13.67
3	19:41:55.0	13.45
4	19:42:08.0	13.32
5	19:42:21.0	13.22
6	19:42:34.0	13.14
7	19:42:47.0	13.07
8	19:43:00.0	13.01
9	19:43:13.0	12.96
10	19:43:26.0	12.92
11	19:43:39.0	12.87
12	19:43:52.0	12.84
13	19:44:05.0	12.80
14	19:44:18.0	12.78
15	19:44:31.0	12.75
16	19:44:44.0	12.73
17	19:44:57.0	12.71
18	19:45:10.0	12.69
19	19:45:23.0	12.68
20	19:45:36.0	12.66
21	19:45:49.0	12.65
22	19:46:02.0	12.63
23	19:46:15.0	12.62
24	19:46:28.0	12.61
25	19:46:41.0	12.60
26	19:46:54.0	12.59
27	19:47:07.0	12.58
28	19:47:20.0	12.57
29	19:47:33.0	12.56
30	19:47:46.0	12.55
31	19:47:59.0	12.55
32	19:48:12.0	12.54
33	19:48:25.0	12.53
34	19:48:38.0	12.53
35	19:48:51.0	12.52
36	19:49:04.0	12.51
37	19:49:17.0	12.51
38	19:49:30.0	12.50
39	19:49:43.0	12.50
40	19:49:56.0	12.50
41	19:50:09.0	12.49
42	19:50:22.0	12.48
43	19:50:35.0	12.48
44	19:50:48.0	12.48
45	19:51:01.0	12.47

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

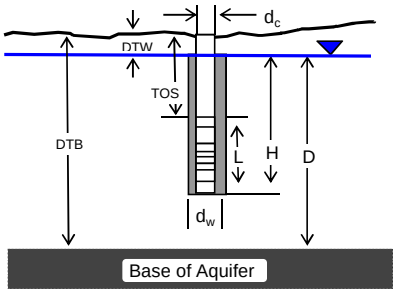
Depth of Base of Aquifer is assumed to be 100 feet (DTB)
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-1 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 19:11

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	16.17	Feet
top of screen (TOS)	27.45	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

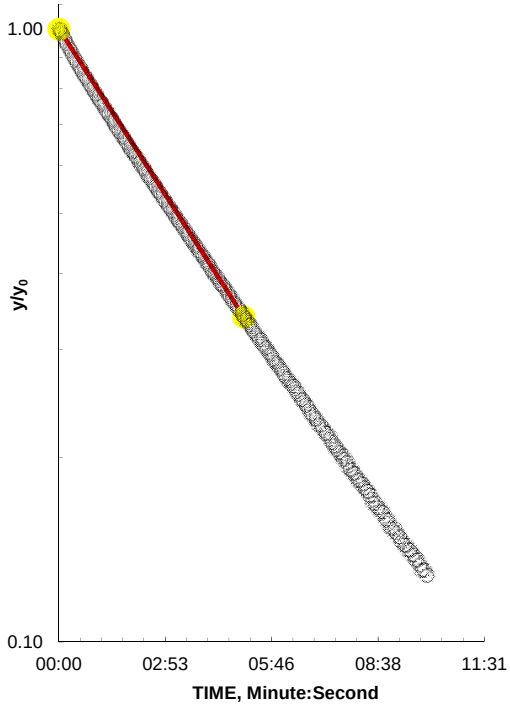


COMPUTED

L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.28	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.58	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.353	
Re =	3.61	Feet
Slope =	0.001565	$\log_{10}$/sec
$t_{90\%}$ recovery =	639	sec

K =	0.25	Feet/Day
K =	8.82E-05	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	19:11:44.0	10.77
2	19:11:57.0	10.85
3	19:12:10.0	10.94
4	19:12:23.0	11.01
5	19:12:36.0	11.07
6	19:12:49.0	11.13
7	19:13:02.0	11.19
8	19:13:15.0	11.24
9	19:13:28.0	11.30
10	19:13:41.0	11.34
11	19:13:54.0	11.39
12	19:14:07.0	11.43
13	19:14:20.0	11.47
14	19:14:33.0	11.51
15	19:14:46.0	11.55
16	19:14:59.0	11.58
17	19:15:12.0	11.61
18	19:15:25.0	11.65
19	19:15:38.0	11.68
20	19:15:51.0	11.71
21	19:16:04.0	11.73
22	19:16:17.0	11.76
23	19:16:30.0	11.78
24	19:16:43.0	11.81
25	19:16:56.0	11.83
26	19:17:09.0	11.86
27	19:17:22.0	11.87
28	19:17:35.0	11.90
29	19:17:48.0	11.92
30	19:18:01.0	11.93
31	19:18:14.0	11.95
32	19:18:27.0	11.96
33	19:18:40.0	11.98
34	19:18:53.0	12.00
35	19:19:06.0	12.01
36	19:19:19.0	12.03
37	19:19:32.0	12.04
38	19:19:45.0	12.05
39	19:19:58.0	12.06
40	19:20:11.0	12.07
41	19:20:24.0	12.09
42	19:20:37.0	12.10
43	19:20:50.0	12.11
44	19:21:03.0	12.12
45	19:21:16.0	12.13

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB)
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-1 (SLUG OUT2 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 20:11

INPUT

Construction:

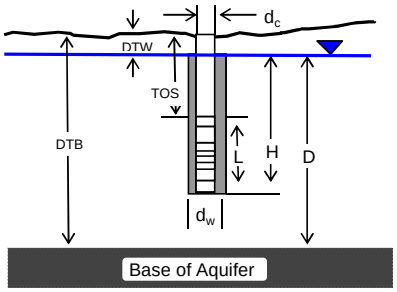
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	27.45	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

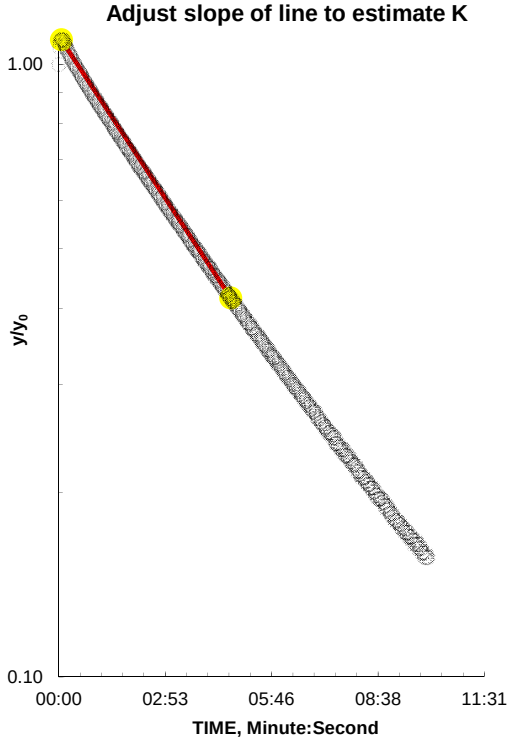
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.28	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.52	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.353	
Re =	3.61	Feet
Slope =	0.001533	$\log_{10}$/sec
$t_{90\%}$ recovery =	652	sec

K =	0.25	Feet/Day
K =	8.82E-05	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	20:11:21.0	10.86
2	20:11:34.0	10.77
3	20:11:47.0	10.86
4	20:12:00.0	10.94
5	20:12:13.0	11.00
6	20:12:26.0	11.07
7	20:12:39.0	11.13
8	20:12:52.0	11.19
9	20:13:05.0	11.24
10	20:13:18.0	11.29
11	20:13:31.0	11.34
12	20:13:44.0	11.38
13	20:13:57.0	11.42
14	20:14:10.0	11.47
15	20:14:23.0	11.51
16	20:14:36.0	11.54
17	20:14:49.0	11.58
18	20:15:02.0	11.61
19	20:15:15.0	11.65
20	20:15:28.0	11.67
21	20:15:41.0	11.71
22	20:15:54.0	11.73
23	20:16:07.0	11.76
24	20:16:20.0	11.78
25	20:16:33.0	11.81
26	20:16:46.0	11.83
27	20:16:59.0	11.86
28	20:17:12.0	11.88
29	20:17:25.0	11.90
30	20:17:38.0	11.92
31	20:17:51.0	11.93
32	20:18:04.0	11.95
33	20:18:17.0	11.96
34	20:18:30.0	11.98
35	20:18:43.0	12.00
36	20:18:56.0	12.01
37	20:19:09.0	12.03
38	20:19:22.0	12.04
39	20:19:35.0	12.05
40	20:19:48.0	12.07
41	20:20:01.0	12.08
42	20:20:14.0	12.09
43	20:20:27.0	12.10
44	20:20:40.0	12.11
45	20:20:53.0	12.12

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB)
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-2 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 10:05

INPUT

Construction:

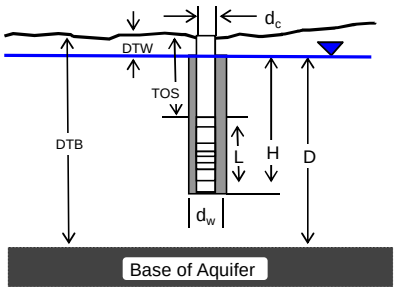
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

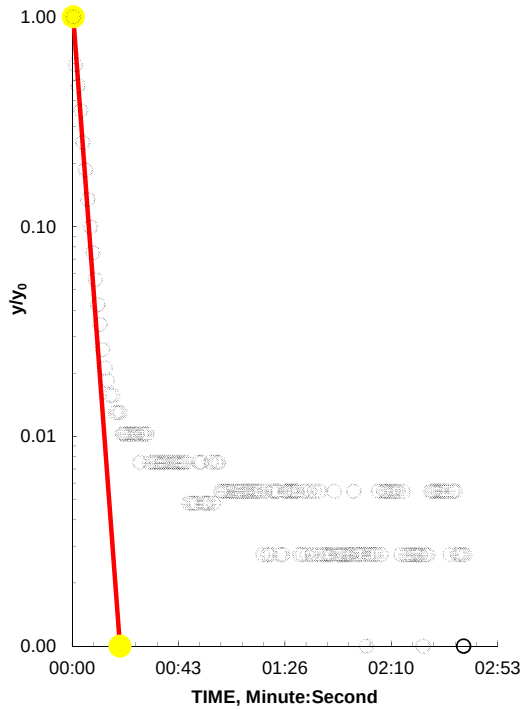
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.46	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.157895	$\log_{10}$/sec
$t_{90\%}$ recovery =	6	sec

K =	26	Feet/Day
K =	9.17E-03	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	10:05:44.0	9.64
2	10:05:47.0	8.70
3	10:05:50.0	8.37
4	10:05:53.0	8.26
5	10:05:56.0	8.21
6	10:05:59.0	8.20
7	10:06:02.0	8.19
8	10:06:05.0	8.19
9	10:06:08.0	8.19
10	10:06:11.0	8.19
11	10:06:14.0	8.19
12	10:06:17.0	8.19
13	10:06:20.0	8.19
14	10:06:23.0	8.19
15	10:06:26.0	8.19
16	10:06:29.0	8.19
17	10:06:32.0	8.18
18	10:06:35.0	8.19
19	10:06:38.0	8.18
20	10:06:41.0	8.18
21	10:06:44.0	8.18
22	10:06:47.0	8.18
23	10:06:50.0	8.18
24	10:06:53.0	8.18
25	10:06:56.0	8.18
26	10:06:59.0	8.18
27	10:07:02.0	8.18
28	10:07:05.0	8.18
29	10:07:08.0	8.18
30	10:07:11.0	8.18
31	10:07:14.0	8.18
32	10:07:17.0	8.18
33	10:07:20.0	8.18
34	10:07:23.0	8.18
35	10:07:26.0	8.18
36	10:07:29.0	8.18
37	10:07:32.0	8.18
38	10:07:35.0	8.18
39	10:07:38.0	8.18
40	10:07:41.0	8.18
41	10:07:44.0	8.18
42	10:07:47.0	8.18
43	10:07:50.0	8.18
44	10:07:53.0	8.18
45	10:07:56.0	8.18

REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

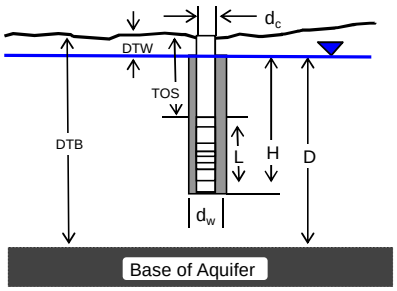
Depth of Base of Aquifer is assumed to be 100 (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-2 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 10:19

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

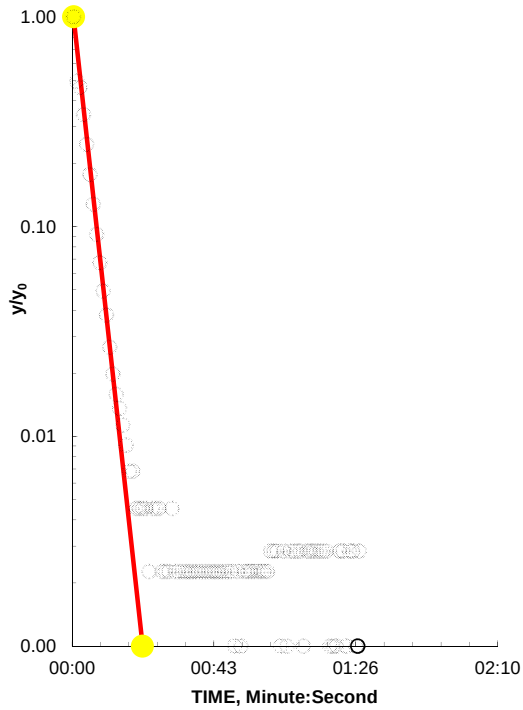


COMPUTED

L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.77	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.142857	$\log_{10}$/sec
$t_{90\%}$ recovery =	7	sec

K =	23	Feet/Day
K =	8.11E-03	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	10:19:50.0	9.94
2	10:19:51.0	9.05
3	10:19:52.0	8.99
4	10:19:53.0	8.78
5	10:19:54.0	8.61
6	10:19:55.0	8.49
7	10:19:56.0	8.40
8	10:19:57.0	8.34
9	10:19:58.0	8.30
10	10:19:59.0	8.27
11	10:20:00.0	8.25
12	10:20:01.0	8.23
13	10:20:02.0	8.21
14	10:20:03.0	8.21
15	10:20:04.0	8.20
16	10:20:05.0	8.20
17	10:20:06.0	8.19
18	10:20:07.0	8.19
19	10:20:08.0	8.19
20	10:20:09.0	8.19
21	10:20:10.0	8.19
22	10:20:11.0	8.19
23	10:20:12.0	8.19
24	10:20:13.0	8.18
25	10:20:14.0	8.19
26	10:20:15.0	8.19
27	10:20:16.0	8.19
28	10:20:17.0	8.18
29	10:20:18.0	8.18
30	10:20:19.0	8.18
31	10:20:20.0	8.19
32	10:20:21.0	8.18
33	10:20:22.0	8.18
34	10:20:23.0	8.18
35	10:20:24.0	8.18
36	10:20:25.0	8.18
37	10:20:26.0	8.18
38	10:20:27.0	8.18
39	10:20:28.0	8.18
40	10:20:29.0	8.18
41	10:20:30.0	8.18
42	10:20:31.0	8.18
43	10:20:32.0	8.18
44	10:20:33.0	8.18
45	10:20:34.0	8.18

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-2 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 10:12

INPUT

Construction:

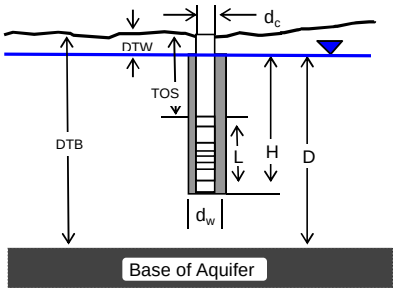
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

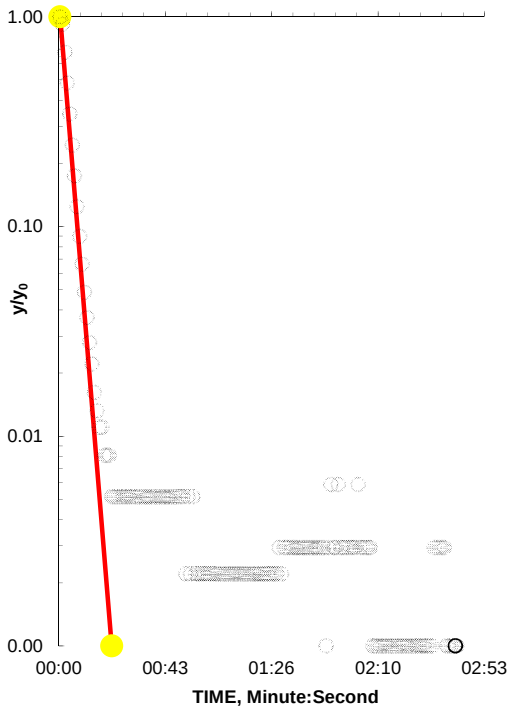
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.36	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.142857	$\log_{10}$/sec
$t_{90\%}$ recovery =	7	sec

K =	23	Feet/Day
K =	8.11E-03	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	10:12:08.0	6.82
2	10:12:11.0	7.52
3	10:12:14.0	7.94
4	10:12:17.0	8.08
5	10:12:20.0	8.14
6	10:12:23.0	8.16
7	10:12:26.0	8.16
8	10:12:29.0	8.17
9	10:12:32.0	8.17
10	10:12:35.0	8.17
11	10:12:38.0	8.17
12	10:12:41.0	8.17
13	10:12:44.0	8.17
14	10:12:47.0	8.17
15	10:12:50.0	8.17
16	10:12:53.0	8.17
17	10:12:56.0	8.17
18	10:12:59.0	8.17
19	10:13:02.0	8.17
20	10:13:05.0	8.17
21	10:13:08.0	8.17
22	10:13:11.0	8.17
23	10:13:14.0	8.17
24	10:13:17.0	8.17
25	10:13:20.0	8.17
26	10:13:23.0	8.17
27	10:13:26.0	8.17
28	10:13:29.0	8.17
29	10:13:32.0	8.17
30	10:13:35.0	8.17
31	10:13:38.0	8.17
32	10:13:41.0	8.17
33	10:13:44.0	8.17
34	10:13:47.0	8.17
35	10:13:50.0	8.17
36	10:13:53.0	8.17
37	10:13:56.0	8.17
38	10:13:59.0	8.17
39	10:14:02.0	8.17
40	10:14:05.0	8.17
41	10:14:08.0	8.17
42	10:14:11.0	8.17
43	10:14:14.0	8.17
44	10:14:17.0	8.17
45	10:14:20.0	8.17

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 0.01 feet below the Total Depth (TD) of the monitoring well.
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-2 (SLUG OUT2 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 10:27

INPUT

Construction:

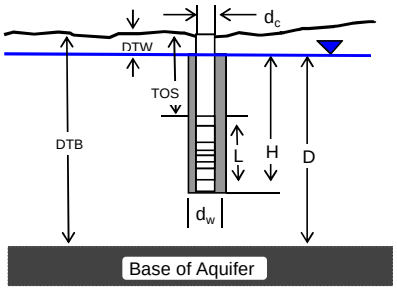
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

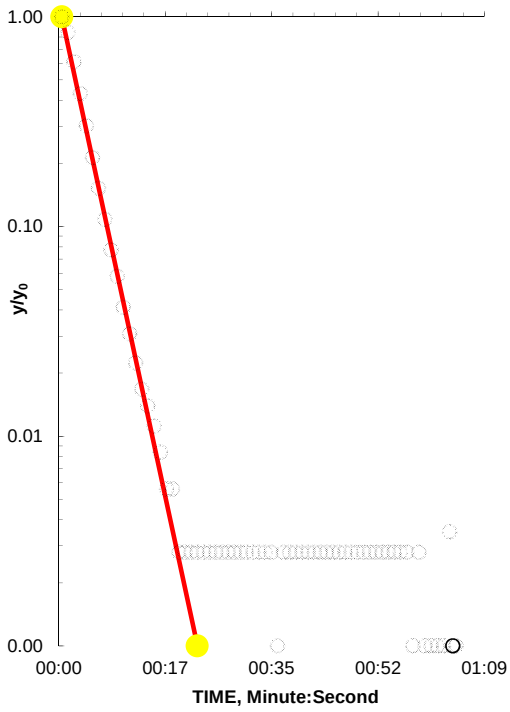
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.43	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.136364	$\log_{10}$/sec
$t_{90\%}$ recovery =	7	sec

K =	22	Feet/Day
K =	7.76E-03	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	10:27:18.0	6.75
2	10:27:19.0	6.98
3	10:27:20.0	7.31
4	10:27:21.0	7.57
5	10:27:22.0	7.75
6	10:27:23.0	7.88
7	10:27:24.0	7.97
8	10:27:25.0	8.03
9	10:27:26.0	8.07
10	10:27:27.0	8.10
11	10:27:28.0	8.12
12	10:27:29.0	8.14
13	10:27:30.0	8.15
14	10:27:31.0	8.16
15	10:27:32.0	8.16
16	10:27:33.0	8.17
17	10:27:34.0	8.17
18	10:27:35.0	8.18
19	10:27:36.0	8.18
20	10:27:37.0	8.18
21	10:27:38.0	8.18
22	10:27:39.0	8.18
23	10:27:40.0	8.18
24	10:27:41.0	8.18
25	10:27:42.0	8.18
26	10:27:43.0	8.18
27	10:27:44.0	8.18
28	10:27:45.0	8.18
29	10:27:46.0	8.18
30	10:27:47.0	8.18
31	10:27:48.0	8.18
32	10:27:49.0	8.18
33	10:27:50.0	8.18
34	10:27:51.0	8.18
35	10:27:52.0	8.18
36	10:27:53.0	8.18
37	10:27:54.0	8.18
38	10:27:55.0	8.18
39	10:27:56.0	8.18
40	10:27:57.0	8.18
41	10:27:58.0	8.18
42	10:27:59.0	8.18
43	10:28:00.0	8.18
44	10:28:01.0	8.18
45	10:28:02.0	8.18

REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

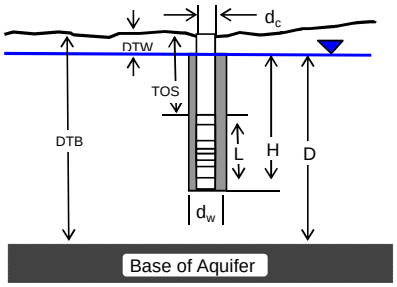
Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-3 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 12:34

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	9.02	Feet
top of screen (TOS)	17.62	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

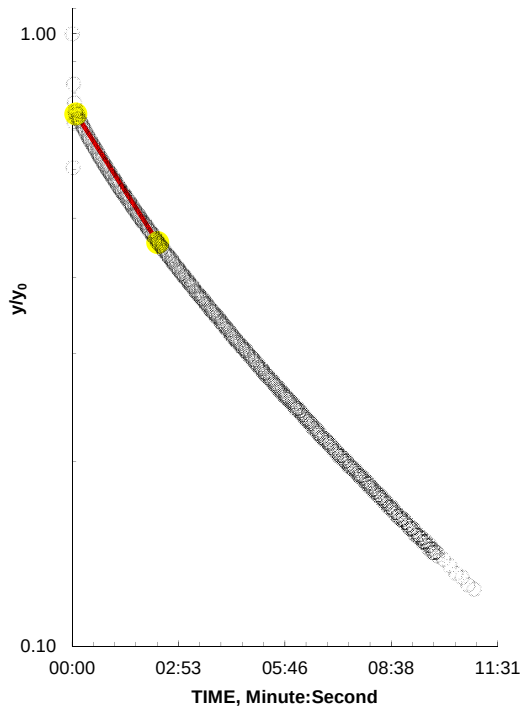


COMPUTED

L_{wetted}	10	Feet
D =	90.98	Feet
H =	18.6	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	2.12	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.293	
Re =	3.40	Feet
Slope =	0.001578	$\log_{10}$/sec
$t_{90\%}$ recovery =	634	sec

K =	0.25	Feet/Day
K =	8.82E-05	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	12:34:35.0	18.08
2	12:34:48.0	17.48
3	12:35:01.0	17.40
4	12:35:14.0	17.32
5	12:35:27.0	17.26
6	12:35:40.0	17.20
7	12:35:53.0	17.14
8	12:36:06.0	17.09
9	12:36:19.0	17.04
10	12:36:32.0	17.00
11	12:36:45.0	16.96
12	12:36:58.0	16.92
13	12:37:11.0	16.88
14	12:37:24.0	16.84
15	12:37:37.0	16.81
16	12:37:50.0	16.78
17	12:38:03.0	16.75
18	12:38:16.0	16.72
19	12:38:29.0	16.69
20	12:38:42.0	16.67
21	12:38:55.0	16.64
22	12:39:08.0	16.62
23	12:39:21.0	16.60
24	12:39:34.0	16.57
25	12:39:47.0	16.55
26	12:40:00.0	16.53
27	12:40:13.0	16.52
28	12:40:26.0	16.50
29	12:40:39.0	16.48
30	12:40:52.0	16.46
31	12:41:05.0	16.45
32	12:41:18.0	16.43
33	12:41:31.0	16.42
34	12:41:44.0	16.40
35	12:41:57.0	16.39
36	12:42:10.0	16.38
37	12:42:23.0	16.36
38	12:42:36.0	16.35
39	12:42:49.0	16.34
40	12:43:02.0	16.33
41	12:43:15.0	16.32
42	12:43:28.0	16.30
43	12:43:41.0	16.30
44	12:43:54.0	16.28
45	12:44:07.0	16.28

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-3 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 14:04

INPUT

Construction:

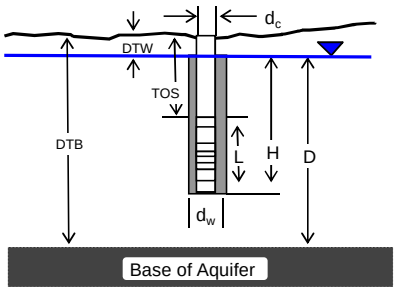
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	9.02	Feet
top of screen (TOS)	17.62	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

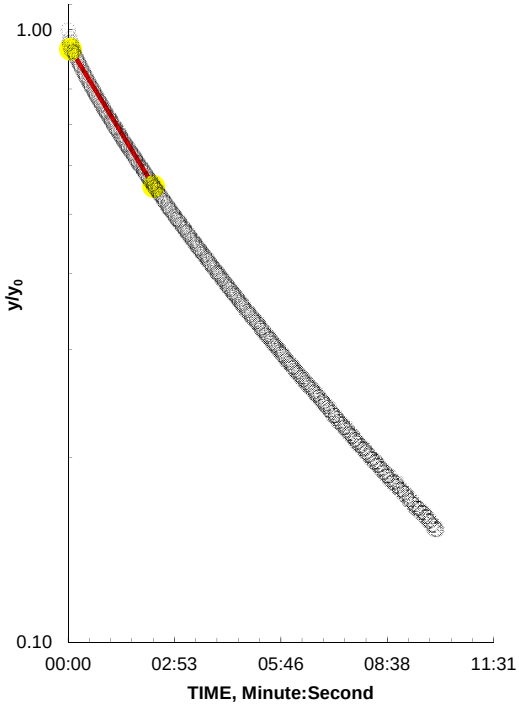
L_{wetted}	10	Feet
D =	90.98	Feet
H =	18.6	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.61	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.293	
Re =	3.40	Feet
Slope =	0.00166	$\log_{10}$/sec
$t_{90\%}$ recovery =	602	sec

K =	0.26	Feet/Day
K =	9.17E-05	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	14:04:52.0	17.57
2	14:05:05.0	17.41
3	14:05:18.0	17.32
4	14:05:31.0	17.25
5	14:05:44.0	17.19
6	14:05:57.0	17.12
7	14:06:10.0	17.07
8	14:06:23.0	17.01
9	14:06:36.0	16.97
10	14:06:49.0	16.92
11	14:07:02.0	16.88
12	14:07:15.0	16.84
13	14:07:28.0	16.80
14	14:07:41.0	16.77
15	14:07:54.0	16.74
16	14:08:07.0	16.71
17	14:08:20.0	16.68
18	14:08:33.0	16.65
19	14:08:46.0	16.62
20	14:08:59.0	16.60
21	14:09:12.0	16.57
22	14:09:25.0	16.55
23	14:09:38.0	16.53
24	14:09:51.0	16.50
25	14:10:04.0	16.48
26	14:10:17.0	16.47
27	14:10:30.0	16.45
28	14:10:43.0	16.43
29	14:10:56.0	16.41
30	14:11:09.0	16.40
31	14:11:22.0	16.38
32	14:11:35.0	16.37
33	14:11:48.0	16.35
34	14:12:01.0	16.34
35	14:12:14.0	16.33
36	14:12:27.0	16.31
37	14:12:40.0	16.30
38	14:12:53.0	16.29
39	14:13:06.0	16.28
40	14:13:19.0	16.27
41	14:13:32.0	16.26
42	14:13:45.0	16.25
43	14:13:58.0	16.24
44	14:14:11.0	16.23
45	14:14:24.0	16.22

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-3 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 13:28

INPUT

Construction:

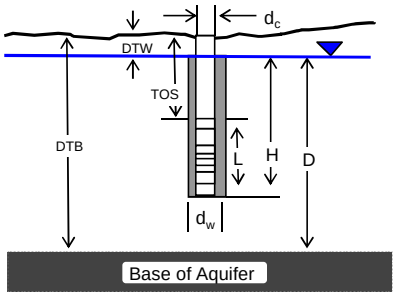
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

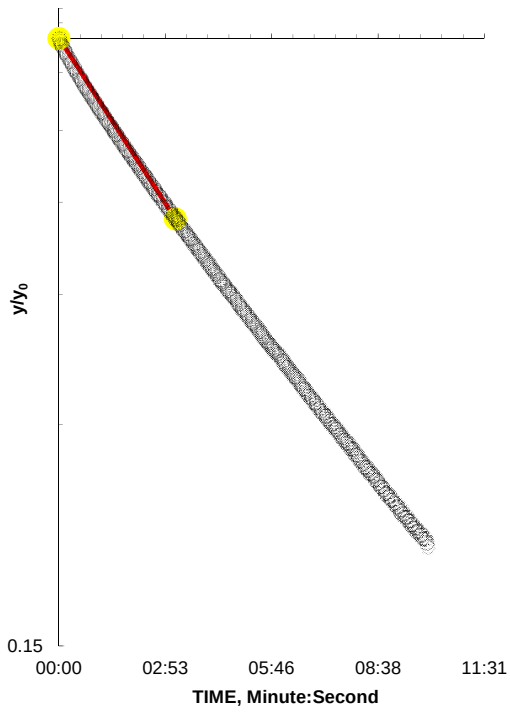
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.58	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.001295	$\log_{10}$/sec
$t_{90\%}$ recovery =	772	sec

K =	0.21	Feet/Day
K =	7.41E-05	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	13:28:31.0	14.27
2	13:28:44.0	14.35
3	13:28:57.0	14.42
4	13:29:10.0	14.48
5	13:29:23.0	14.53
6	13:29:36.0	14.58
7	13:29:49.0	14.63
8	13:30:02.0	14.67
9	13:30:15.0	14.72
10	13:30:28.0	14.76
11	13:30:41.0	14.80
12	13:30:54.0	14.83
13	13:31:07.0	14.87
14	13:31:20.0	14.90
15	13:31:33.0	14.93
16	13:31:46.0	14.96
17	13:31:59.0	15.00
18	13:32:12.0	15.02
19	13:32:25.0	15.05
20	13:32:38.0	15.07
21	13:32:51.0	15.11
22	13:33:04.0	15.13
23	13:33:17.0	15.15
24	13:33:30.0	15.17
25	13:33:43.0	15.19
26	13:33:56.0	15.22
27	13:34:09.0	15.24
28	13:34:22.0	15.26
29	13:34:35.0	15.27
30	13:34:48.0	15.29
31	13:35:01.0	15.31
32	13:35:14.0	15.33
33	13:35:27.0	15.34
34	13:35:40.0	15.36
35	13:35:53.0	15.38
36	13:36:06.0	15.39
37	13:36:19.0	15.40
38	13:36:32.0	15.42
39	13:36:45.0	15.43
40	13:36:58.0	15.44
41	13:37:11.0	15.46
42	13:37:24.0	15.47
43	13:37:37.0	15.48
44	13:37:50.0	15.49
45	13:38:03.0	15.50

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-3 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 14:42

INPUT

Construction:

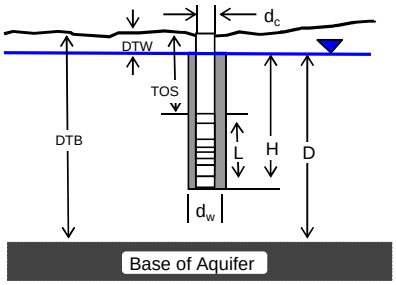
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	16.17	Feet
top of screen (TOS)	28.12	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

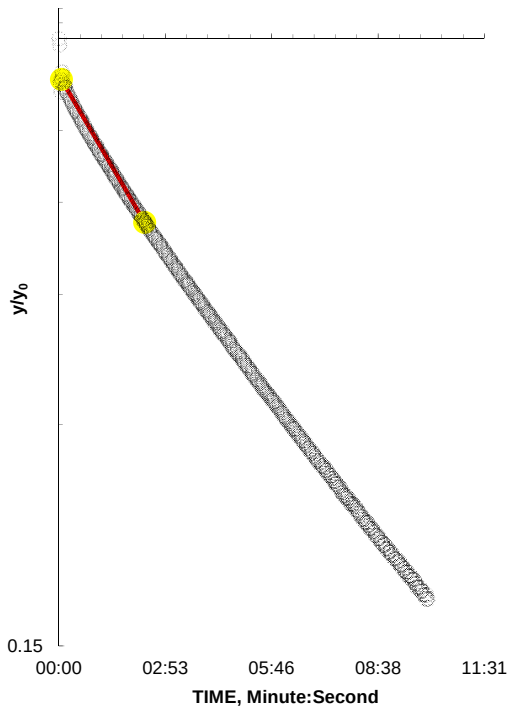
L_{wetted}	10	Feet
D =	83.83	Feet
H =	21.95	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.85	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.365	
Re =	3.66	Feet
Slope =	0.001435	$\log_{10}$/sec
$t_{90\%}$ recovery =	697	sec

K =	0.23	Feet/Day
K =	8.11E-05	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	14:42:09.0	14.01
2	14:42:22.0	14.30
3	14:42:35.0	14.38
4	14:42:48.0	14.44
5	14:43:01.0	14.51
6	14:43:14.0	14.56
7	14:43:27.0	14.61
8	14:43:40.0	14.67
9	14:43:53.0	14.71
10	14:44:06.0	14.75
11	14:44:19.0	14.80
12	14:44:32.0	14.84
13	14:44:45.0	14.87
14	14:44:58.0	14.91
15	14:45:11.0	14.94
16	14:45:24.0	14.98
17	14:45:37.0	15.01
18	14:45:50.0	15.03
19	14:46:03.0	15.06
20	14:46:16.0	15.09
21	14:46:29.0	15.12
22	14:46:42.0	15.14
23	14:46:55.0	15.17
24	14:47:08.0	15.19
25	14:47:21.0	15.21
26	14:47:34.0	15.24
27	14:47:47.0	15.26
28	14:48:00.0	15.28
29	14:48:13.0	15.30
30	14:48:26.0	15.32
31	14:48:39.0	15.33
32	14:48:52.0	15.35
33	14:49:05.0	15.37
34	14:49:18.0	15.38
35	14:49:31.0	15.40
36	14:49:44.0	15.41
37	14:49:57.0	15.43
38	14:50:10.0	15.44
39	14:50:23.0	15.46
40	14:50:36.0	15.47
41	14:50:49.0	15.48
42	14:51:02.0	15.49
43	14:51:15.0	15.50
44	14:51:28.0	15.51
45	14:51:41.0	15.52

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

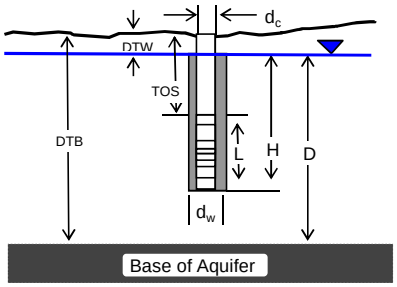
Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-4 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 15:35

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	11.31	Feet
top of screen (TOS)	16.18	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

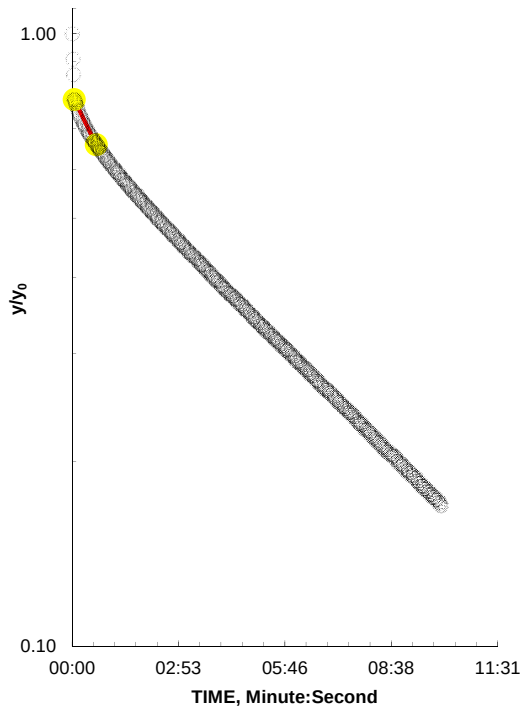


COMPUTED

L_{wetted}	10	Feet
D =	88.69	Feet
H =	14.87	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	2.18	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.209	
Re =	3.13	Feet
Slope =	0.002049	log_{10}/sec
$t_{90\%}$ recovery =	488	sec

K =	0.31	Feet/Day
K =	1.09E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	15:35:54.0	15.88
2	15:36:07.0	15.30
3	15:36:20.0	15.21
4	15:36:33.0	15.14
5	15:36:46.0	15.08
6	15:36:59.0	15.03
7	15:37:12.0	14.98
8	15:37:25.0	14.93
9	15:37:38.0	14.89
10	15:37:51.0	14.85
11	15:38:04.0	14.81
12	15:38:17.0	14.78
13	15:38:30.0	14.75
14	15:38:43.0	14.71
15	15:38:56.0	14.68
16	15:39:09.0	14.65
17	15:39:22.0	14.62
18	15:39:35.0	14.59
19	15:39:48.0	14.56
20	15:40:01.0	14.54
21	15:40:14.0	14.52
22	15:40:27.0	14.49
23	15:40:40.0	14.47
24	15:40:53.0	14.44
25	15:41:06.0	14.42
26	15:41:19.0	14.40
27	15:41:32.0	14.38
28	15:41:45.0	14.36
29	15:41:58.0	14.34
30	15:42:11.0	14.32
31	15:42:24.0	14.30
32	15:42:37.0	14.28
33	15:42:50.0	14.27
34	15:43:03.0	14.25
35	15:43:16.0	14.24
36	15:43:29.0	14.22
37	15:43:42.0	14.21
38	15:43:55.0	14.19
39	15:44:08.0	14.17
40	15:44:21.0	14.16
41	15:44:34.0	14.15
42	15:44:47.0	14.13
43	15:45:00.0	14.12
44	15:45:13.0	14.11
45	15:45:26.0	14.09

REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

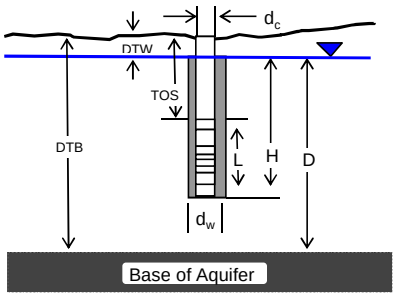
Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-4 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 16:40

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	11.31	Feet
top of screen (TOS)	16.18	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

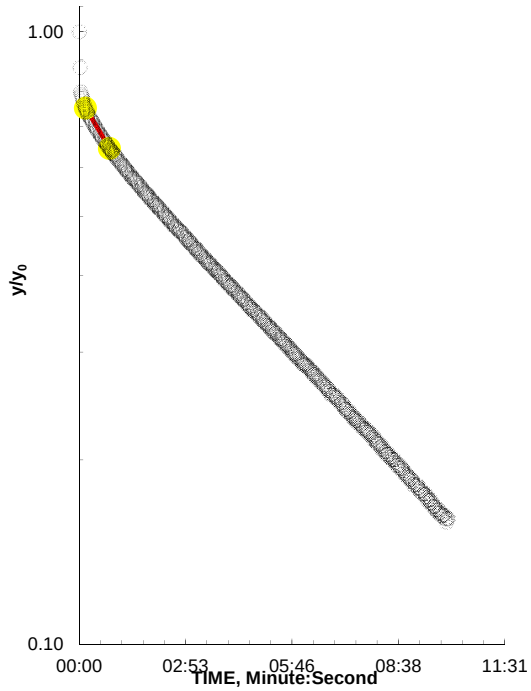


COMPUTED

L_{wetted}	10	Feet
D =	88.69	Feet
H =	14.87	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.99	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.209	
Re =	3.13	Feet
Slope =	0.001688	$\log_{10}$/sec
$t_{90\%}$ recovery =	592	sec

K =	0.26	Feet/Day
K =	9.17E-05	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	16:40:09.0	15.69
2	16:40:22.0	15.17
3	16:40:35.0	15.09
4	16:40:48.0	15.03
5	16:41:01.0	14.97
6	16:41:14.0	14.92
7	16:41:27.0	14.88
8	16:41:40.0	14.84
9	16:41:53.0	14.80
10	16:42:06.0	14.76
11	16:42:19.0	14.73
12	16:42:32.0	14.69
13	16:42:45.0	14.66
14	16:42:58.0	14.63
15	16:43:11.0	14.60
16	16:43:24.0	14.57
17	16:43:37.0	14.54
18	16:43:50.0	14.51
19	16:44:03.0	14.49
20	16:44:16.0	14.46
21	16:44:29.0	14.44
22	16:44:42.0	14.42
23	16:44:55.0	14.39
24	16:45:08.0	14.37
25	16:45:21.0	14.35
26	16:45:34.0	14.33
27	16:45:47.0	14.31
28	16:46:00.0	14.29
29	16:46:13.0	14.27
30	16:46:26.0	14.26
31	16:46:39.0	14.24
32	16:46:52.0	14.22
33	16:47:05.0	14.21
34	16:47:18.0	14.19
35	16:47:31.0	14.17
36	16:47:44.0	14.16
37	16:47:57.0	14.14
38	16:48:10.0	14.13
39	16:48:23.0	14.11
40	16:48:36.0	14.10
41	16:48:49.0	14.09
42	16:49:02.0	14.07
43	16:49:15.0	14.06
44	16:49:28.0	14.05
45	16:49:41.0	14.04

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-4 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/11/2015
Time: 16:00

INPUT

Construction:

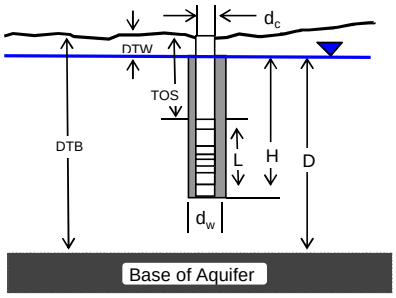
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	11.31	Feet
top of screen (TOS)	16.18	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

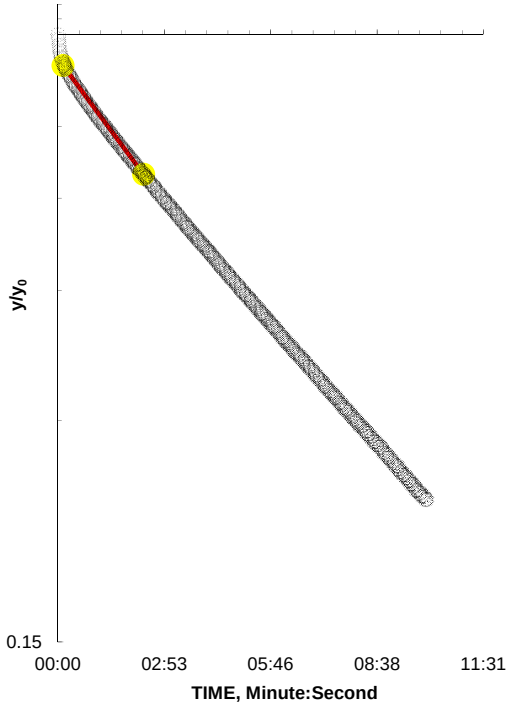
L_{wetted}	10	Feet
D =	88.69	Feet
H =	14.87	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.73	Feet
$y_{0\text{-SLUG}}$ =	1.27	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.209	
Re =	3.13	Feet
Slope =	0.001128	$\log_{10}$/sec
$t_{90\%}$ recovery =	886	sec

K =	0.17	Feet/Day
K =	6.00E-05	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

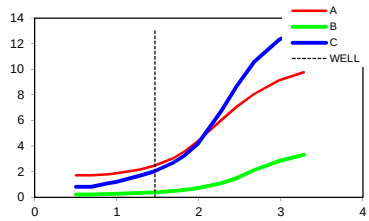
Entry	Time, Hr:Min:Sec	Water Level
1	16:00:32.0	11.82
2	16:00:45.0	12.00
3	16:00:58.0	12.07
4	16:01:11.0	12.12
5	16:01:24.0	12.17
6	16:01:37.0	12.21
7	16:01:50.0	12.26
8	16:02:03.0	12.30
9	16:02:16.0	12.34
10	16:02:29.0	12.37
11	16:02:42.0	12.41
12	16:02:55.0	12.44
13	16:03:08.0	12.48
14	16:03:21.0	12.51
15	16:03:34.0	12.54
16	16:03:47.0	12.57
17	16:04:00.0	12.59
18	16:04:13.0	12.62
19	16:04:26.0	12.65
20	16:04:39.0	12.67
21	16:04:52.0	12.70
22	16:05:05.0	12.73
23	16:05:18.0	12.75
24	16:05:31.0	12.77
25	16:05:44.0	12.79
26	16:05:57.0	12.81
27	16:06:10.0	12.84
28	16:06:23.0	12.86
29	16:06:36.0	12.88
30	16:06:49.0	12.89
31	16:07:02.0	12.91
32	16:07:15.0	12.93
33	16:07:28.0	12.95
34	16:07:41.0	12.96
35	16:07:54.0	12.98
36	16:08:07.0	13.00
37	16:08:20.0	13.01
38	16:08:33.0	13.03
39	16:08:46.0	13.04
40	16:08:59.0	13.05
41	16:09:12.0	13.07
42	16:09:25.0	13.08
43	16:09:38.0	13.09
44	16:09:51.0	13.11
45	16:10:04.0	13.12

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

Inch	0.083333	Second	1.16E-05	Gallons	0.133681	1					5	6		8					
Feet	1	Minute	0.000694	Liters	0.035594	Empirical look-up table for Bouwer and Rice method of slug test analysis													
Meter	3.283333	Hour	0.041667	Cubic inch	0.000579	log(L/rw)	A	B	C	D-log	Delta-A	Delta-B	Delta-C			WELL			
cm	0.032833	Day	1			0.5	1.738	0.229	0.835	0.189133	0	0	0		1.463757	0			
mm	0.003283					0.689133	1.738	0.229	0.835	0.202	0.064	0.04	0.255		1.463757	13			
PSI	2.31					0.891133	1.802	0.269	1.09	0.098167	0.068	-0.004	0.102						
						0.9893	1.87	0.265	1.192	0.295633	0.305	0.074	0.504						
Out Units =	Feet/Day					1.284933	2.175	0.339	1.696	0.172867	0.289	0.068	0.327						
Convert =	1					1.4578	2.464	0.407	2.023	0.2277	0.593	0.083	0.675						
						1.6855	3.057	0.49	2.698	0.141867	0.547	0.095	0.585						
Casing dia. (dc)	2	Inch				1.827367	3.604	0.585	3.283	0.159667	0.793	0.153	0.9						
Annulus dia. (dw)	8.25	Inch				1.987033	4.397	0.738	4.183	0.283767	1.625	0.365	2.549						
Screen Length (L)	10	Feet				2.2708	6.022	1.103	6.732	0.187333	1.047	0.407	1.943						
						2.458133	7.069	1.51	8.675	0.217233	0.993	0.6175	1.905						
Depths to:						2.675367	8.062	2.1275	10.58	0.305233	1.094	0.721	1.74						
water level (DTW)	11.31	Feet				2.9806	9.156	2.8485	12.32	0.296633	0.611	0.469	0.806						
top of screen (TOS)	16.18	Feet				3.277233	9.767	3.3175	13.126										
Base of Aquifer (DTB	100	Feet																	
Annular Fill:																			
across screen --	Medium Sand																		
above screen --	Bentonite																		
Aquifer Material --	Surficial Aquifer, (fine sand and silt, 55 values)																		
Lwetted	10	Feet																	
D =	88.69	Feet																	
H =	14.87	Feet																	
y0 =	1.79	Feet																	
y0 (output units)=	1.79	Feet																	
Fraction penetrated =	0.167663																		

Type:	Bailer	
LENGTH	5.09	Feet
Rod Diameter	1.315	Inch
Factor=	0.6575	
$y_{0\text{-Prelim}}$ =	5.09	feet
$y_{0\text{-SLUG}}$ =	2.200439	feet
$y_{0\text{-SLUG(output units)}}$ =	2.20	Feet
Discrepancy =	21%	



slope points	0:00:07	22:24:13		
	0.000804	0.775852		
Partial penetrate A =		2.48	2.464	
B =		0.41	0.407	
Fully penetrate C =		2.04	2.023	
Rc =	0.083333	ft		
Rw =	0.34375	ft		
Lwetted	10	ft		
D =	88.69	ft		
H =	14.87	ft		
L/rw =	29.09			
partial	2.208717	5.36947	5.36947	
full	2.761342			
ln(Re/rw) =	2.208717			
Re =	3.13			
Slope =	22:32:59	$\log_{10}$/day		
$t_{90\%}$ recovery =	772	sec		
K =	0.197451	ft/d		
K =	0.197451	Feet/Day	0.01	
K =	0.2	Feet/Day	20	
D=	88.69	Feet		
T =	17.738	Feet2/Day	1	
T =	18	Feet2/Day	18	

Absolute Shut Down

Input is consistent.

Decision	Option			
0	Water level is below base of screen			
0	Casing diameter is greater than the Annulus			
0	Base of screen is deeper than base of aquifer			
0	Screen length is less than 0.1 ft	0.1		
0	Slope will produce a negative K			
0	K= 0.2 is less than extreme minimum of 0.01 for Surficial	0.01		
0	K= 0.2 is greater than extreme maximum of 50 for Surfici	50		
0	Slug discrepancy of 21% is greater than maximum of 30%		21	30
1	Input is consistent.			

WELL ID: P-5 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 12:30

INPUT

Construction:

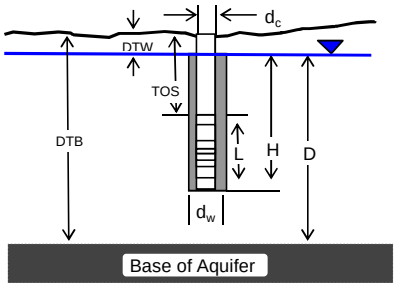
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	11.92	Feet
top of screen (TOS)	17.61	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

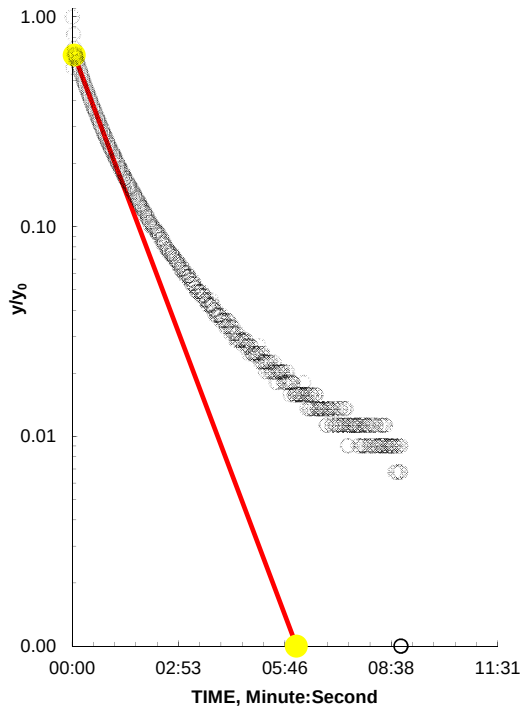
L_{wetted}	10	Feet
D =	88.08	Feet
H =	15.69	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.77	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.230	
Re =	3.20	Feet
Slope =	0.007806	$\log_{10}$/sec
$t_{90\%}$ recovery =	128	sec

K =	1.2	Feet/Day
K =	4.23E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	12:30:48.0	14.42
2	12:30:59.0	13.68
3	12:31:10.0	13.47
4	12:31:21.0	13.32
5	12:31:32.0	13.21
6	12:31:43.0	13.12
7	12:31:54.0	13.05
8	12:32:05.0	12.99
9	12:32:16.0	12.94
10	12:32:27.0	12.91
11	12:32:38.0	12.88
12	12:32:49.0	12.85
13	12:33:00.0	12.82
14	12:33:11.0	12.81
15	12:33:22.0	12.79
16	12:33:33.0	12.78
17	12:33:44.0	12.76
18	12:33:55.0	12.75
19	12:34:06.0	12.75
20	12:34:17.0	12.73
21	12:34:28.0	12.73
22	12:34:39.0	12.72
23	12:34:50.0	12.72
24	12:35:01.0	12.71
25	12:35:12.0	12.71
26	12:35:23.0	12.70
27	12:35:34.0	12.70
28	12:35:45.0	12.69
29	12:35:56.0	12.69
30	12:36:07.0	12.69
31	12:36:18.0	12.69
32	12:36:29.0	12.69
33	12:36:40.0	12.68
34	12:36:51.0	12.68
35	12:37:02.0	12.68
36	12:37:13.0	12.67
37	12:37:24.0	12.68
38	12:37:35.0	12.67
39	12:37:46.0	12.67
40	12:37:57.0	12.67
41	12:38:08.0	12.67
42	12:38:19.0	12.67
43	12:38:30.0	12.67
44	12:38:41.0	12.67
45	12:38:52.0	12.67

REMARKS:

Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-5 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 12:56

INPUT

Construction:

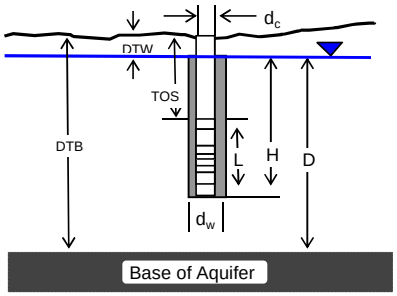
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	11.92	Feet
top of screen (TOS)	17.61	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

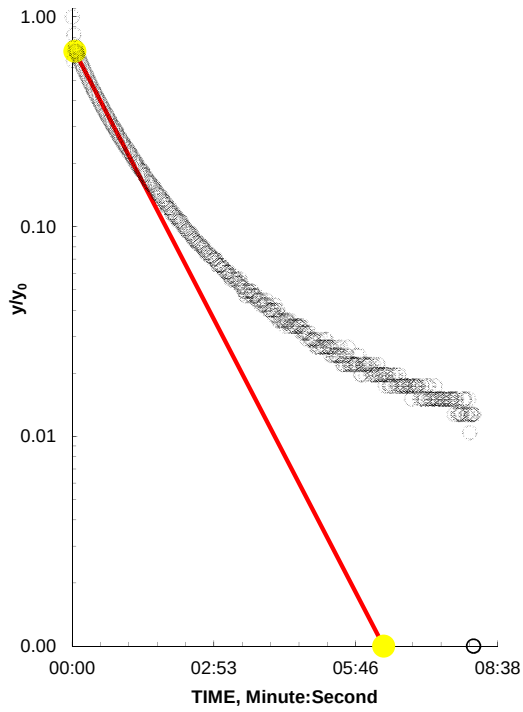
L_{wetted}	10	Feet
D =	88.08	Feet
H =	15.69	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.73	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.230	
Re =	3.20	Feet
Slope =	0.007542	$\log_{10}$/sec
$t_{90\%}$ recovery =	133	sec

K =	1.2	Feet/Day
K =	4.23E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	12:56:32.0	14.37
2	12:56:42.0	13.69
3	12:56:52.0	13.50
4	12:57:02.0	13.36
5	12:57:12.0	13.25
6	12:57:22.0	13.16
7	12:57:32.0	13.09
8	12:57:42.0	13.03
9	12:57:52.0	12.98
10	12:58:02.0	12.94
11	12:58:12.0	12.90
12	12:58:22.0	12.87
13	12:58:32.0	12.85
14	12:58:42.0	12.82
15	12:58:52.0	12.81
16	12:59:02.0	12.79
17	12:59:12.0	12.78
18	12:59:22.0	12.77
19	12:59:32.0	12.75
20	12:59:42.0	12.75
21	12:59:52.0	12.73
22	13:00:02.0	12.73
23	13:00:12.0	12.72
24	13:00:22.0	12.71
25	13:00:32.0	12.71
26	13:00:42.0	12.71
27	13:00:52.0	12.70
28	13:01:02.0	12.70
29	13:01:12.0	12.70
30	13:01:22.0	12.69
31	13:01:32.0	12.69
32	13:01:42.0	12.69
33	13:01:52.0	12.68
34	13:02:02.0	12.68
35	13:02:12.0	12.68
36	13:02:22.0	12.68
37	13:02:32.0	12.68
38	13:02:42.0	12.67
39	13:02:52.0	12.67
40	13:03:02.0	12.67
41	13:03:12.0	12.67
42	13:03:22.0	12.67
43	13:03:32.0	12.67
44	13:03:42.0	12.67
45	13:03:52.0	12.67

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-5 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 12:43

INPUT

Construction:

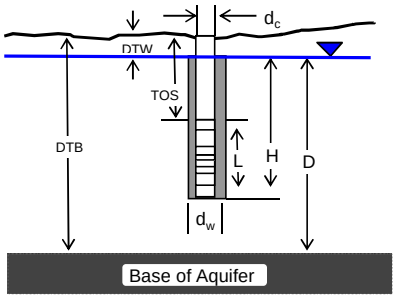
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	11.92	Feet
top of screen (TOS)	17.61	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

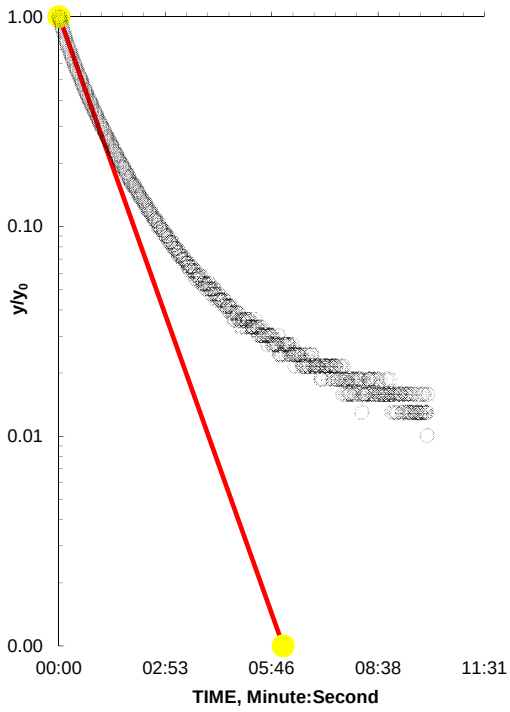
L_{wetted}	10	Feet
D =	88.08	Feet
H =	15.69	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.39	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.230	
Re =	3.20	Feet
Slope =	0.008242	$\log_{10}$/sec
$t_{90\%}$ recovery =	121	sec

K =	1.3	Feet/Day
K =	4.59E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	12:43:24.0	11.27
2	12:43:37.0	11.62
3	12:43:50.0	11.84
4	12:44:03.0	12.00
5	12:44:16.0	12.12
6	12:44:29.0	12.22
7	12:44:42.0	12.29
8	12:44:55.0	12.34
9	12:45:08.0	12.39
10	12:45:21.0	12.43
11	12:45:34.0	12.46
12	12:45:47.0	12.49
13	12:46:00.0	12.51
14	12:46:13.0	12.53
15	12:46:26.0	12.54
16	12:46:39.0	12.56
17	12:46:52.0	12.57
18	12:47:05.0	12.58
19	12:47:18.0	12.59
20	12:47:31.0	12.59
21	12:47:44.0	12.60
22	12:47:57.0	12.60
23	12:48:10.0	12.61
24	12:48:23.0	12.61
25	12:48:36.0	12.61
26	12:48:49.0	12.62
27	12:49:02.0	12.62
28	12:49:15.0	12.62
29	12:49:28.0	12.62
30	12:49:41.0	12.63
31	12:49:54.0	12.63
32	12:50:07.0	12.63
33	12:50:20.0	12.63
34	12:50:33.0	12.63
35	12:50:46.0	12.63
36	12:50:59.0	12.63
37	12:51:12.0	12.63
38	12:51:25.0	12.63
39	12:51:38.0	12.64
40	12:51:51.0	12.64
41	12:52:04.0	12.64
42	12:52:17.0	12.64
43	12:52:30.0	12.64
44	12:52:43.0	12.64
45	12:52:56.0	12.64

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 0.01 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-5 (SLUG OUT2 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 13:07

INPUT

Construction:

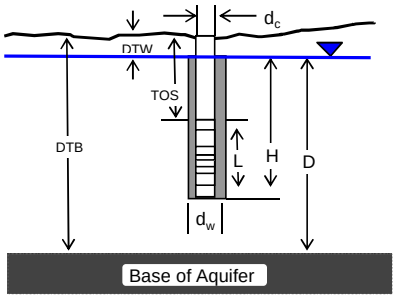
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	11.92	Feet
top of screen (TOS)	17.61	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

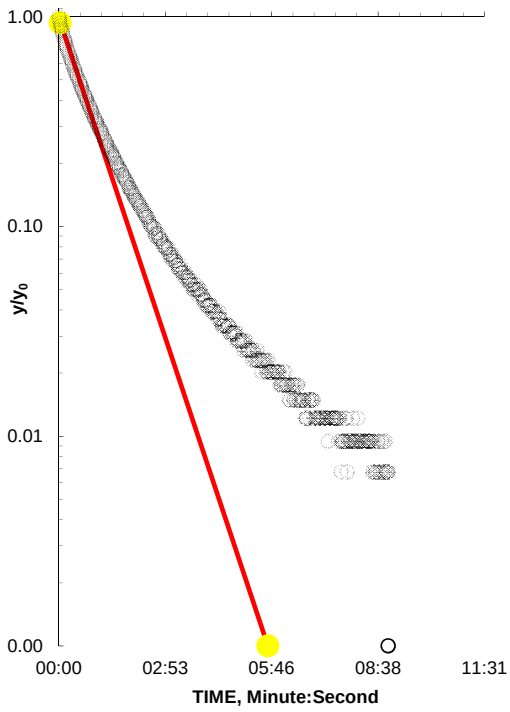
L_{wetted}	10	Feet
D =	88.08	Feet
H =	15.69	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.48	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.230	
Re =	3.20	Feet
Slope =	0.008817	$\log_{10}$/sec
$t_{90\%}$ recovery =	113	sec

K =	1.4	Feet/Day
K =	4.94E-04	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	13:07:24.0	11.18
2	13:07:35.0	11.56
3	13:07:46.0	11.78
4	13:07:57.0	11.94
5	13:08:08.0	12.06
6	13:08:19.0	12.15
7	13:08:30.0	12.23
8	13:08:41.0	12.29
9	13:08:52.0	12.34
10	13:09:03.0	12.38
11	13:09:14.0	12.42
12	13:09:25.0	12.45
13	13:09:36.0	12.48
14	13:09:47.0	12.50
15	13:09:58.0	12.52
16	13:10:09.0	12.53
17	13:10:20.0	12.54
18	13:10:31.0	12.56
19	13:10:42.0	12.57
20	13:10:53.0	12.58
21	13:11:04.0	12.58
22	13:11:15.0	12.59
23	13:11:26.0	12.60
24	13:11:37.0	12.60
25	13:11:48.0	12.61
26	13:11:59.0	12.61
27	13:12:10.0	12.61
28	13:12:21.0	12.62
29	13:12:32.0	12.62
30	13:12:43.0	12.63
31	13:12:54.0	12.63
32	13:13:05.0	12.63
33	13:13:16.0	12.63
34	13:13:27.0	12.63
35	13:13:38.0	12.64
36	13:13:49.0	12.64
37	13:14:00.0	12.64
38	13:14:11.0	12.64
39	13:14:22.0	12.64
40	13:14:33.0	12.64
41	13:14:44.0	12.64
42	13:14:55.0	12.64
43	13:15:06.0	12.65
44	13:15:17.0	12.65
45	13:15:28.0	12.65

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-6 (SLUG IN 1 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 14:10

INPUT

Construction:

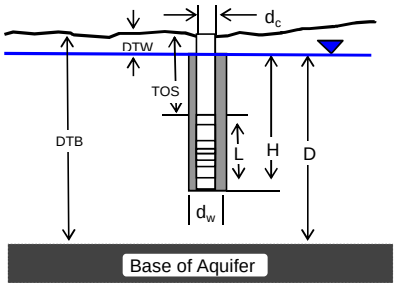
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	9.98	Feet
top of screen (TOS)	17.41	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

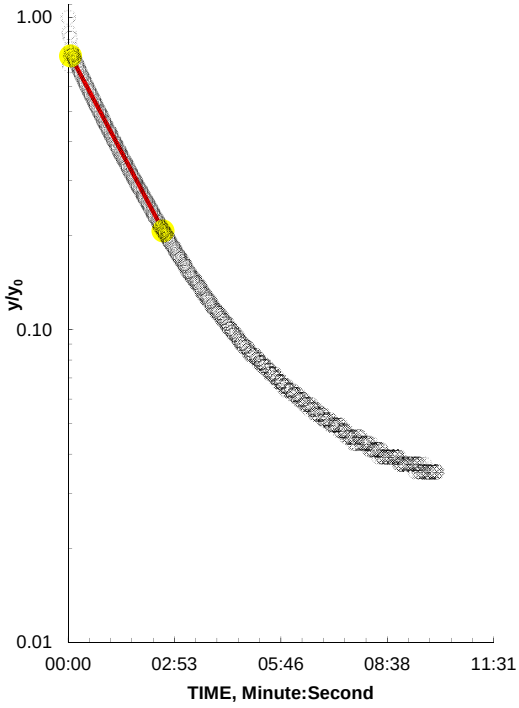
L_{wetted}	10	Feet
D =	90.02	Feet
H =	17.43	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.94	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.269	
Re =	3.32	Feet
Slope =	0.003728	$\log_{10}$/sec
$t_{90\%}$ recovery =	268	sec

K =	0.58	Feet/Day
K =	2.05E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	14:10:03.0	16.68
2	14:10:16.0	16.13
3	14:10:29.0	15.96
4	14:10:42.0	15.81
5	14:10:55.0	15.69
6	14:11:08.0	15.59
7	14:11:21.0	15.50
8	14:11:34.0	15.42
9	14:11:47.0	15.34
10	14:12:00.0	15.28
11	14:12:13.0	15.23
12	14:12:26.0	15.18
13	14:12:39.0	15.14
14	14:12:52.0	15.10
15	14:13:05.0	15.07
16	14:13:18.0	15.04
17	14:13:31.0	15.02
18	14:13:44.0	14.99
19	14:13:57.0	14.97
20	14:14:10.0	14.96
21	14:14:23.0	14.94
22	14:14:36.0	14.93
23	14:14:49.0	14.91
24	14:15:02.0	14.90
25	14:15:15.0	14.89
26	14:15:28.0	14.88
27	14:15:41.0	14.88
28	14:15:54.0	14.87
29	14:16:07.0	14.86
30	14:16:20.0	14.86
31	14:16:33.0	14.85
32	14:16:46.0	14.85
33	14:16:59.0	14.84
34	14:17:12.0	14.84
35	14:17:25.0	14.83
36	14:17:38.0	14.83
37	14:17:51.0	14.82
38	14:18:04.0	14.82
39	14:18:17.0	14.82
40	14:18:30.0	14.82
41	14:18:43.0	14.82
42	14:18:56.0	14.82
43	14:19:09.0	14.81
44	14:19:22.0	14.81
45	14:19:35.0	14.81

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

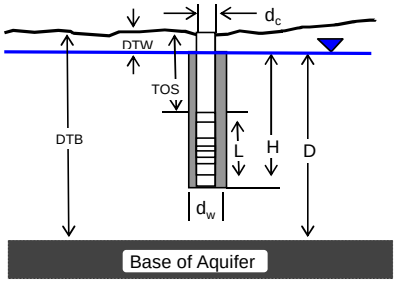
Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-6 (SLUG IN 2 - FALLING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 14:46

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	9.98	Feet
top of screen (TOS)	17.41	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

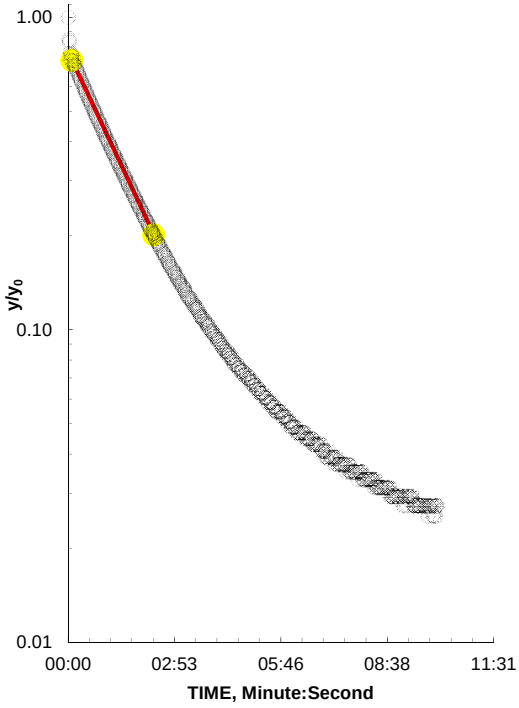


COMPUTED

L_{wetted}	10	Feet
D =	90.02	Feet
H =	17.43	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	2.05	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.269	
Re =	3.32	Feet
Slope =	0.004196	$\log_{10}$/sec
$t_{90\%}$ recovery =	238	sec

K =	0.66	Feet/Day
K =	2.33E-04	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	14:46:00.0	16.81
2	14:46:13.0	16.16
3	14:46:26.0	15.98
4	14:46:39.0	15.82
5	14:46:52.0	15.69
6	14:47:05.0	15.58
7	14:47:18.0	15.48
8	14:47:31.0	15.40
9	14:47:44.0	15.32
10	14:47:57.0	15.26
11	14:48:10.0	15.21
12	14:48:23.0	15.16
13	14:48:36.0	15.12
14	14:48:49.0	15.08
15	14:49:02.0	15.05
16	14:49:15.0	15.02
17	14:49:28.0	15.00
18	14:49:41.0	14.98
19	14:49:54.0	14.96
20	14:50:07.0	14.95
21	14:50:20.0	14.93
22	14:50:33.0	14.92
23	14:50:46.0	14.91
24	14:50:59.0	14.90
25	14:51:12.0	14.89
26	14:51:25.0	14.88
27	14:51:38.0	14.87
28	14:51:51.0	14.87
29	14:52:04.0	14.86
30	14:52:17.0	14.86
31	14:52:30.0	14.85
32	14:52:43.0	14.85
33	14:52:56.0	14.84
34	14:53:09.0	14.84
35	14:53:22.0	14.84
36	14:53:35.0	14.84
37	14:53:48.0	14.83
38	14:54:01.0	14.83
39	14:54:14.0	14.83
40	14:54:27.0	14.82
41	14:54:40.0	14.82
42	14:54:53.0	14.82
43	14:55:06.0	14.82
44	14:55:19.0	14.82
45	14:55:32.0	14.82

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

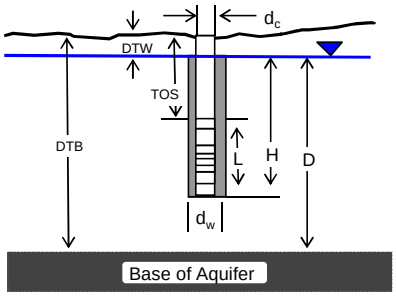
Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-3 (SLUG OUT1 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 14:28

INPUT

Construction:		
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet
Depths to:		
water level (DTW)	9.98	Feet
top of screen (TOS)	17.41	Feet
Base of Aquifer (DTB)	100	Feet
Annular Fill:		
across screen --	Medium Sand	
above screen --	Bentonite	

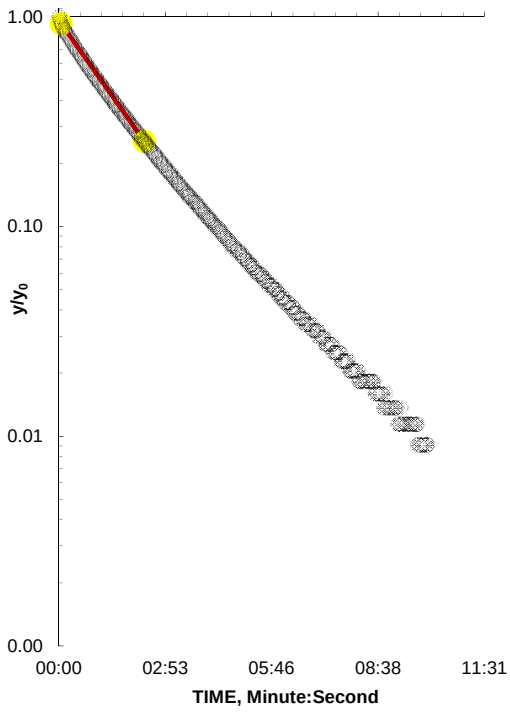


COMPUTED

L_{wetted}	10	Feet
D =	90.02	Feet
H =	17.43	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.76	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet
From look-up table using L/r_w		
Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.269	
Re =	3.32	Feet
Slope =	0.004163	$\log_{10}$/sec
$t_{90\%}$ recovery =	240	sec

K =	0.65	Feet/Day
K =	2.29E-04	Cm/Sec

Adjust slope of line to estimate K



Reduced Data

Entry	Time, Hr:Min:Sec	Water Level
1	14:28:30.0	13.00
2	14:28:43.0	13.30
3	14:28:56.0	13.50
4	14:29:09.0	13.65
5	14:29:22.0	13.79
6	14:29:35.0	13.90
7	14:29:48.0	14.00
8	14:30:01.0	14.08
9	14:30:14.0	14.15
10	14:30:27.0	14.22
11	14:30:40.0	14.28
12	14:30:53.0	14.33
13	14:31:06.0	14.37
14	14:31:19.0	14.41
15	14:31:32.0	14.45
16	14:31:45.0	14.48
17	14:31:58.0	14.50
18	14:32:11.0	14.53
19	14:32:24.0	14.55
20	14:32:37.0	14.57
21	14:32:50.0	14.59
22	14:33:03.0	14.61
23	14:33:16.0	14.62
24	14:33:29.0	14.63
25	14:33:42.0	14.64
26	14:33:55.0	14.65
27	14:34:08.0	14.66
28	14:34:21.0	14.67
29	14:34:34.0	14.68
30	14:34:47.0	14.69
31	14:35:00.0	14.69
32	14:35:13.0	14.70
33	14:35:26.0	14.70
34	14:35:39.0	14.71
35	14:35:52.0	14.71
36	14:36:05.0	14.71
37	14:36:18.0	14.72
38	14:36:31.0	14.72
39	14:36:44.0	14.73
40	14:36:57.0	14.73
41	14:37:10.0	14.73
42	14:37:23.0	14.73
43	14:37:36.0	14.73
44	14:37:49.0	14.74
45	14:38:02.0	14.74

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

WELL ID: P-6 (SLUG OUT2 - RAISING HEAD TEST)

Local ID: GTEC - GRAND TOWER, IL
Date: 12/12/2015
Time: 15:05

INPUT

Construction:

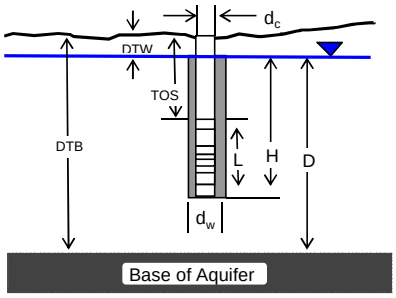
Casing dia. (d_c)	2	Inch
Annulus dia. (d_w)	8.25	Inch
Screen Length (L)	10	Feet

Depths to:

water level (DTW)	9.98	Feet
top of screen (TOS)	17.41	Feet
Base of Aquifer (DTB)	100	Feet

Annular Fill:

across screen -- Medium Sand
above screen -- Bentonite



COMPUTED

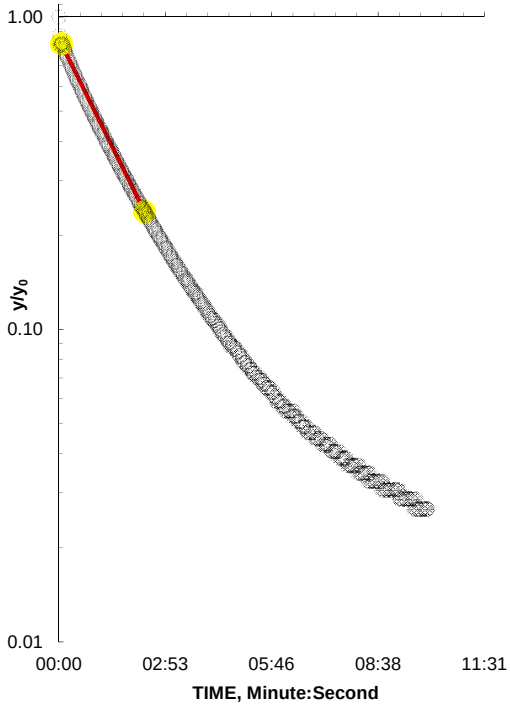
L_{wetted}	10	Feet
D =	90.02	Feet
H =	17.43	Feet
L/r_w =	29.09	
$y_{0\text{-DISPLACEMENT}}$ =	1.99	Feet
$y_{0\text{-SLUG}}$ =	2.20	Feet

From look-up table using L/r_w

Partial penetrate A =	2.480	
B =	0.409	
ln(Re/rw) =	2.269	
Re =	3.32	Feet
Slope =	0.003977	$\log_{10}$/sec
$t_{90\%}$ recovery =	251	sec

K =	0.62	Feet/Day
K =	2.19E-04	Cm/Sec

Adjust slope of line to estimate K



Entry	Reduced Data Time, Hr:Min:Sec	Water Level
1	15:05:26.0	12.80
2	15:05:39.0	13.30
3	15:05:52.0	13.50
4	15:06:05.0	13.65
5	15:06:18.0	13.79
6	15:06:31.0	13.90
7	15:06:44.0	14.00
8	15:06:57.0	14.09
9	15:07:10.0	14.16
10	15:07:23.0	14.23
11	15:07:36.0	14.28
12	15:07:49.0	14.33
13	15:08:02.0	14.38
14	15:08:15.0	14.42
15	15:08:28.0	14.45
16	15:08:41.0	14.48
17	15:08:54.0	14.51
18	15:09:07.0	14.53
19	15:09:20.0	14.55
20	15:09:33.0	14.57
21	15:09:46.0	14.59
22	15:09:59.0	14.61
23	15:10:12.0	14.62
24	15:10:25.0	14.63
25	15:10:38.0	14.64
26	15:10:51.0	14.65
27	15:11:04.0	14.66
28	15:11:17.0	14.67
29	15:11:30.0	14.68
30	15:11:43.0	14.68
31	15:11:56.0	14.69
32	15:12:09.0	14.70
33	15:12:22.0	14.70
34	15:12:35.0	14.71
35	15:12:48.0	14.71
36	15:13:01.0	14.71
37	15:13:14.0	14.72
38	15:13:27.0	14.72
39	15:13:40.0	14.72
40	15:13:53.0	14.73
41	15:14:06.0	14.73
42	15:14:19.0	14.73
43	15:14:32.0	14.73
44	15:14:45.0	14.73
45	15:14:58.0	14.73

REMARKS: Bouwer and Rice analysis of slug test, WRR 1976

Depth of Base of Aquifer is assumed to be 100 feet (DTB).
Instrumentation Northwest Inc.
AquaStar PT12
Aqua4Plus Ver 1.8.6

Appendix 7

Technical Memorandum, Contaminant Fate and Transport Model, January 2019

Technical Memorandum

ROCKLAND CAPITAL

Groundwater Flow / Contaminant Fate and Transport Model Update
Grand Tower Energy Center, LLC

25 July 2019

Project No.: 0297751

The business of sustainability

ERM

Signature page

25 July 2019

Technical Memorandum

Groundwater Flow / Contaminant Fate and Transport Model Update
Grand Tower Energy Center, LLC

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Acronyms and Abbreviations

Name	Description
Ameren	Ameren Energy Generating Company
cm/sec	centimeter per second
CCW	coal combustion waste
[CHB]	Constant head boundaries
COCs	contaminants of concern
Kd	distribution coefficient
F&T	fate and transport
F&T	fate and transport
ft msl	feet above mean sea level
ft bgs	feet below ground surface
GMZ	Groundwater Management Zone
GTEC	Grand Tower Energy Center, LLC
GUI	Graphical User Interface
IEPA	Illinois Environmental Protection Agency
in/yr	inches per year
L/kg	liter per kilogram
MW	Megawatt
MISO	Midcontinent Independent System Operator
NPDES	National Pollutant Discharge Elimination System
NRT	Natural Resource Technology, Inc.
NRMS	normalized root mean squared
RSLs	Regional Screening Levels
Rockland	Rockland Capital
3D	three dimensional
UPW	Upstream-Weighting
WWT	waste water treatment

1. INTRODUCTION AND PURPOSE

Environmental Resources Management, Inc. (ERM) was commissioned by Rockland Capital (hereafter Rockland) to produce a three dimensional (3D) contaminant fate and transport (F&T) numerical groundwater model (Model) to simulate the hydrogeologic conditions and environmental F&T of constituents of concern (COCs) in groundwater related to historical operations of the coal combustion waste (CCW) impoundment (hereafter "Study Area") located on the Grand Tower Energy Center, LLC (GTEC) facility property (Site) in Jackson County, Illinois. The site location is shown on **Figure 1**.

ERM conducted modeling for the March 2019 Application to Establish a Groundwater Management Zone (GMZ), using boron and sulfate as the modeled parameters. In IEPA's June 6, 2019 response letter, IEPA requested that the modeling be expanded to include total dissolved solids (TDS), molybdenum, and lithium. IEPA agreed that TDS would not be necessary, but did request modeling of the other parameters. In addition, IEPA requested that the models be continued until impacts are below the applicable groundwater quality objectives. This memorandum provides the model inputs and modeled results for boron, sulfate, lithium, and molybdenum, to a point where they no longer exceed the applicable standards at the existing monitor wells.

1.1 Site History

GTEC has reportedly produced electricity since 1951 utilizing both coal and oil fired boilers prior to converting to natural gas in 2001. While operating coal fired boilers, GTEC developed a CCW basin for both fly ash and bottom ash residuals. Reportedly, original construction of the basin included an internal divider soil berm to segregate bottom ash and fly ash residuals. The earliest plans reviewed for the basin were prepared by Sargent & Lundy dated 1969. Based on plans dated 1985, the basin was expanded from an original 10-acre footprint to the current footprint of approximately 21-acres.

The CCW basin has not received CCW materials since converting to natural gas in 2001. The basin is permitted to receive low volume facility waste water, which discharges to an unnamed tributary of the Mississippi River under an active National Pollutant Discharge Elimination System (NPDES) permit (NPDES Permit No. IL0000124). The new NPDES permit allows for continued waste water discharge to the ash pond, however, since commissioning of the onsite waste water treatment (WWT) plant in Q2 2017, the low volume facility waste water has been discharged through the new outfall (BO1), such that the CCW basin receives no plant discharges.

In 2009, the GTEC owner at the time, Ameren Energy Generating Company (Ameren), was requested to provide a hydrogeologic assessment report for the CCW basin in order to evaluate groundwater quality data and determine if operation of the impoundment had adversely affected groundwater. Ameren commissioned Natural Resource Technology, Inc. (NRT) to perform the assessment and report findings. The assessment began in 2010 and was completed in March 2013. A complete copy of the Phase 1 Hydrogeologic Assessment for the GTEC CCW surface impoundment is included in Appendix 1 of the March 2019 submittal prepared by ERM entitled "*Application to Establish a Groundwater Management Zone*."

While the assessment was ongoing, GTEC received a Violation Notice from the Illinois Environmental Protection Agency (IEPA) (Violation Notice W-2012-00062 dated June 27, 2012). This violation notice was issued due to reported exceedances of Class I groundwater standards for groundwater samples from four (4) monitoring wells installed during the hydrogeologic assessment. A copy of the Violation Notice is included in Appendix 2 of the March 2019 submittal prepared by ERM entitled "*Application to Establish a Groundwater Management Zone*" for reference.

In response to IEPA comments on the January 2017 GMZ Application, ERM installed additional monitoring wells to further evaluate groundwater quality around and downgradient of the CCW basin. The results of that investigation are summarized in the August 9, 2018 Annual Groundwater Monitoring Report (prepared by ERM for Rockland Capital), and used to update the current understanding of site conditions and modeled response to the proposed closure concept.

Currently, GTEC is a 478 Megawatt (MW) natural gas combined cycle facility that is located in Grand Tower, Illinois adjacent to the east bank of the Mississippi River. GTEC is located on approximately 300 acres of land and is a merchant facility, which sells energy and capacity into the Midcontinent Independent System Operator (MISO) system. The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of Rockland Capital, and was purchased from Ameren in February 2014.

1.2 Model-specific Objectives

The main objective of the Model was to provide additional information in support of the installation of a cap without removal of source material as a viable solution for final CCW basin closure. More specific objectives include:

- Update the preliminary Model to include additional monitoring well data and responses to IEPA's comments;
- Recalibrate the model using more recent (October 2017) water level readings, assuming a quasi-steady state condition;
- Based on the calibrated model, prepare and calibrate a contaminant transport model for boron, sulfate, lithium and molybdenum in a semi-quantitative manner to reproduce main concentration trends. Boron and sulfate are considered key indicator parameters due to their mobility and higher concentrations on site. Lithium and molybdenum were included at the request of IEPA;
- Conduct model simulations to the point where modeled concentrations are below applicable groundwater quality standards; and
- Conduct long term simulations including the transient effects of river stage seasonal changes, to account for resulting changes in groundwater flow directions and rates.

1.3 Document Organization

This document is organized into the following sections:

- Conceptual Site Model Overview: this section provides an overview of the current understanding of how groundwater occurs and moves in the subsurface, including a description of recharge-discharge mechanisms, aquifers and aquitards, aquifer properties and flow directions
- Groundwater Flow Model Construction: this section presents the rationale and steps involved in the construction of the numerical model, such as code selection, definition of model domain, selection of boundary conditions, aquifer properties and calibration procedure and results.
- Contaminant Fate and Transport: this section provides the rationale and steps involved in the addition of constituents to the flow model to predict future groundwater conditions.
- Remediation Scenario Simulation and Results: this section summarizes the outcome of the Fate and Transport modeling.
- Modeling Limitations and Uncertainties: this section discusses the limitations required to produce a working model and the uncertainties that are produced by those limitations.

- Conclusions and Recommendations
- References

2. CONCEPTUAL SITE MODEL OVERVIEW

2.1 Regional Geology

The GTEC facility is located in the Mississippi Valley where Quaternary coarse-grained outwash deposits of the Henry Formation are overlain by channel and floodplain deposits of the Cahokia Formation (Berg and Kempton; 1988; Lineback, 1979). The outwash of the Henry Formation generally consists of sands and gravels, and is a significant aquifer under the site. Historic well logs suggest the Henry Formation ranges in thickness from 150 to 200 feet in the GTEC area. The Cahokia Formation consists primarily of overbank and modern river and stream deposits, and is comprised more commonly of finer-grained silt and clay with occasional sand seams. This unit is the uppermost saturated unit under the site. Wells on the site are screened within the Henry Formation, which appears to be hydraulically connected to the Cahokia Formation.

2.2 Site Hydrogeology

The groundwater monitor well network consists of ten shallow monitor wells (APW-1R through APW-10S) and two deep monitor wells (APW-6D and APW-10D). The shallow wells are screened approximately 50 to 60 feet below ground surface (ft bgs), within the very fine sands of the Henry Formation, which appear to be hydraulically connected to the saturated soils in the Cahokia Formation. The deep monitor wells are screened deeper in the formation in medium to coarse sands. APW-6D is screened from 140 to 150 ft bgs and APW-10D is screened from 86 to 96 ft bgs, on top of bedrock. **Figure 2** shows the site layout and the locations of the monitor wells. Historical groundwater elevations indicate that groundwater flow is primarily to the west to southwest, along and toward the Mississippi River, except during periods of elevated river stage when flow is primarily to the east. Groundwater flow direction is typically from east to west towards the Mississippi River when the river stage is below an elevation of 339 feet above mean sea level (ft msl). **Figure 3** compares the interpolated groundwater flow and river stage during eight monitoring events conducted between September 2017 and February 2018. During high flow periods in the river, when the stage raised above 339 ft msl, the groundwater flow direction appears to reverse and flow primarily from west to east.

2.3 Source of Impacts

The source of impact to groundwater at the site appears to be leached compounds from the ash contained in the CCW basin. Constituents of concern for the preliminary model were boron, iron, manganese, and sulfate. In accordance with the IEPA response to the January 2017 GMZ Application, iron and manganese were removed from the analyte list. Fate and transport of boron and sulfate were included in the updated model, along with lithium and molybdenum per IEPA's request.

2.4 Definition of GMZ and Points of Compliance

The GMZ was originally defined as the property owned by GTEC, which is over 300 acres in size. Based on conversations with the IEPA, the GMZ was redefined to include the areas where COCs are known or suspected to exceed applicable groundwater quality standards. The location of the GMZ is shown on Figures 9 through 30. Within the GMZ, the points of compliance are considered to be the existing wells around the perimeter of the CCW basin.

3. GROUNDWATER FLOW MODEL CONSTRUCTION

3.1 Code Selection

MODFLOW-NWT (Niswonger et. al., 2011), a Newton formulation of MODFLOW-2005 (Harbaugh, 2005) was selected to simulate groundwater flow in the Study Area. MODFLOW-NWT linearization approach uses a continuous function of groundwater head to solve the system of nonlinear equations representing an unconfined aquifer with the Upstream-Weighting (UPW) Package rather than the drying and rewetting discrete method used in other packages provided in MODFLOW-2005 or earlier versions.

MODFLOW-NWT does not set dewatered cells as no-flow, or inactive, so rewetting variables are not necessary. The UPW Package maintains a smooth and continuous function by using the upstream head to calculate the flow between cells so that flow from a dewatered cell is not possible and creating inactive cells is not necessary.

The USGS MODFLOW code and associated packages have been widely used and accepted for simulated groundwater flow. Documentation can be found at https://water.usgs.gov/ogw/modflow.

The Graphical User Interface (GUI) Visual MODFLOW Classic (Waterloo Hydrogeologic version 4.6, 2015) was used for model construction, calibration and output interpretation.

3.2 Model Domain and Grid

The model domain is 8,400 feet by 7,100 feet and encompasses 59,640,000 square feet (ft^2). To minimize numerical dispersion during transport simulations, the model grid is generally aligned with the primary groundwater flow direction across the Study Area (**Figure 4**). The grid is constructed of six layers, 110 rows and 91 columns. The largest model cells are 110 ft x 110 ft with increasing discretization at the Site level to 50 ft x 50 ft. Land surface elevations are from ArcGIS online services. All other layer elevations were determined from borehole lithology, using ordinary kriging to create the surface. A description of the layering is indicated below and illustrated on **Figure 5**.

- Layer One (1) represents the fly ash and bottom ash residuals within the basin;
- Layer Two (2) represents the clay lining in the basin and the shallow unsaturated zone across the remaining area of the model;
- Layer Three (3) represents Cahokia formation;
- Layers Four (4) and Five (5) represent the upper and lower Henry formation; and
- Layer Six (6) represents bedrock. Layer 6 is included to represent the base of the Henry formation.

3.3 Boundary Conditions

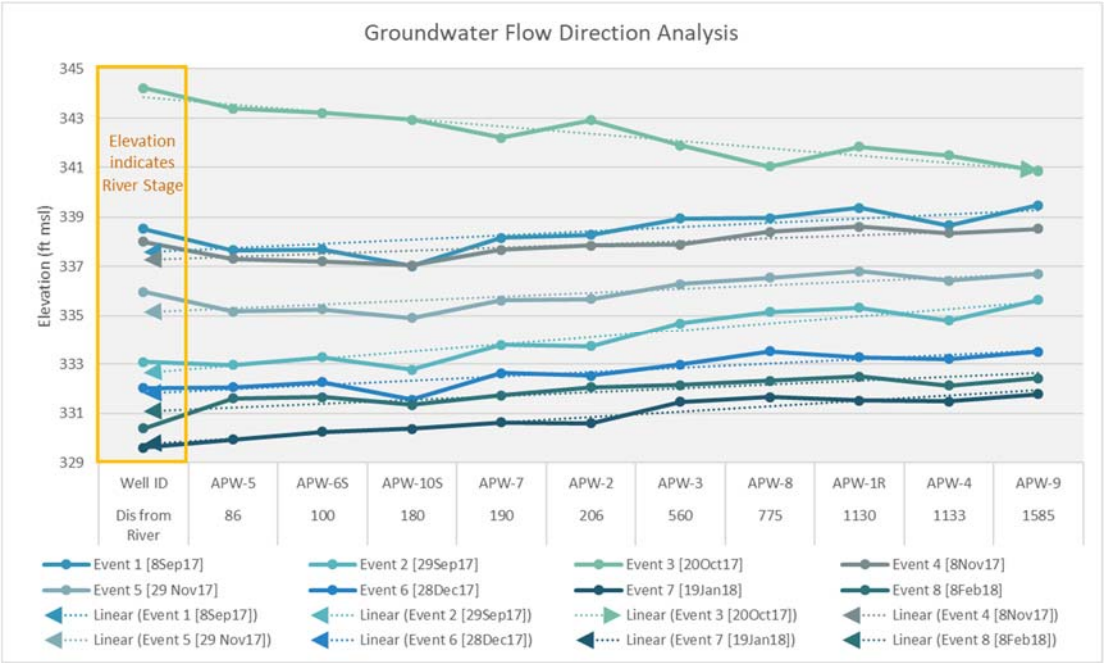
Boundary conditions are an essential component of a groundwater flow model and represent the external hydrology outside the model domain. The boundary conditions establish the external geometry for the model domain and control the inflow and outflow of the model. The solution to the groundwater flow equation, the head at a given point in space and time, must satisfy the equation and the boundary conditions (Franke et al. 1987).

The boundary conditions used to represent the Site are: no-flow (Type II boundary, used to represent groundwater divides or flow lines), constant head (Type I boundary used to represent the Mississippi River and areas of groundwater outflows), and constant flux (Type II boundary used to represent recharge) boundaries. The locations of the boundaries can be seen in **Figure 6**. No-flow boundaries are set as the bottom of layer 6 and the northern and eastern borders along a regional hydraulic divide.

Constant head boundaries [CHB] are set as the domain inflow and outflow on the western and southern boundaries of the model domain, and represent the Mississippi River and the model discharge, respectively. Inactive cells are used outside of these boundaries to remove external areas from the solution. Details of these boundaries are provided below.

Due to the site's proximity to the banks of the Mississippi River and the impact that the river stage has on groundwater flow to the region, an accurate model of fate and transport could not be completed using solely a steady state flow solution. Groundwater flow in the vicinity of the site moves primarily to the east during periods of high river stage and to the west during periods of low river stage. Graphical evidence of this change in directionality is shown below:

Graph 1: Groundwater Flow Direction Analysis



To simulate years of alternating flow, average annual high and low river stage data were simplified to quarterly rising and falling head values to create a transient constant head boundary [CHB] for the river that varied between 325 and 360 ft msl. The potentiometric surface in the wells was correlated to the river stage and a transient model was completed using average seasonal fluctuations based on published river stage data. Interpolated potentiometric surfaces from subsequent gauging events conducted by ERM correlate well to the transient model results.

3.3.1 Model Inflow

The groundwater inflow into the model is represented with a constant head boundary at the western model active domain extent and aerial recharge over the terrestrial domain. A constant head cell is used where the head at the corresponding cell is known and does not change as a result of the flow solution (Harbaugh, 2005). As much water as required may enter or leave the domain through this cell to maintain this specified head. Constant head cells in layer 1 represent the river stage and are a source of water to the Model during mid to high stages. Constant head cells are present in layers 3 and 4 providing inflows to the aquifer and representing upgradient recharge sources. The average river stage during the calibration gauging time period was used to create a potentiometric surface in the aquifer and projected to

the boundary to determine the initial heads used at the boundaries. This head was adjusted during model calibration.

An average annual precipitation of 33.21 inches per year (in/yr) was calculated during the completion of the Hydrogeologic Evaluation of Landfill Performance (HELPv3.07) model during the landfill design engineering phase. For consistency, this value was used for the Model. Taking into account runoff, evapotranspiration and impermeable surfaces, the aerial recharge rate applied over the upland and lowland model domain is 1.8 in/yr (5.4% of the precipitation value) and 1.5 in/yr (4.5%) respectively. The smaller rate for developed land assumes that impervious surfaces of asphalt and buildings reduces recharge rates, although not completely. A recharge rate of 2 in/yr (6%) was applied to the CCW basin area prior to the simulated cap installation. The original simulated cap installation, which assumed a two-foot cover instead of three feet, resulted in a recharge rate of 0.00693 in/yr that was applied to the CCW impoundment area. Per IEPA comments, ERM evaluated the recharge rate using a three-foot cover. The resulting recharge rate reduced the recharge from 0.00693 in/yr to 0.0009 in/yr, but made no impact to the modeled results of COC retraction in response to the cap. The post-cap recharge rate was based on the original 30 year average infiltration data provided by the HELP model, but the revised model is included in Appendix A. ERM utilized the original, more conservative recharge rate in the model calculations since the new HELP recharge rate had minimal impact to the model results.

3.3.2 Model Outflows

Flows out of the model are represented with constant head cells along the southern boundary and the constant head cells representing the river during low stage. The constant head boundary is set in layers four, five, and six to represent groundwater outflow from the model domain. Groundwater levels near the Mississippi River show that during times of peak and flood stage flow, the river is losing to the aquifer and therefore outflow from the model domain was necessary to the south. Outflow heads were determined during model calibration.

3.4 Model Properties

In preparation for the design of the proposed cap to the impoundment area, permeability testing was conducted on the material directly beneath the CCW (CCW Clay Layer). Additionally, piezometers installed by ERM into the uppermost saturated unit beneath the CCW basin (Cahokia Formation) were subjected to aquifer testing to determine the hydraulic conductivity of the aquifer under the site. The hydraulic conductivity of the Henry Formation aquifer was conducted in 2017 following the installation of monitor wells APW-5 through APW-10D.

Table 1: Clay Liner Testing Results

Well ID	Screened Interval (ft bgs)	Location/ Formation	Primary Soil Type	Coefficient of Permeability (k) (cm/sec)	Geometric Mean
A-1	28 – 30.5	CCW Clay Layer	Clay	1.6 E-5	6.3 E-7
A-4	26 – 28.5	CCW Clay Layer	Clay	8.5 E-8	
A-6	23 – 25.5	CCW Clay Layer	Clay	9.3 E-6	
A-10	32 – 34.5	CCW Clay Layer	Clay	1.0 E-6	
A-15	26 – 28.5	CCW Clay Layer	Clay	8.4 E-8	
A-19	25 – 27.5	CCW Clay Layer	Clay	5.9 E-8	

Table 2: Summary of Slug Testing Results

Well ID	Screened Interval (ft bgs)	Location/ Formation	Primary Soil Type	Hydraulic Conductivity (K) (cm/sec)	Geometric Mean
P-1	25 – 35	Cahokia	Silty/Clayey	1.35 E-4	3.00E-4
P-2	25 – 35	Cahokia	Silty/Clayey	8.10 E-3	
P-3	14.5 – 24.5	Cahokia	Silty/Clayey	8.35 E-5	
P-4	15 – 25	Cahokia	Silty/Clayey	8.07 E-5	
P-5	15 – 25	Cahokia	Silty/Clayey	4.49 E-4	
P-6	15 – 25	Cahokia	Silty/Clayey	2.21 E-4	
APW-5	50 – 60	Upper Henry	Fine Sand	7.76 E-3	3.77E-3
APW-6S	50 – 60	Upper Henry	Fine Sand	5.28 E-3	
APW-7	50 – 60	Upper Henry	Fine Sand	1.69 E-3	
APW-8	50 – 60	Upper Henry	Fine Sand	7.82 E-3	
APW-9	50 – 60	Upper Henry	Fine Sand	4.18 E-3	
APW-10S	50 – 60	Upper Henry	Fine Sand	1.26 E-3	
APW-6D	140 – 150	Lower Henry	Sand	1.92 E-2	2.44E-2
APW-10D	86 – 96	Lower Henry	Sand	3.10 E-2	

The Model hydraulic conductivities were originally determined from slug test data and then adjusted during Model calibration. The effective porosity values used are within the representative values provided by Kruseman and de Ritter (2000) for unconsolidated material. The Model hydraulic conductivities and effective porosities are presented in below.

Table 3: Model Hydraulic Conductivity and Effective Porosity

Kx (cm/sec)	Ky (cm/sec)	Kz (cm/sec)	Porosity Effective / Total	Zone	Layers	Formation/Soil Type
4E-5	4E-5	4E-6	0.15 / 0.35	4	1	CCW Ash Residuals
1.85E-6	1.85E-6	1.85E-7	0.1 / 0.55	2	1, 2, 3	CCW Clay Layer Clay
1.3E-4	1.3E-4	1.3E-5	0.12 / 0.35	3	1, 2, 3, 4, 5	Cahokia Silty/Clayey
1.1E-2	6.6E-2	6.6E-3	0.15 / 0.35	5	4, 5	Henry Fine Sand / Sand
2.9 E-4	2.9 E-4	2.9 E-4	0.15 / 0.35	1	6	Bedrock

Model properties were implemented in the model using regional property zones that pertain to the hydrostratigraphic units. Within these zones, properties are kept the same (i.e. piecewise constant zonation). Location and values for these zones are presented in **Figure 7**.

3.5 Model Calibration

Model calibration is the process of adjusting model boundaries and properties within reason to produce a satisfactory match of the model simulation to field observation data (Anderson, 2015). In a steady state model, a satisfactory match is met when summary statistics quantitatively expressing the goodness of fit between the measured water level elevations and the modeled potentiometric surface are minimized. When plotting measured water level elevations against simulated water levels a perfect fit would represent a straight line with a slope of one.

The Model was calibrated to groundwater elevation data collected in October 2017 to get the most complete dataset from wells inside the Model domain. Model parameters were adjusted by hand to increase the goodness of fit until a reasonable model was constructed. Once the Model contained reasonable parameter estimates, the automated parameter estimator PEST (Doherty, 2016) was used to identify hydraulic conductivities and recharge zones that minimize the summary statistics.

3.6 Sensitivity Analysis

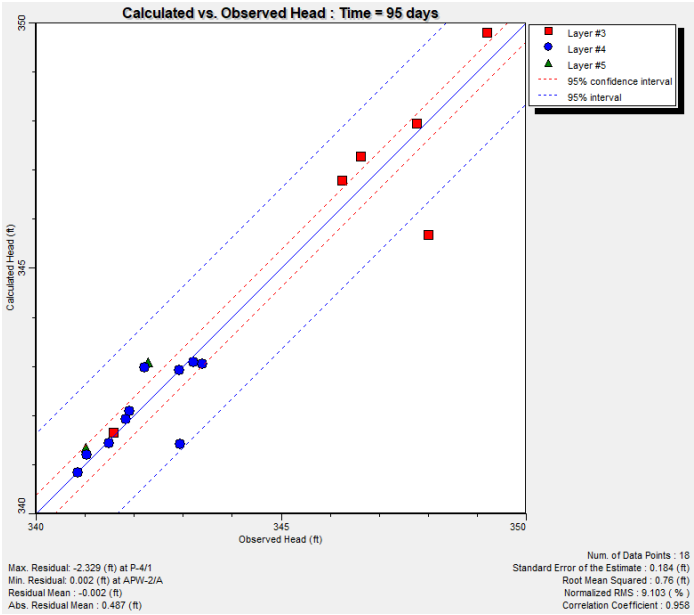
During model calibration, PEST was used to refine the calibration of the model against observed groundwater heads. Composite parameter sensitivities are computed by the PEST algorithm during the variation of individual parameters. The hydraulic conductivity of zone number 2, which is the clay unit explicitly defined to simulate the liner beneath the CCW impoundment, is the most sensitive parameter. This demonstrates the importance of the low permeability layer on the hydraulic head of the groundwater flow system and its incorporation into the Model. The next most sensitive parameter is recharge to the low lying areas of the Model. This suggests the recharge rate applied is correct with the corresponding hydraulic properties of the porous material. The third most sensitive parameter is the vertical hydraulic conductivity in zone number 5. These results indicate that the Model is not as sensitive to the hydraulic conductivity zones of the near surface layers.

3.7 Flow Model Calibration Results

During the first iteration of the Model (submitted with the *Application to Establish a Groundwater Management Zone* on 19 January 2017), calibration was completed as a steady state simulation, using the only potentiometric surface data available at the time. Following the installation of the additional monitor wells in 2017, the model calibration was updated using new data. The first time step of the transient flow model was run in steady state to allow calculation of calibration statistics. Generally speaking, flow direction is very similar to the measured equipotentials for a similar river stage elevation shown in the *Annual Groundwater Monitoring Report* for the Grand Tower Energy Center, LLC (ERM, 2018). A comparison of the transient model flow equipotentials with the closest applicable measured site data is included in **Figure 8**.

Results of the model calibration indicate a good match between calculated and observed groundwater elevations at the existing site monitoring wells. Model basic statistical measures are within the typically industry accepted parameters, including a low mean residual error, and a normalized root mean squared (NRMS) error of 9.103% (the target NRMS is 10% or less for most sites). Model calibration basic statistics are provided below.

Graph 2: Model calculated heads verse observed head and summary statistics



Max Residual: -2.329 (ft) at P-4

Min Residual: 0.002 (ft) at APW-2

Residual Mean: -0.002 (ft)

Abs. Residual Mean: 0.487 (ft)

Num. of Data Points: 18

Standard Error of the Estimate: 0.184 (ft)

Root Mean Squared: 0.76 (ft)

Normalized RMS: 9.103 (%)

Correlation Coefficient: 0.958

Modeled hydraulic conductivity values were compared to published reference values (Freeze and Cherry, 1979; Kalinski and Yerra, 2005) and field collected values for each material type. For each zone, the modeled value was found to be within the appropriate ranges defined by both published and field references.

Graph 3: Analysis of Modeled K values

4. CONTAMINANT FATE AND TRANSPORT

4.1 Objectives and Code Selection of Solution Method

The primary objective of the contaminant fate and transport (F&T) model is to predict how the COCs identified for the site impact groundwater and how they will respond to the installation of the CCW basin cap in support of the creation of a Groundwater Management Zone (GMZ).

The numerical code selected for this project is MT3DMS (Zheng and Wang, 1999) version 5.3 (Zheng, 2010). This model solves the three-dimensional flow and transport of dissolved species using the heads and flow solution of MODFLOW models and is one of the most tested and used finite differences codes in the world.

MT3DMS includes processes such as advection, dispersion, first order decay due to biodegradation or physical processes, and includes a dual domain formulation to account for forward and back diffusion processes from low permeability materials within aquifers. This code uses MODFLOW output velocities to calculate migration and attenuation of impacts.

The solution method selected for this project is upstream finite differences, implicit in time, solved with MT3DMS' Generalized Conjugate Gradient solver with default solution settings. The Model was set to use effective porosity rather than total porosity. Time step 1 was run as steady state for calibration.

Model inputs include boundary conditions, which describe the source location of impacts and mass loading over time, material properties, and the properties of modeled impacts as described in the next sections.

4.2 Parameter Properties

The main transport processes included in the F&T modeling include advection (bulk plume movement due to groundwater flow), dispersion (concentration spreading due to velocity changes in magnitude and direction), and forward/back diffusion processes (driven by concentration gradients). Sorption to organic material is represented by linear isotherms.

Sorption Distribution Coefficient

- Sulfate does not generally sorb to soil so the distribution coefficient (Kd) was assumed to be 0 (1/mg/L).
- Initially, a Kd of 3 (L/kg) or 3E-6 (1/mg/L) was selected for boron, based on the published partition coefficient found in the parameters table included with the EPA Regional Screening Levels (RSLs) table. (Baes, 1984). The behavior of boron in the fate and transport model using a Kd of 3E-6 did not match measured concentrations. Water analyses normally report boron concentrations in terms of elemental B, without attempting to define the actual species that are present. Boron forms an extensive series of complexes and polymeric ions. Hydroxide monomeric species include boric acid, H_3BO_3, which may also be written $B(OH)_3$(aq), and its dissociation products. This means that the uncharged ion predominates up to pH 9.24 and is the most likely form in most natural water. Because the more important boron solute species are anionic or uncharged, they are probably not extensively adsorbed on other mineral surfaces (Hem, 1985, 86, 89). For the purpose of the model, the distribution coefficient for boron was also assumed to be 0 (1/mg/L).
- Initially, a Kd of 300 (L/kg) or 3E-4 (1/mg/L) was selected for lithium, based on the published partition coefficient found in the parameters table included with the EPA RSLs table. (Baes, 1984). The behavior of Lithium in the fate and transport model using a Kd of 3E-4 (1/mg/L) did not match measured concentrations. Data published by the Electric Power Research Institute (Ladwig, 2006) indicate the range of lithium Kd values at Coal Combustion Product sites can range from 0.03 to 0.25 L/kg. Additional geochemical reactions contribute to the mobility of lithium. For the purpose of the model, a distribution coefficient of 0.01 (L/kg) or 1E-8 (1/mg/L) was derived during model calibration for lithium.
- Initially, a Kd of 20 (L/kg) or 2E-5 (1/mg/L) was selected for molybdenum, based on the published partition coefficient found in the parameters table included with the EPA RSLs table. (Baes, 1984). The behavior of Lithium in the fate and transport model using a Kd of 2E-5 (1/mg/L) did not match

measured concentrations. Data published by the Electric Power Research Institute (Ladwig, 2006) indicate the range of molybdenum Kd values at Coal Combustion Product sites can range from 0.6 to 500 L/kg with increased possibility of mobility at pH values greater than 7. pH of groundwater at the site ranges from approximately 6 to 8. Additional geochemical reactions may contribute to increases/decreases in mobility. For the purpose of the model, a distribution coefficient of 0.03 (L/kg) or 3E-8 (1/mg/L) was derived during model calibration for molybdenum.

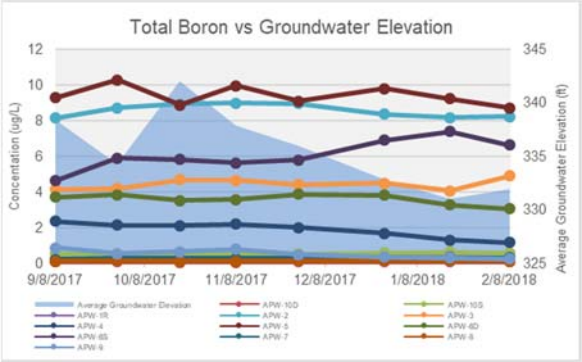
4.3 Source Concentrations

The sources of boron, sulfate, lithium, and molybdenum to the groundwater are represented as a recharge boundary condition [RBC] concentration cells assigned to Layer 1. The recharge concentration boundary condition specifies the concentration of each species accompanying the recharge flux specified in the flow model. If no recharge is applied to the Recharge Concentration cells, then impacts will not be added to the model. Despite minor variations, the concentrations are stable under current conditions. This validates the belief that the recharge to the plume is primarily based on infiltration through Layer 2 rather than groundwater contact. Additionally, cross sections developed during the initial permit application indicate that the bottom elevation of the CCW residuals was measured at approximately 348 ft. The maximum measured water table elevation in the monitor wells during 2017-2018 was 343.39 ft.

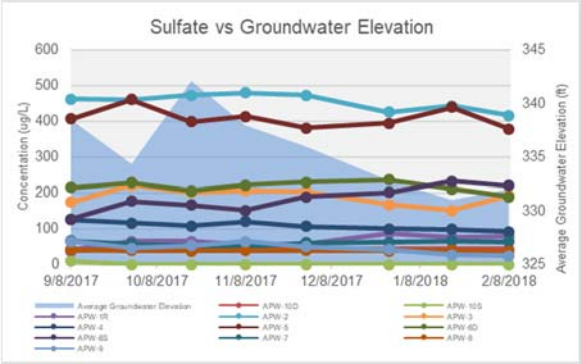
Analysis of the detected concentrations in relation to groundwater elevation is presented below.

Graph 4: Concentrations vs Average Groundwater Elevation

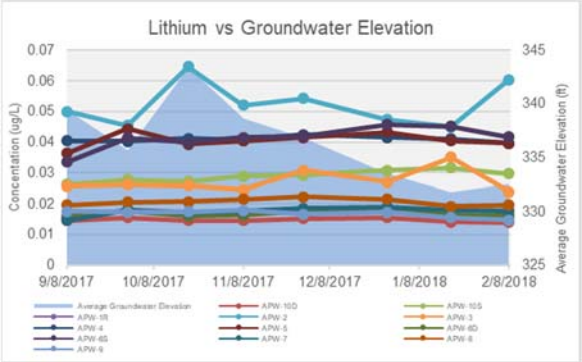
Boron



Sulfate



Lithium



Molybdenum

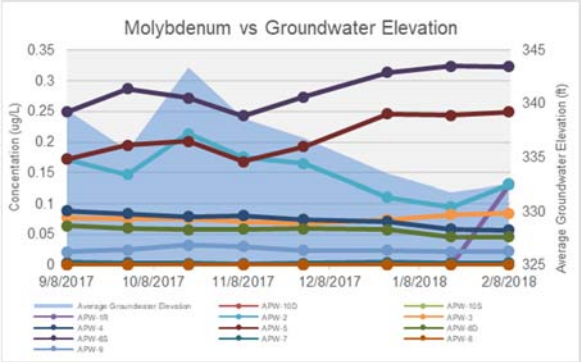


Table 4: Concentrations vs Average Groundwater Elevation Correlation Analysis

COC	Correlation	Locations
Boron	Possible inverse correlation	APW-5
	No strong correlation	APW-1R, APW-2, APW-3, APW-4, APW-6S, APW-6D, APW-7, APW-8, APW-9, APW-10S, APW-10D
Sulfate	Possible inverse correlation	APW-5
	No strong correlation	APW-1R, APW-2, APW-3, APW-4, APW-6S, APW-6D, APW-7, APW-8, APW-9, APW-10S, APW-10D
Lithium	Possible direct correlation	APW-2
	Possible inverse correlation	APW-5, APW-6S
	No strong correlation	APW-1R, APW-3, APW-4, APW-6D, APW-7, APW-8, APW-9, APW-10S, APW-10D
Molybdenum	Possible direct correlation	APW-2
	Possible inverse correlation	APW-5, APW-6S
	No strong correlation	APW-1R, APW-3, APW-4, APW-6D, APW-7, APW-8, APW-9, APW-10S, APW-10D

Recharge concentration values were estimated based on the known groundwater concentrations and adjusted to best match measured concentrations in groundwater.

5. REMEDIATION SCENARIO SIMULATION AND RESULTS

5.1 Landfill Cap Installation

To simulate the completion of the landfill cap over the CCW basin, recharge in the area of the cap was reduced to 0.00693 in/yr in accordance with the expected infiltration through the cap as indicated by the original HELP model, which utilized a two-foot cover layer. The recharge rate for a three-foot cover had no impact on the final results, so the original HELP recharge rate was used in the model simulations.

5.2 Results and Conclusions

The contaminant fate and transport was simulated for 50 years from the installation of the cap within an estimated transient flow field. Source conditions were based on the initial placement of CCW materials beginning in 1951 and ending in 2001 (when the plant was converted to natural gas) using known groundwater concentration values.

Figure 9 (boron / sulfate) and **Figure 10** (lithium / molybdenum) show the modeled current conditions for impact to groundwater in each of the saturated layers of the model. **Figures 11 through 30** illustrate the modeled concentrations of boron, sulfate, lithium and molybdenum at five year intervals for 50 years following the installation of the cap. Concentration over Time charts for the point of compliance wells (perimeter wells) are included in **Appendix B**.

5.2.1 Boron

- Modeled concentrations of boron are illustrated on **Figures 11** through **15** and are graphed in **Appendix B**.

- Currently, concentrations of boron in groundwater exceed the Class I groundwater standard of 2 mg/L in Layers 4 and 5.
- The Model predicts that the horizontal and vertical extents of the boron plume will begin to contract within the first 5 years.
- The Model predicts that boron concentrations in Layer 5 will reduce to below 4 mg/L by Year 10 and to below 2 mg/L between Year 25 and 30.
- The Model predicts boron concentrations greater than 2 mg/L with be contained within the proposed GMZ by Year 30.
- The Model predicts boron concentrations at the point of compliance wells will be less than 2 mg/L by Year 45.

5.2.2 Sulfate

- Modeled concentrations of sulfate are illustrated on **Figures 16** through **20** and are graphed in **Appendix B**.
- Currently, concentrations of sulfate in groundwater exceed the Class I groundwater standard of 400 mg/L in Layer 4.
- The Model predicts that the horizontal and vertical extents of the sulfate plume with begin to contract within the first 5 years.
- The model predicts concentrations of sulfate greater than 400 mg/L in Layer 4 only.
- The Model predicts that the sulfate concentrations at the point of compliance wells will be less than 400 mg/L in Layer 4 by Year 15.

5.2.3 Lithium

- Modeled concentrations of lithium are illustrated on **Figures 21** through **25** and are graphed in **Appendix B**.
- Currently, concentrations of lithium in groundwater exceed the EPA Tapwater screening level of 0.04 mg/L in Layers 4 and 5.
- The Model predicts that lithium concentrations in Layer 5 will be less than 0.04 mg/L by Year 20.
- The Model predicts that lithium concentrations greater than 0.04 mg/L with be contained within the proposed GMZ by Year 25.
- The Model predicts that lithium concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 35.

5.2.4 Molybdenum

- Modeled concentrations of molybdenum are illustrated on **Figures 26** through **30** and are graphed in **Appendix B**.
- Currently, concentrations of molybdenum in groundwater exceed the EPA Tapwater screening level of 0.1 mg/L in Layers 4 and 5.
- The Model predicts that the horizontal and vertical extents of the molybdenum plume with begin to contract within the first 10 years.

- The Model predicts that molybdenum concentrations greater than 0.1 mg/L with be contained within the proposed GMZ by Year 45.
- The Model predicts that molybdenum concentrations in Layer 5 will be less than 0.1 mg/L by Year 45.
- The Model predicts that molybdenum concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 50.

6. MODELING LIMITATIONS AND UNCERTAINTIES

The following are limitations and uncertainties in the Model:

- The Model does not include complex heterogeneities.
- The Model uses conservative source values to estimate a worst case scenario.
- The Model uses estimations and averages to simulate the fluctuations of the Mississippi River. Actual impact of the seasonal variation are likely to vary.
- Complex geochemical reactions are not included in the Model.

7. CONCLUSIONS AND RECOMMENDATIONS

ERM developed a numerical 3D groundwater flow model using site-specific data to evaluate the solute transport of sulfate and boron downgradient of the CCW basin on the GTEC facility property in Grand Tower, Jackson County, Illinois. The steady state Model was calibrated to water table elevation data and the quality of the calibration is considered adequate as per industry accepted goodness-of-fit standards, such as a mean residual near zero and a normalized root mean squared error of 9.1%.

- The model predicts that installation of a cap over the CCW basin will restrict further expansion of the existing groundwater plume.
- The Model predicts that the horizontal and vertical extents of the groundwater plume with begin to contract within the first 5 years and will no longer reach the river boundary by Year 25.
- The Model predicts boron concentrations at the point of compliance wells will be less than 2 mg/L by Year 45.
- The Model predicts that the sulfate concentrations at the point of compliance wells will be less than 400 mg/L in Layer 4 by Year 15.
- The Model predicts that lithium concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 35.
- The Model predicts that molybdenum concentrations at the point of compliance wells will be less than 0.04 mg/L by Year 50.

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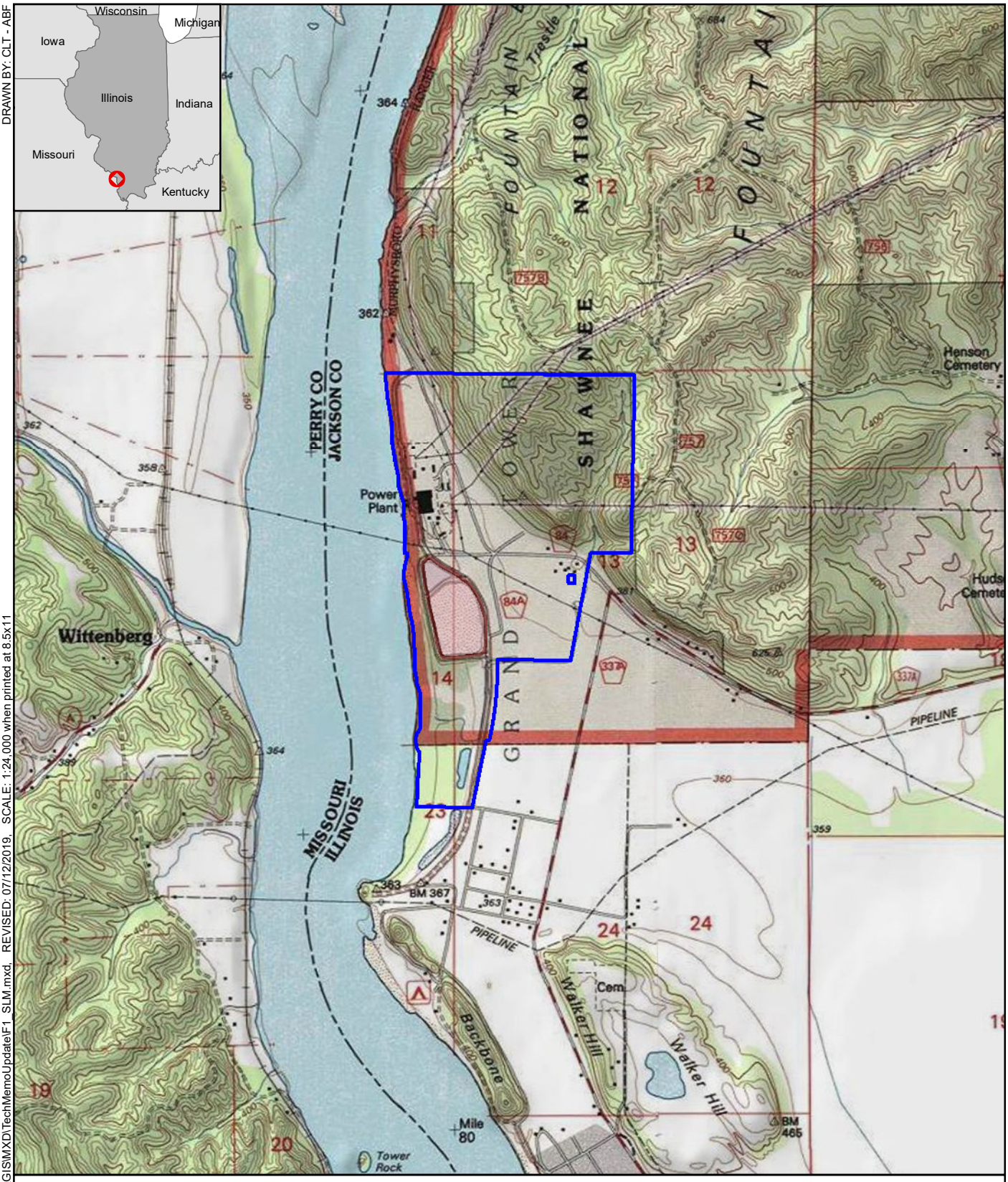

Coal Combustion Waste (CCW) Surface Impoundment

Site

N

0 3,000

Feet

1:24,000 1 inch = 2,000 feet

Environmental Resources Management
www.erm.com

Figure 1
Site Location Map
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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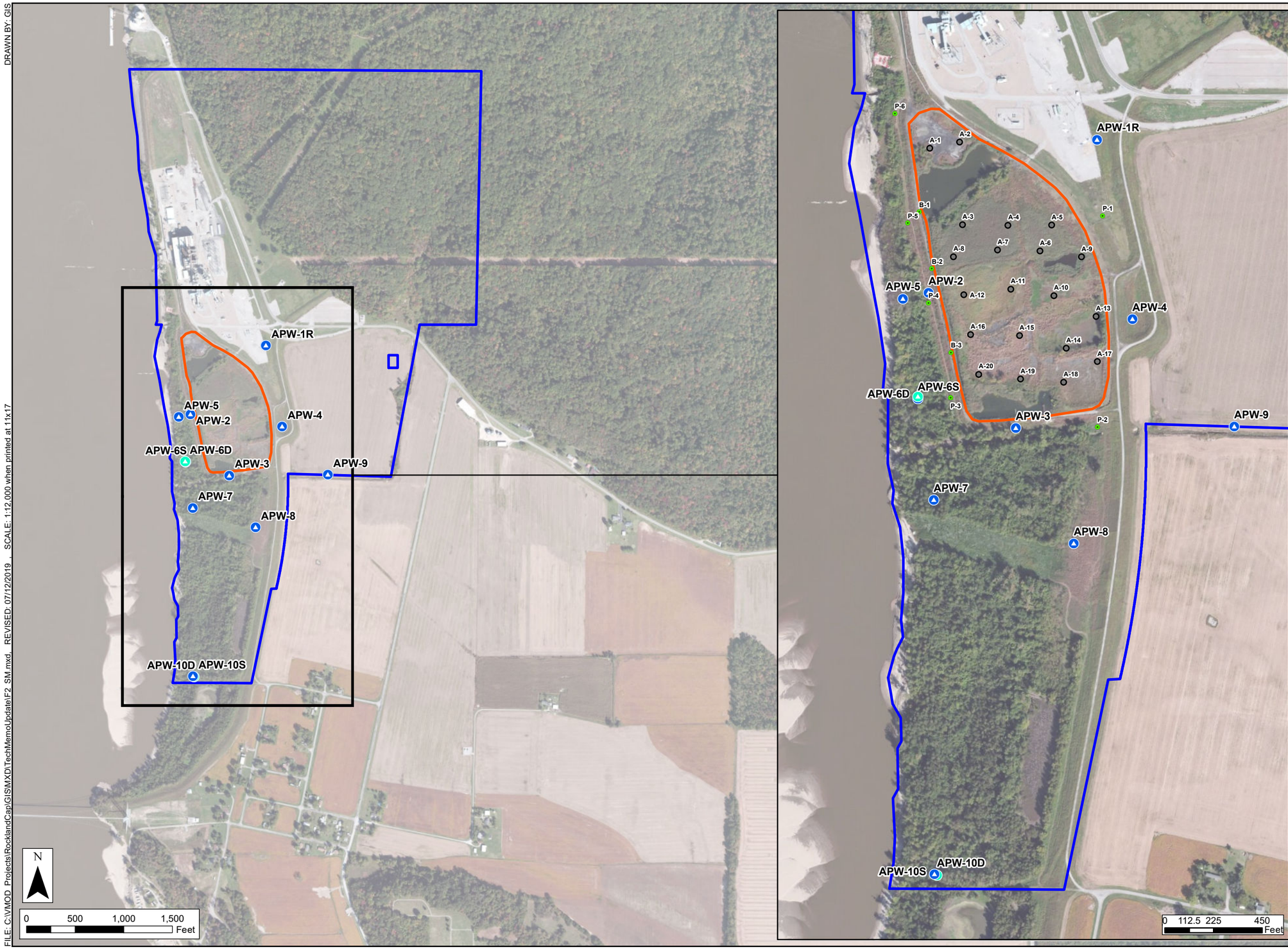

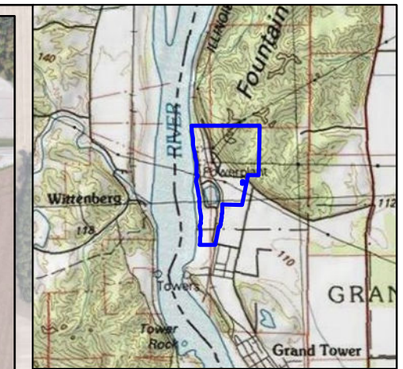

Legend

- Site
- CCW Surface Impoundment
- Boring
- Piezometer
- Shallow Well
- Deep Well

Figure 2
Aerial Map of the Site with Monitoring Well Locations
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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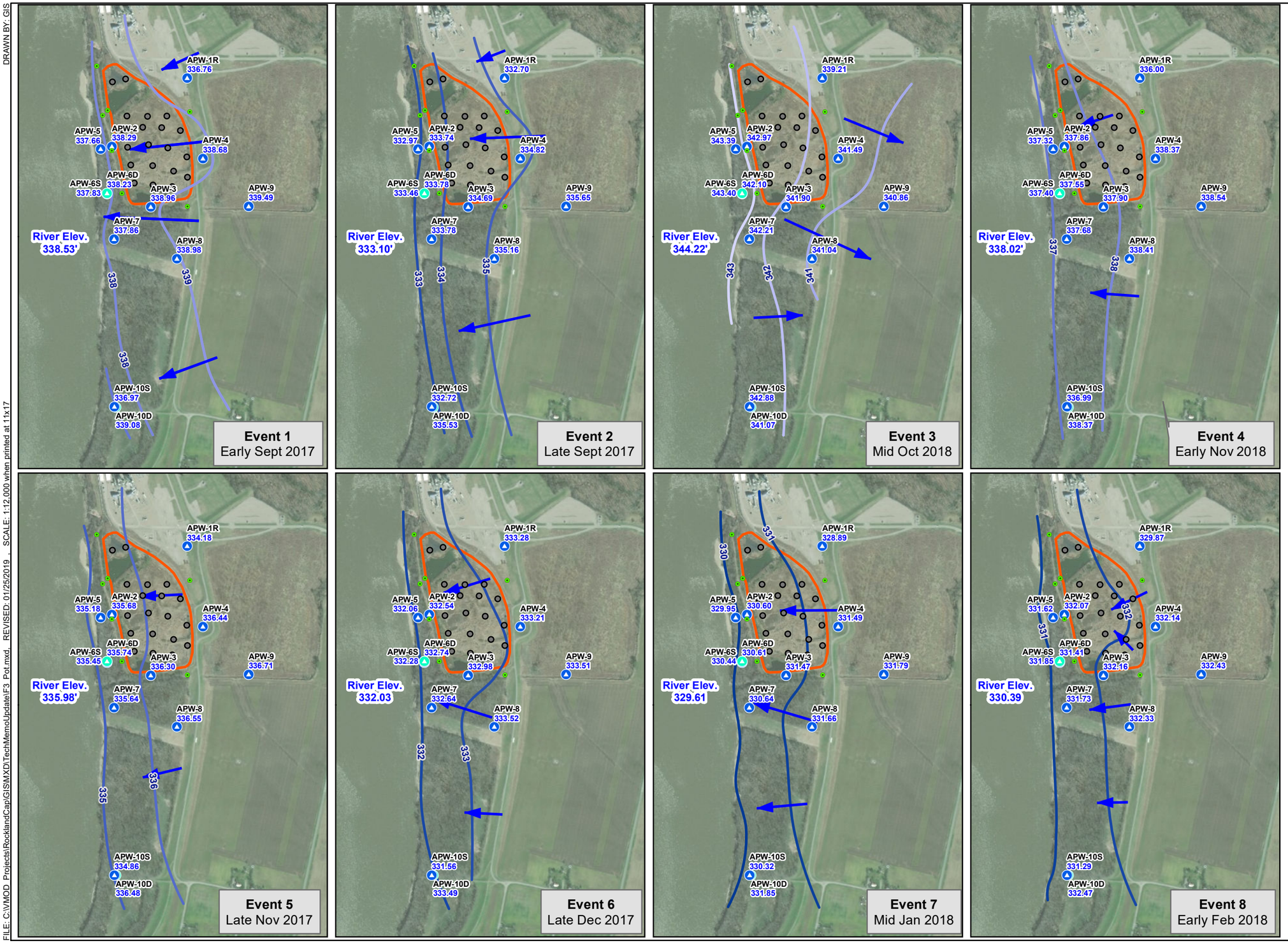

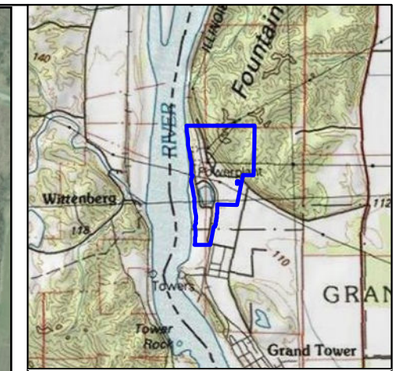

Legend

- CCW Surface Impoundment
- Boring
- Piezometer
- Shallow Well
- Deep Well

Potentiometric Surface Elevation (ft msl)

343 339 336 333 330

Groundwater Flow Direction

(Approximate)

Notes
ft msl = feet above mean sea level

N

0 500 1,000 Feet

Figure 3
Comparison of River Stage & Potentiometric Surface
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F3_Pot.mxd REVISED: 01/25/2019 SCALE: 1:12,000 when printed at 11x17

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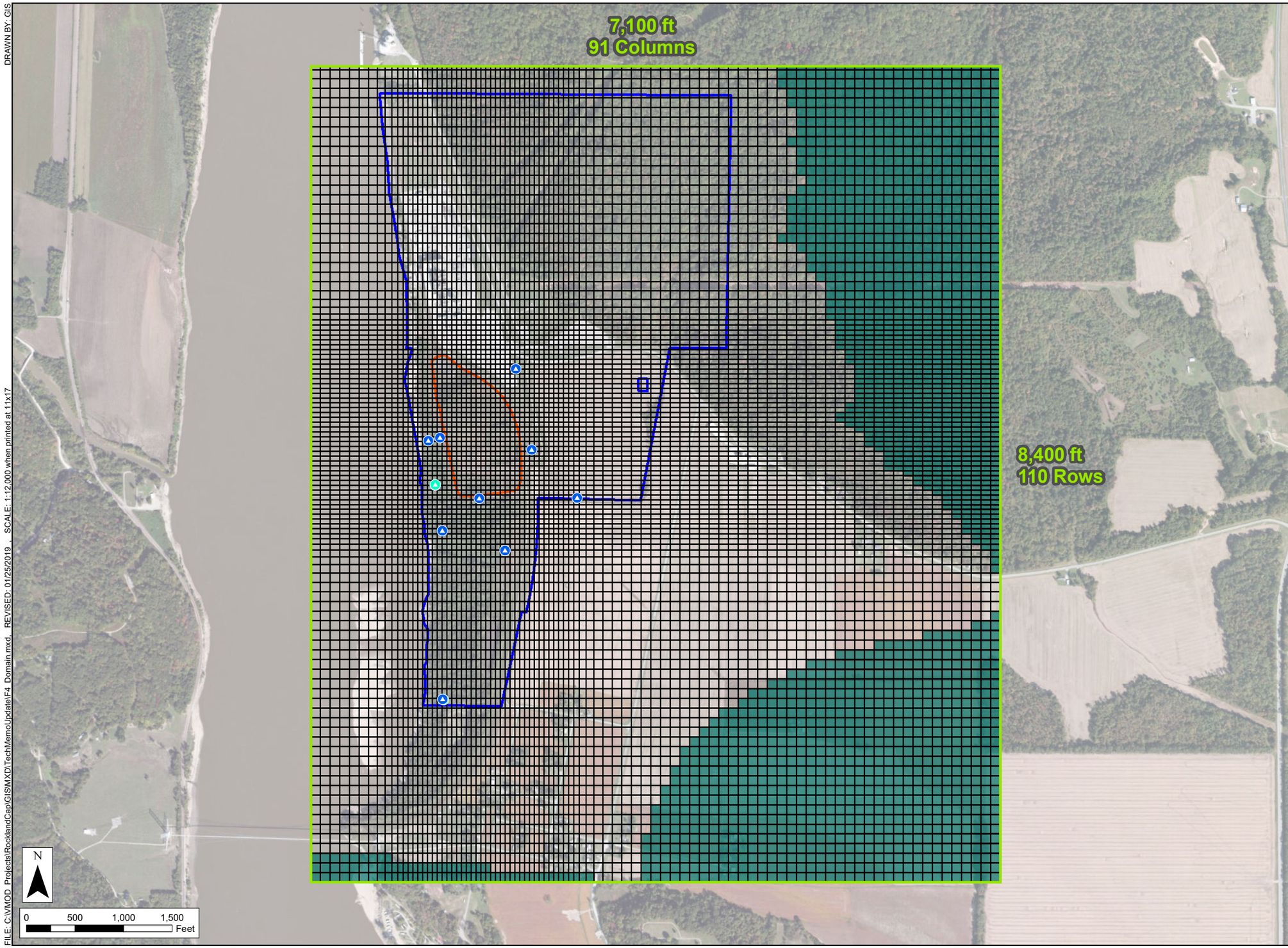

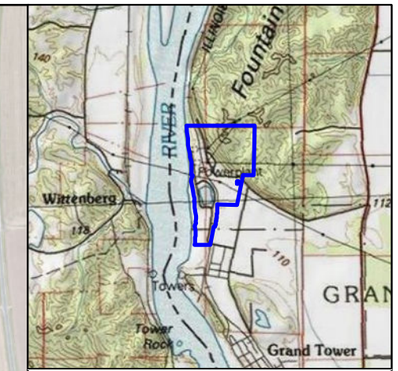

Legend

- Shallow Well
- Deep Well
- Site
- CCW Surface Impoundment
- Model Domain
- Model Grid
- Inactive Zone

Figure 4
Model Domain & Grid
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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SCALE: 1:12,000 when printed at 11x17

FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F4_Domain.mxd, REVISED: 01/25/2019

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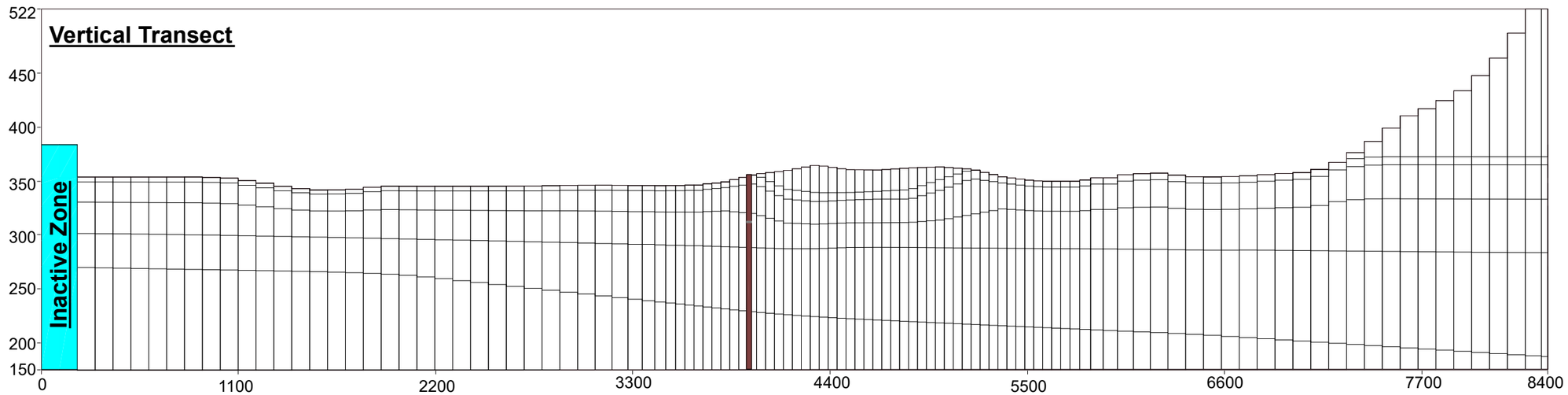

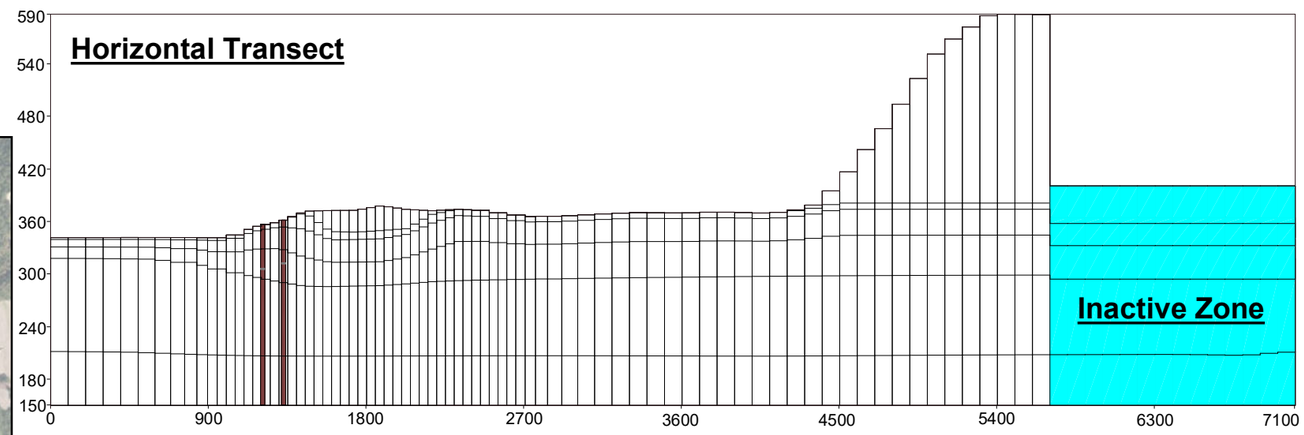

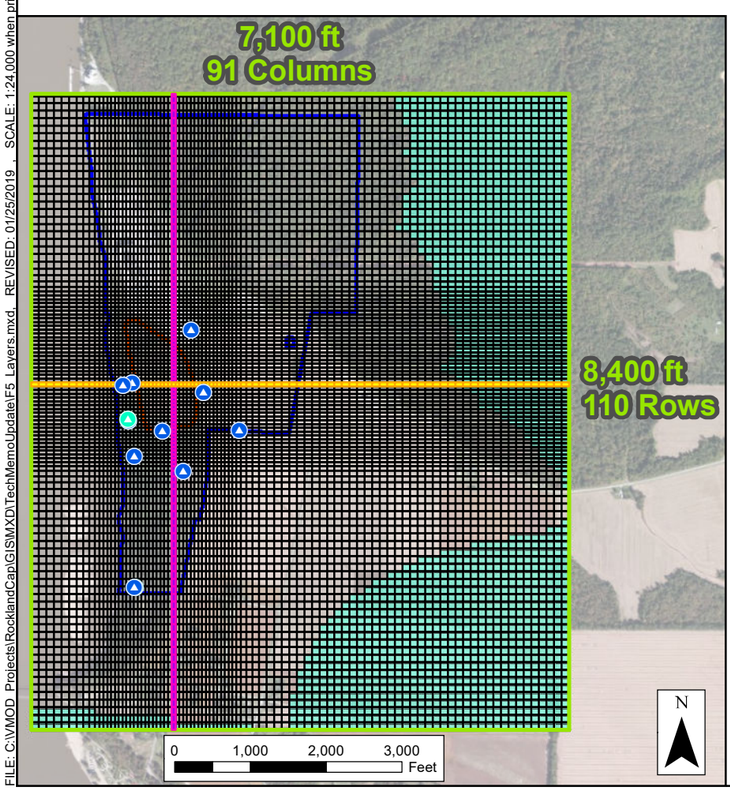

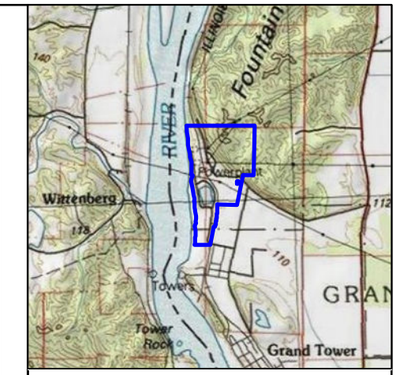

Legend

- Shallow Well
- Deep Well
- Site
- CCW Surface Impoundment
- Horizontal Transect (Row 53)
- Vertical Transect (Column 27)
- Model Domain
- Model Grid
- Inactive Zone

Layer One (1) represents the fly ash and bottom ash residuals within the impoundment;

Layer Two (2) represents the clay lining in the impoundment area and the shallow unsaturated zone across the remaining area of the model;

Layer Three (3) represents Cahokia formation;

Layers Four (4) and Five (5) represent the upper and lower Henry formation; and

Layer Six (6) represents bedrock. Layer 6 is included to represent the base of the Henry formation.

Figure 5
Model Layering
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F5_Layers.mxd, REVISED: 01/25/2019 , SCALE: 1:24,000 when printed at 11x17

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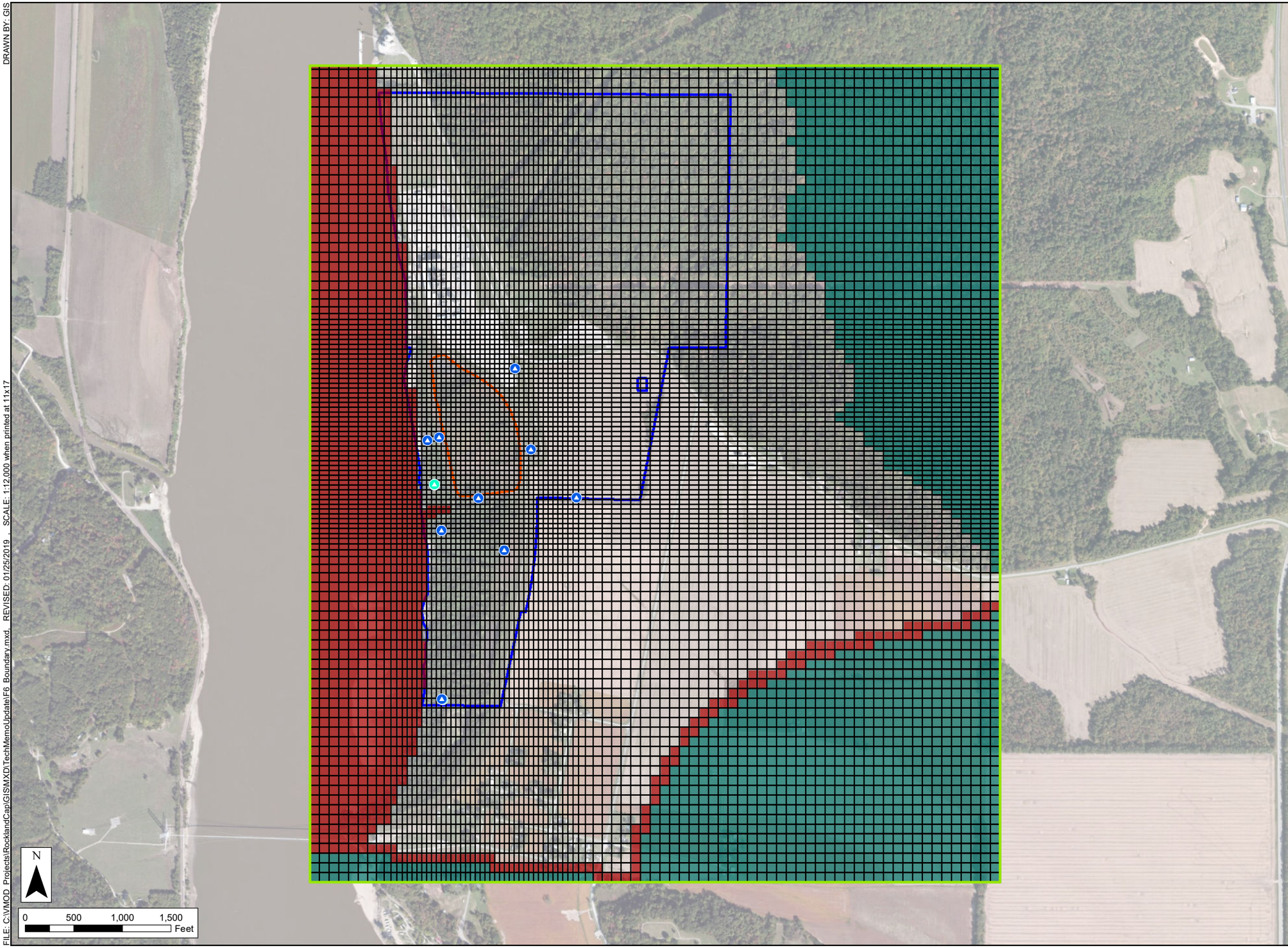

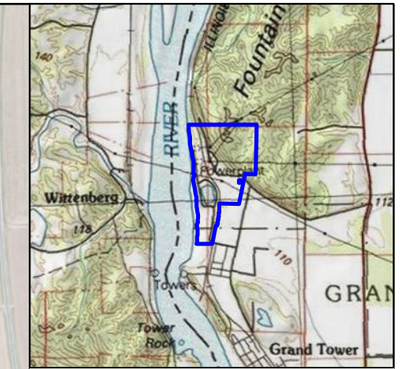

Legend

- Shallow Well
- Deep Well
- Site
- CCW Surface Impoundment
- Model Domain
- Model Grid
- Inactive Zone
- Constant Head Boundary

To simulate years of alternating flow, average annual high and low river stage data were simplified to quarterly rising and falling head values to create a transient constant head boundary [CHB] for the river that varied between 325 and 360 ft msl.

Figure 6
Boundary Conditions
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F6_Boundary.mxd, REVISED: 01/25/2019 , SCALE: 1:12,000 when printed at 11x17

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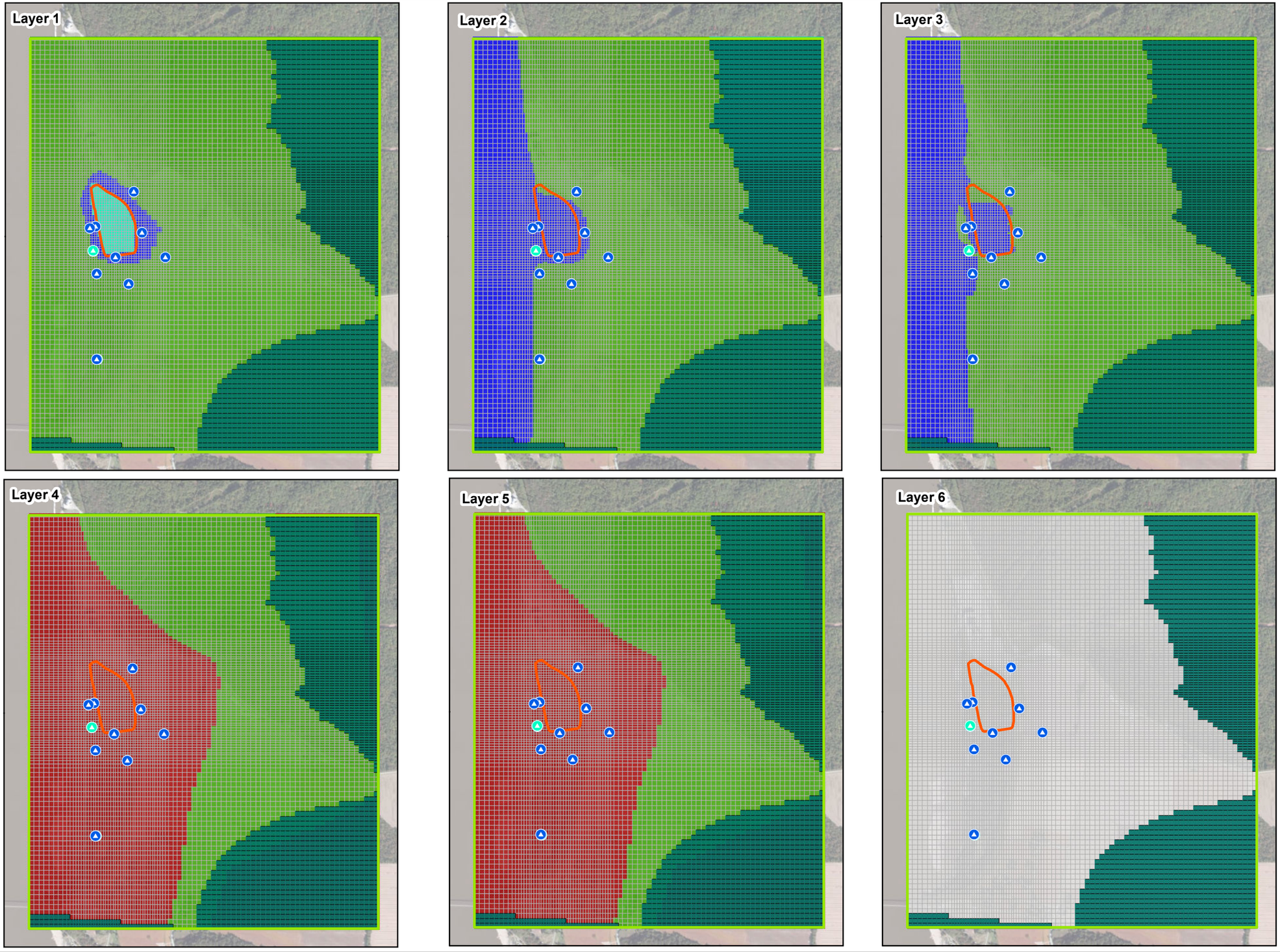

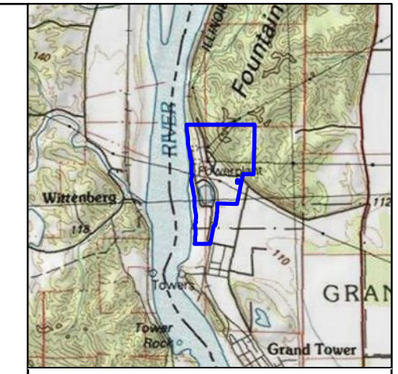

Legend

- Shallow Well
- Deep Well
- CCW Surface Impoundment
- Model Domain
- Model Grid
- Inactive Zone

Hydraulic Conductivity Zones

- Zone 1: Bedrock
- Zone 2: Clay
- Zone 3: Silty/Clayey
- Zone 4: CCW Ash Residuals
- Zone 5: Fine Sand/Sand

See Tech Memo Table 3: Model Hydraulic Conductivity and Effective Porosity for values

N

0 1,000 2,000 3,000 Feet

Figure 7
Model Properties
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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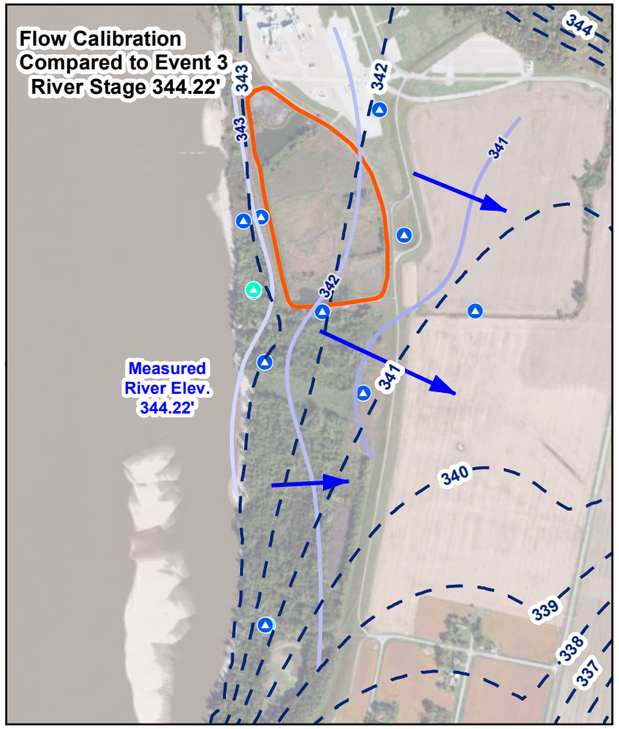
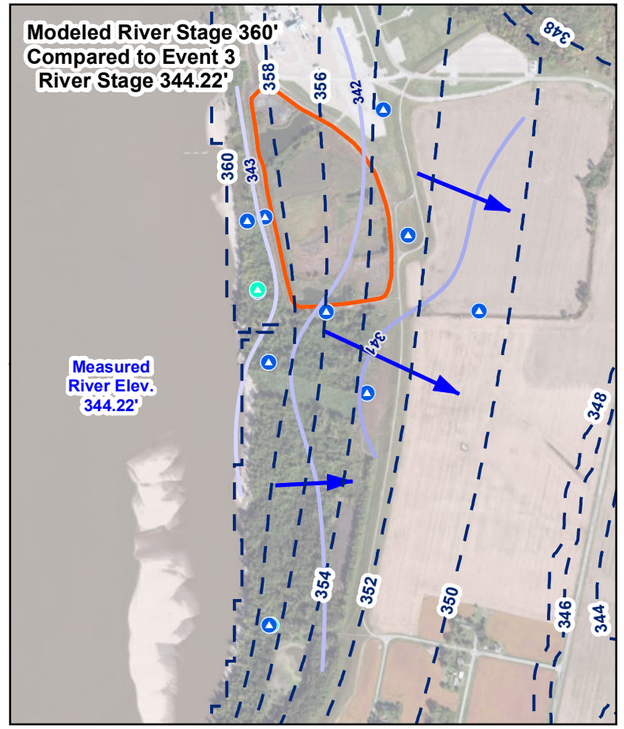
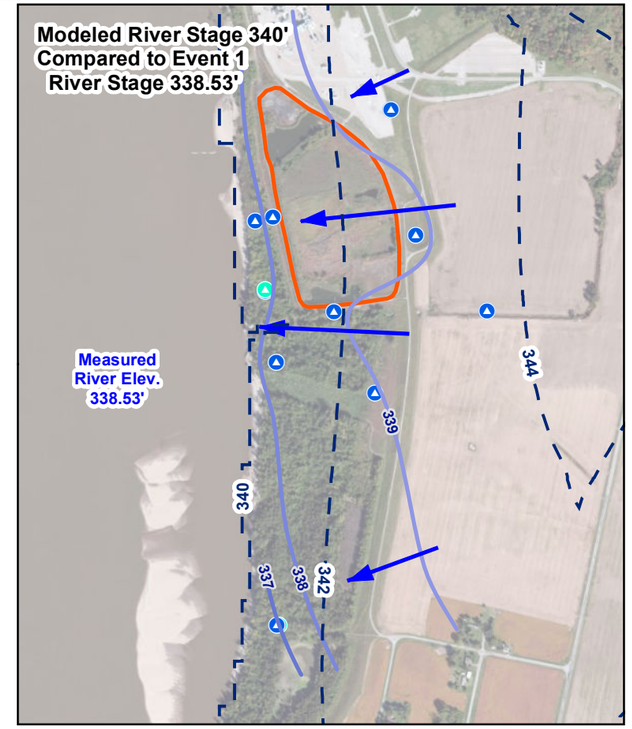
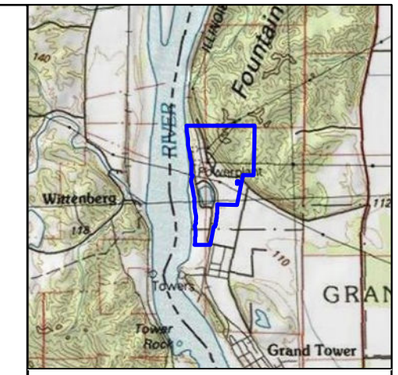








Legend

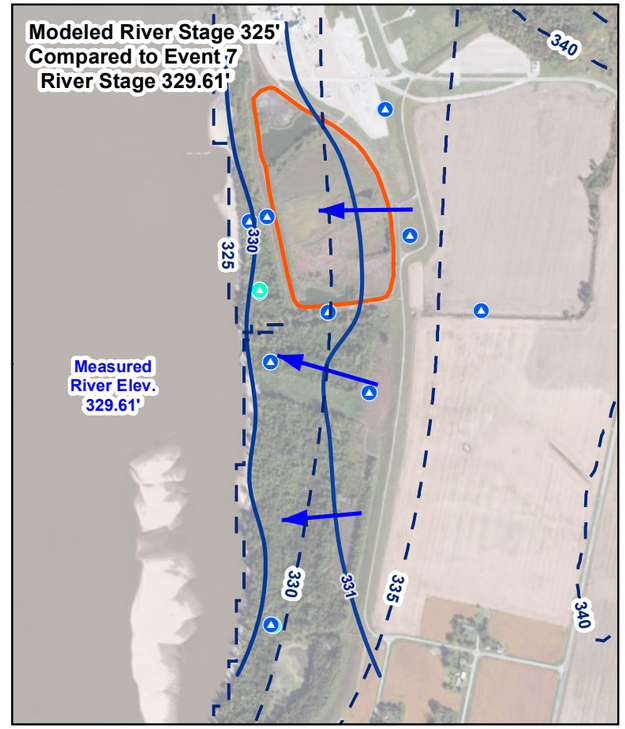
- Shallow Well
- Deep Well
- CCW Surface Impoundment
- Modeled Equipotential Line

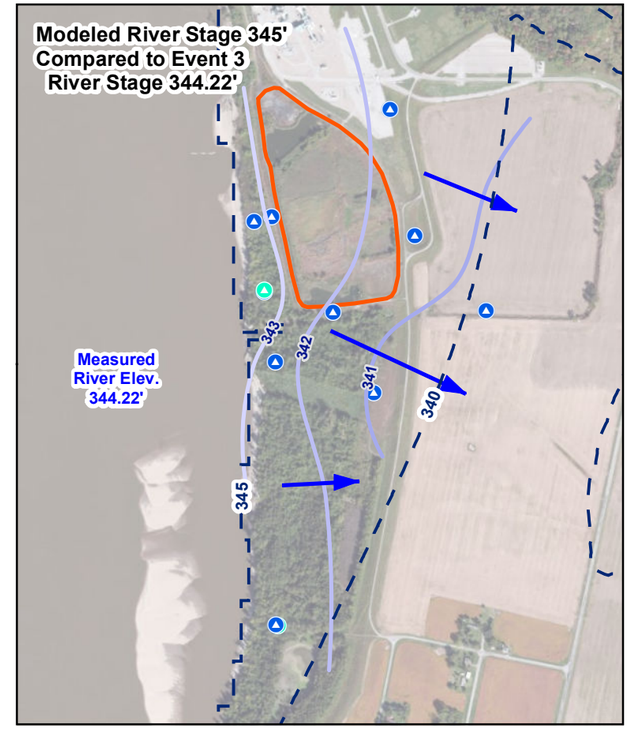
Interpolated Potentiometric Surface (ft msl)

- 343
- 342
- 341
- 339
- 338
- 337
- 336
- 335
- 334
- 333
- 332
- 331
- 330

Flow Direction

- Approximate Groundwater Flow





N

0 500 1,000 1,500 Feet

Figure 8
Comparison of Modeled & Measured Groundwater Equipotentials
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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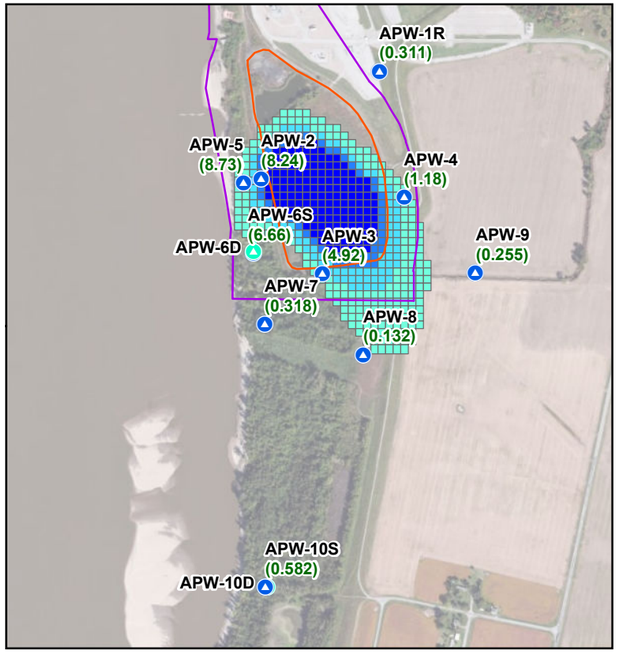
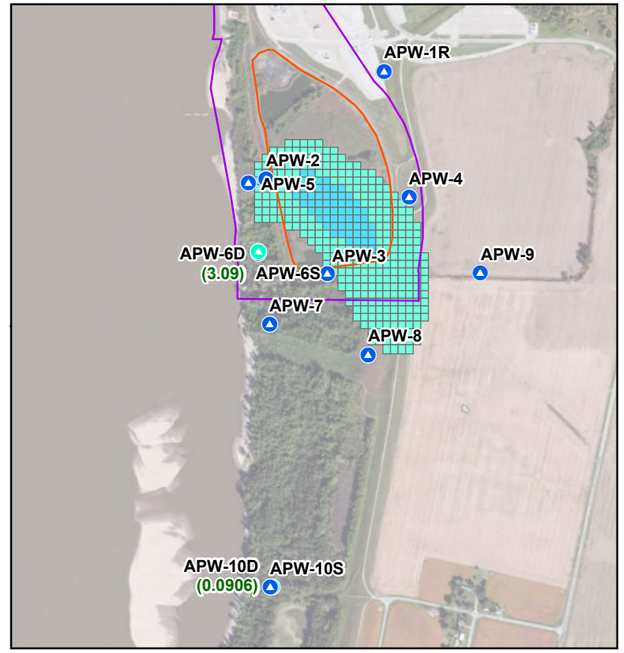
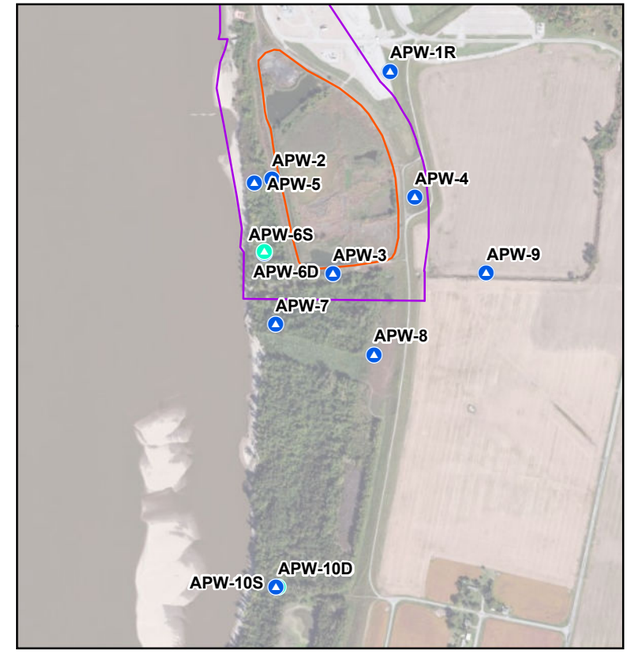
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Concentrations (8 Feb 2018) and Modeled Results



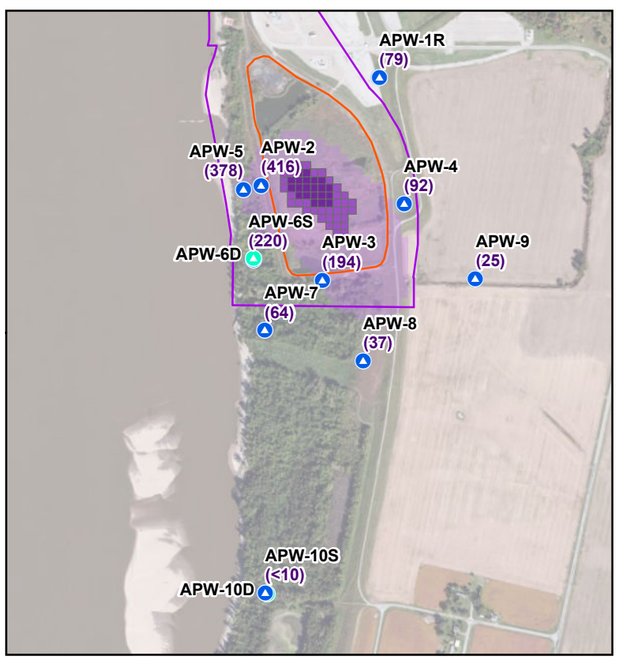
LAYER 5 (Lower Henry Formation)
Boron Concentrations (8 Feb 2018) and Modeled Results



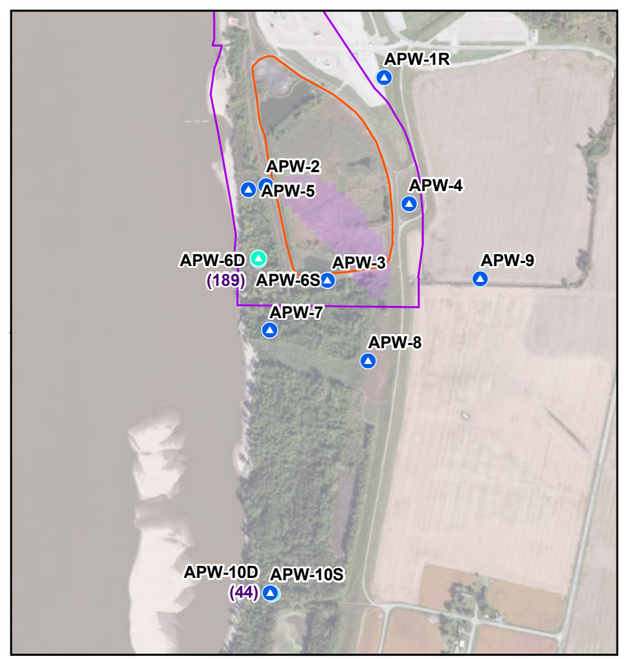
LAYER 6 (Bedrock)
Boron Concentrations (8 Feb 2018) and Modeled Results



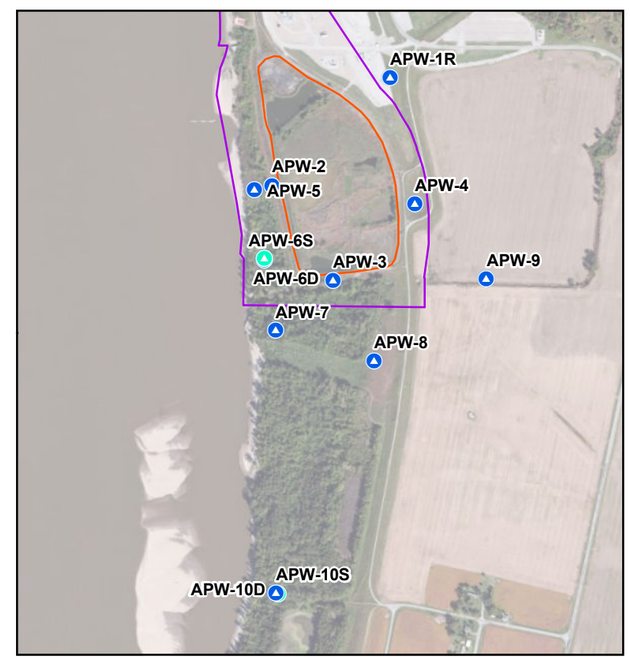
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Concentrations (8 Feb 2018) and Modeled Results

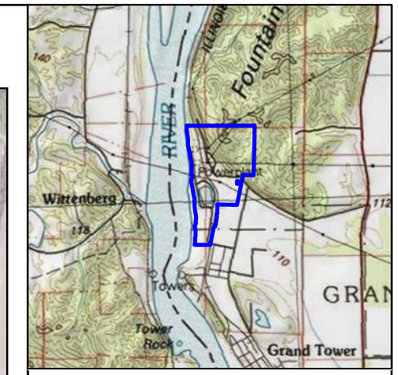


LAYER 5 (Lower Henry Formation)
Sulfate Concentrations (8 Feb 2018) and Modeled Results



LAYER 6 (Bedrock)
Sulfate Concentrations (8 Feb 2018) and Modeled Results





Legend

- Shallow Well
- Deep Well
- Proposed Location of GMZ
- Inactive Ash

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- > 8 mg/L

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

(8.73) = Boron concentration (8 Feb 2018)
(418) = Sulfate concentration (8 Feb 2018)
All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 9
Current Concentrations & Pre-Cap Model Results

Grand Tower Energy Center
Grand Tower
Jackson County, Illinois

Environmental Resources Management
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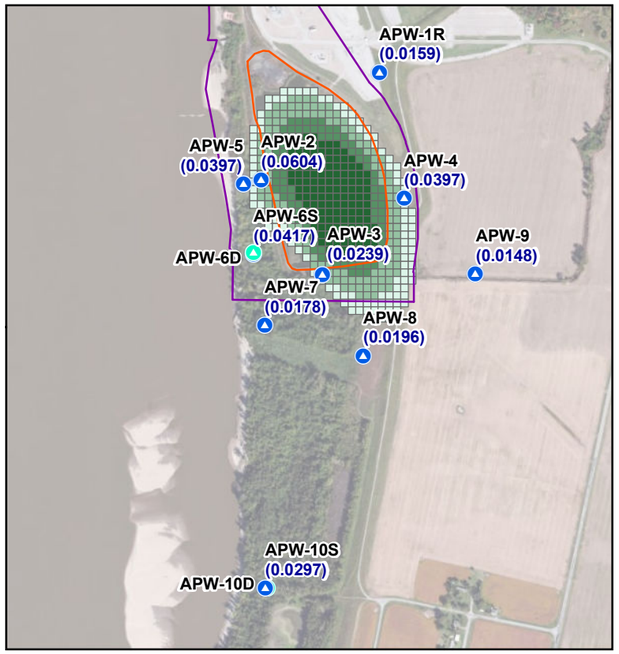
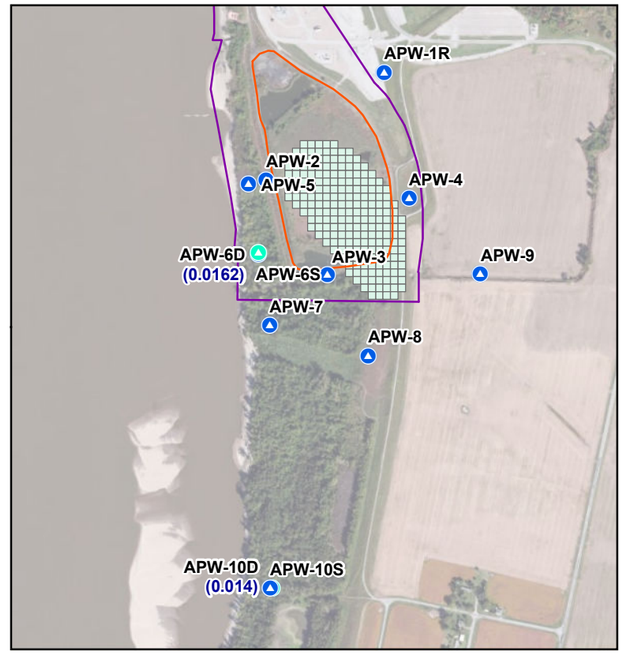
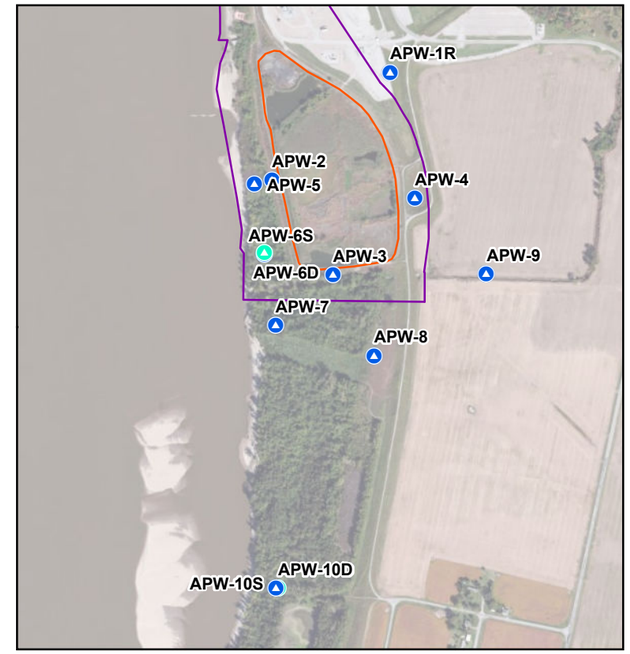
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Concentrations (8 Feb 2018) and Modeled Results



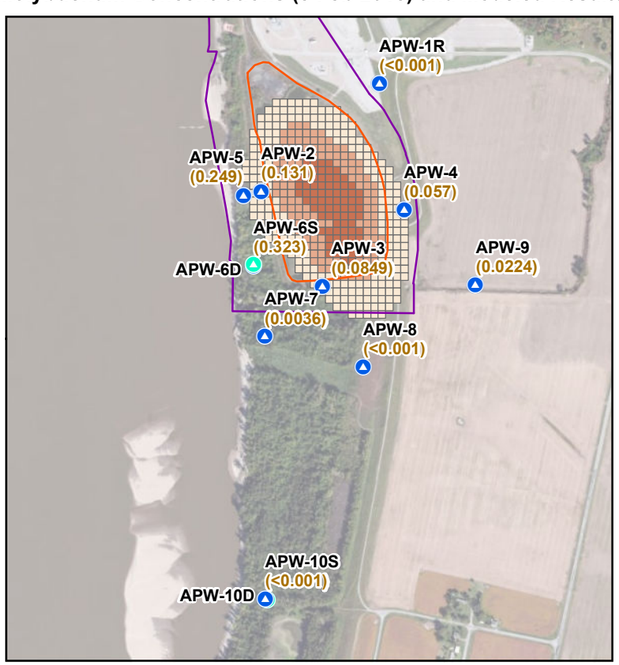
LAYER 5 (Lower Henry Formation)
Lithium Concentrations (8 Feb 2018) and Modeled Results



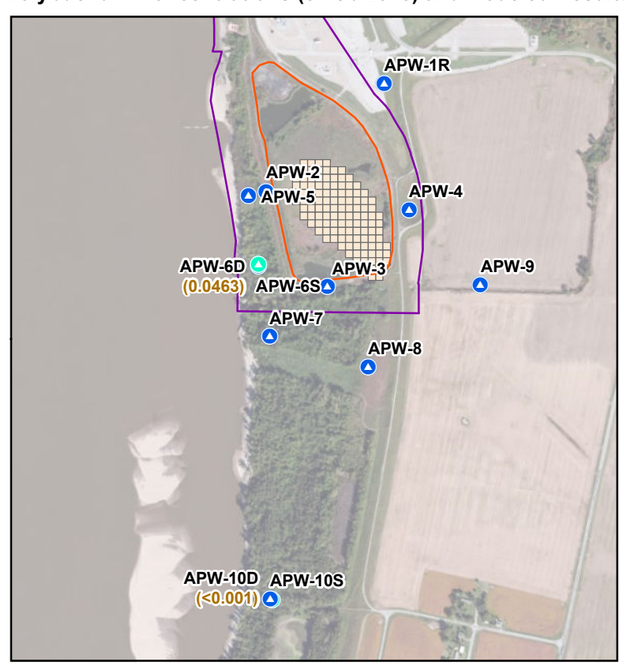
LAYER 6 (Bedrock)
Lithium Concentrations (8 Feb 2018) and Modeled Results



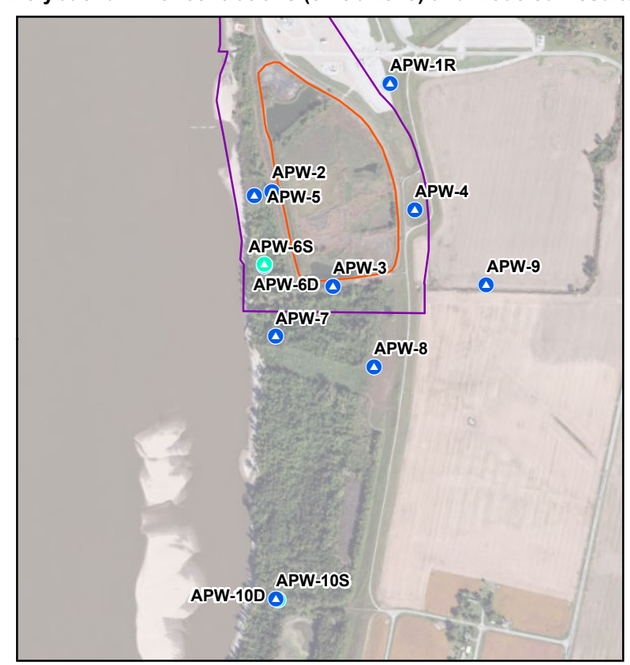
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Concentrations (8 Feb 2018) and Modeled Results

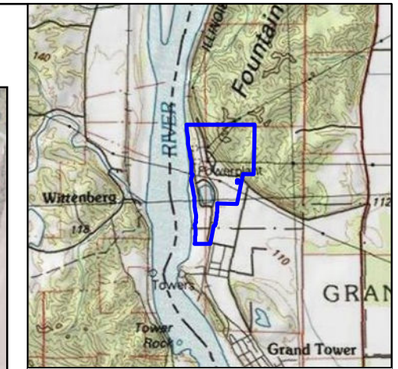


LAYER 5 (Lower Henry Formation)
Molybdenum Concentrations (8 Feb 2018) and Modeled Results



LAYER 6 (Bedrock)
Molybdenum Concentrations (8 Feb 2018) and Modeled Results





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

(0.0604) = Lithium concentration (8 Feb 2018)
(0.323) = Molybdenum concentration (8 Feb 18)
All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 10
Current Concentrations & Pre-Cap Model Results

Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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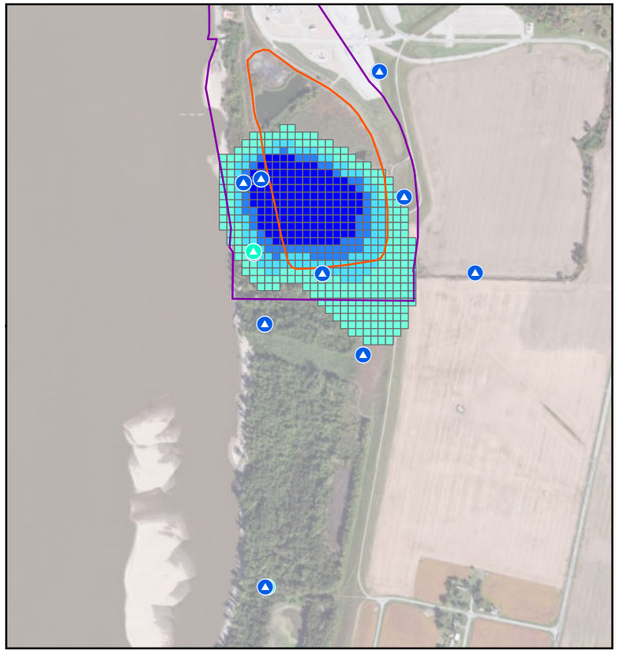
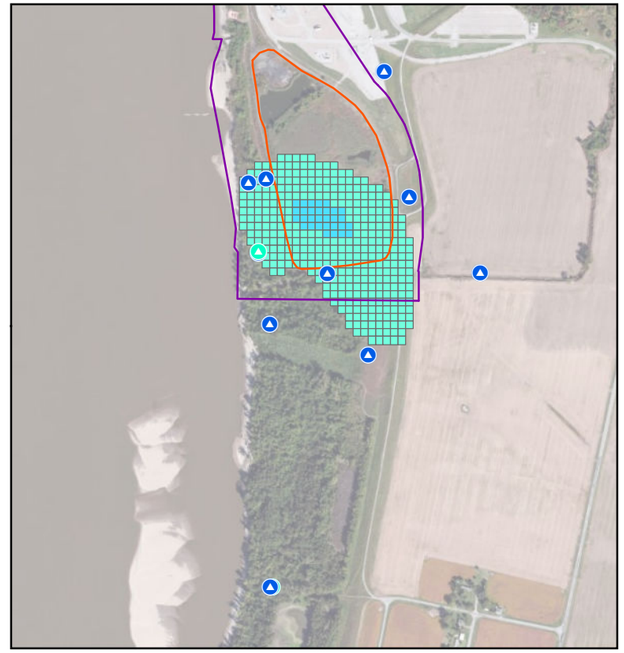
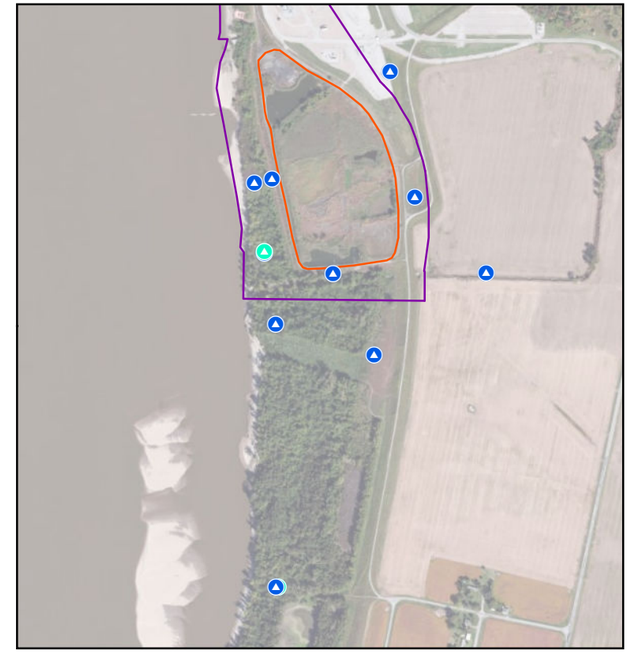
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 5



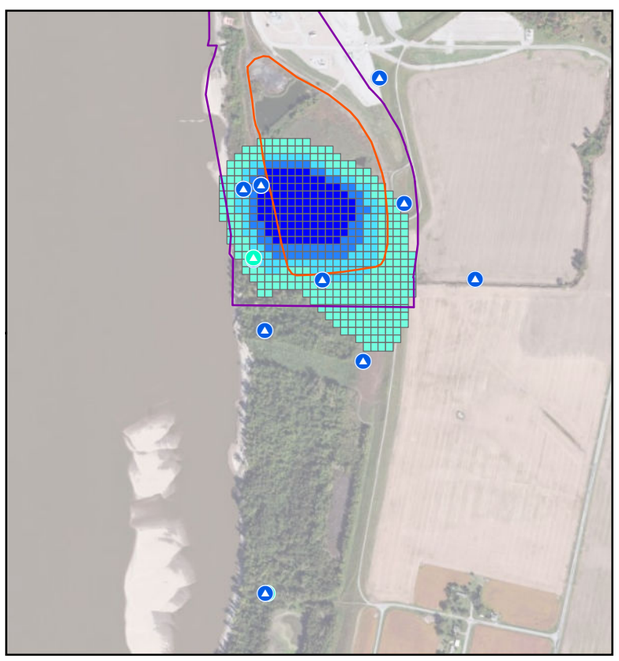
LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 5



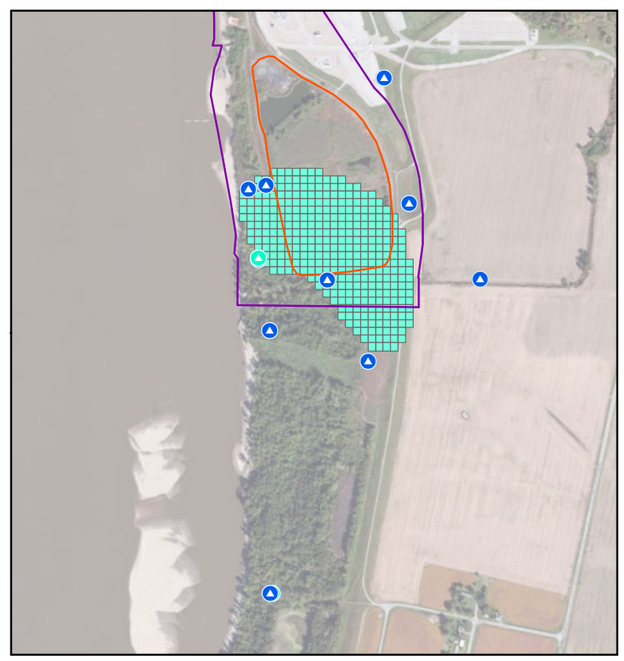
LAYER 6 (Bedrock)
Boron Modeled Results - Year 5



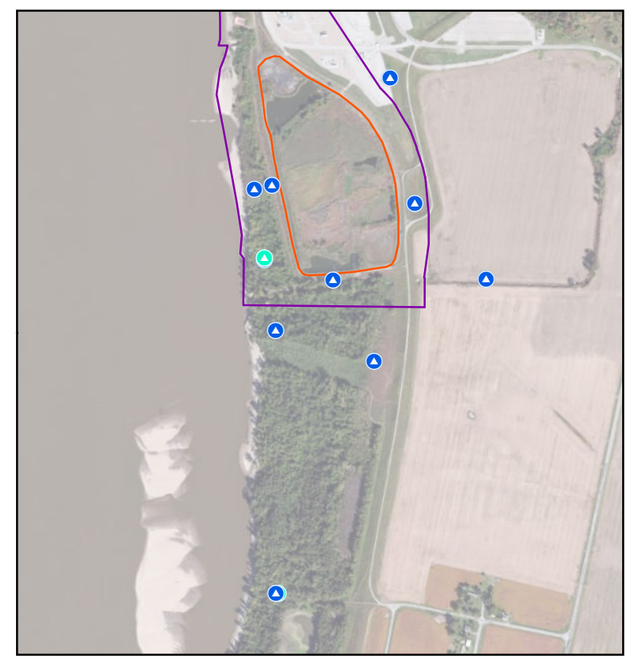
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 10

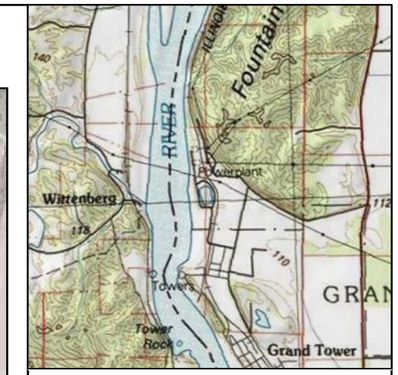


LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 10



LAYER 6 (Bedrock)
Boron Modeled Results - Year 10





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- >8 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 11
Boron Model Results 5 & 10 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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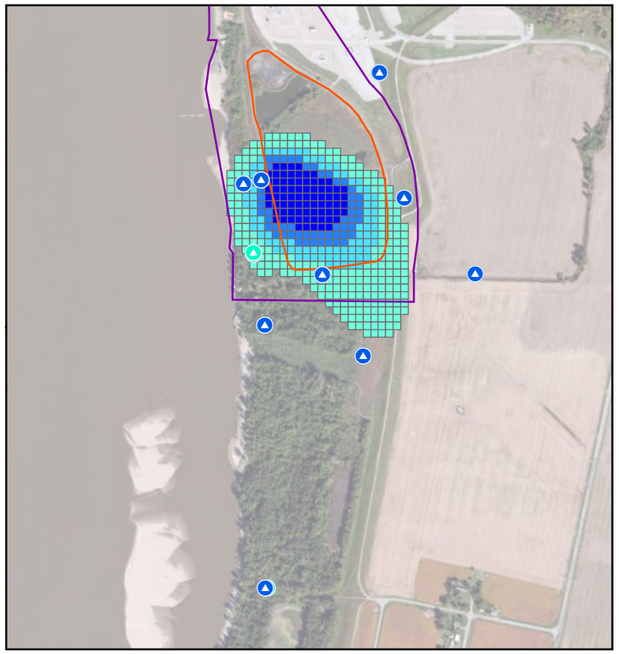
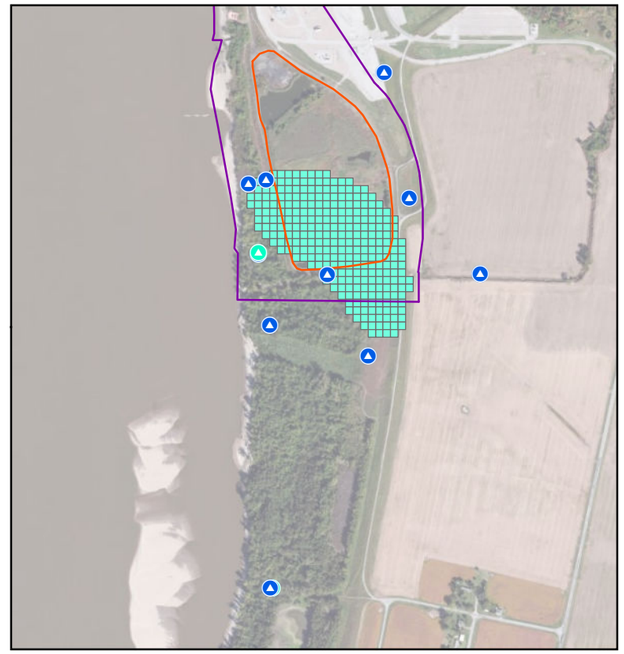
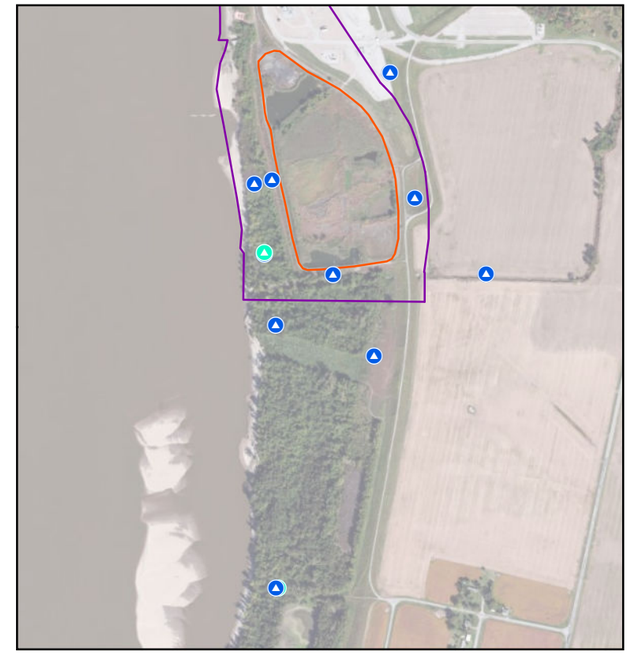
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 15



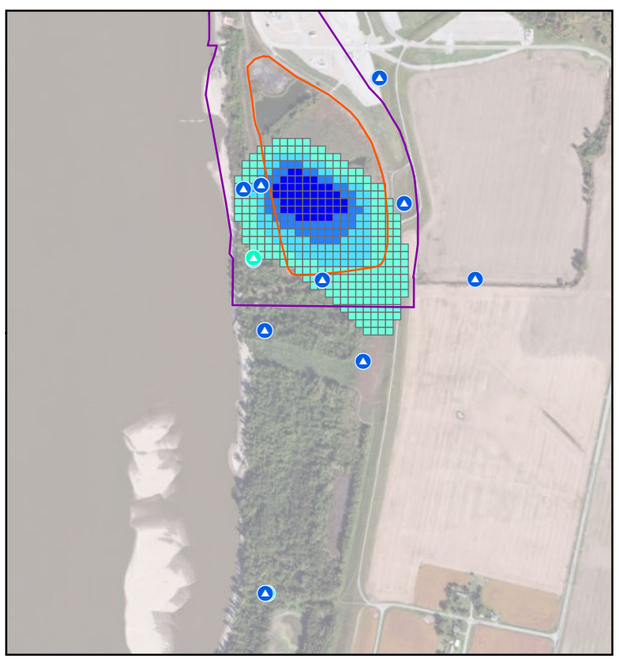
LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 15



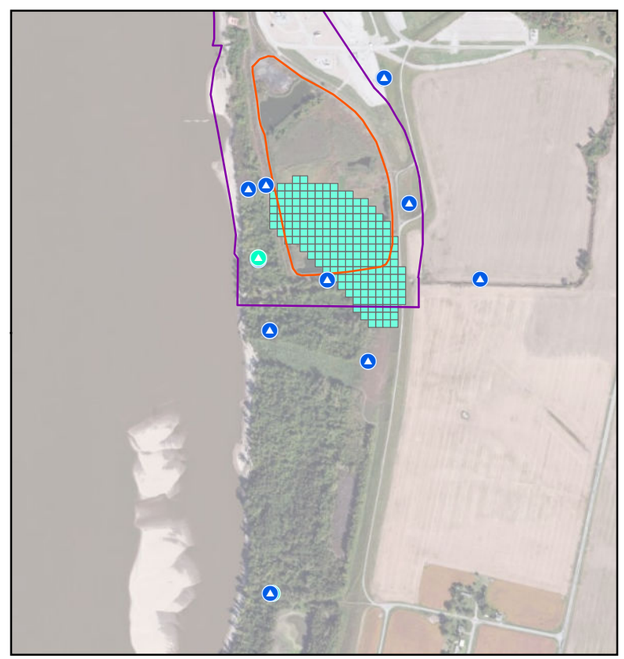
LAYER 6 (Bedrock)
Boron Modeled Results - Year 15



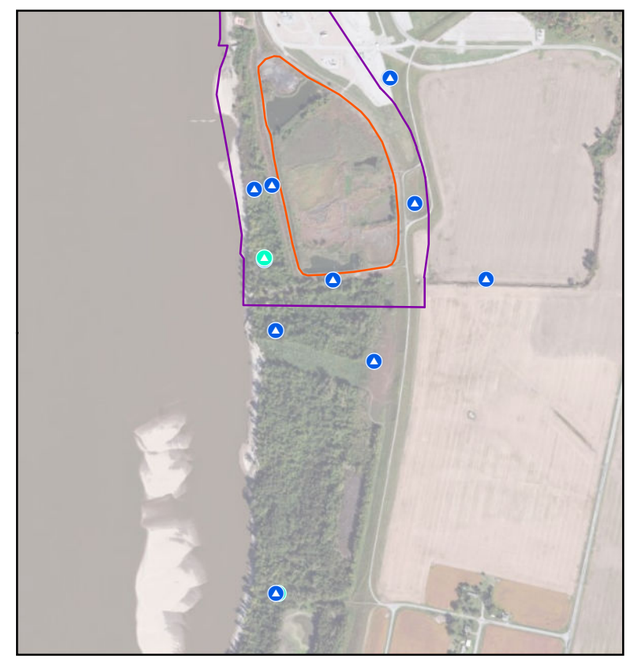
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 20

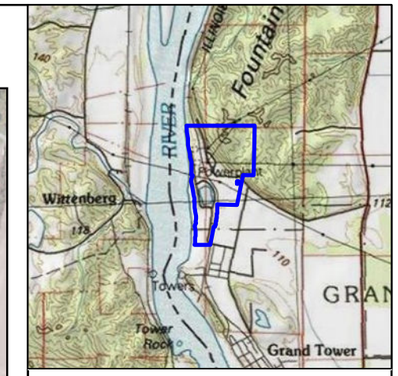


LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 20



LAYER 6 (Bedrock)
Boron Modeled Results - Year 20





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- >8 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 12
Boron Model Results 15 & 20 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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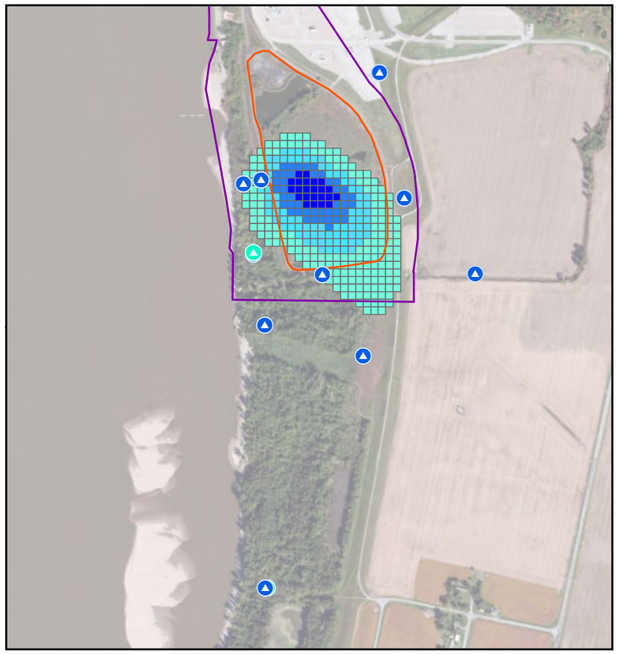
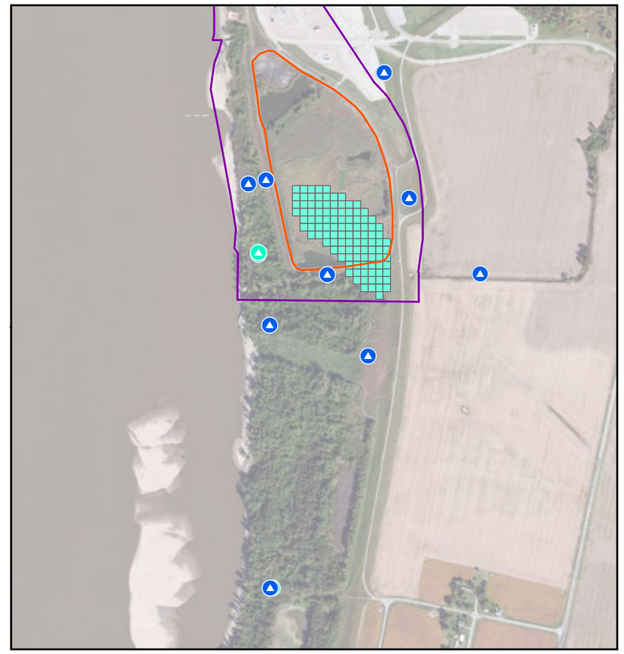
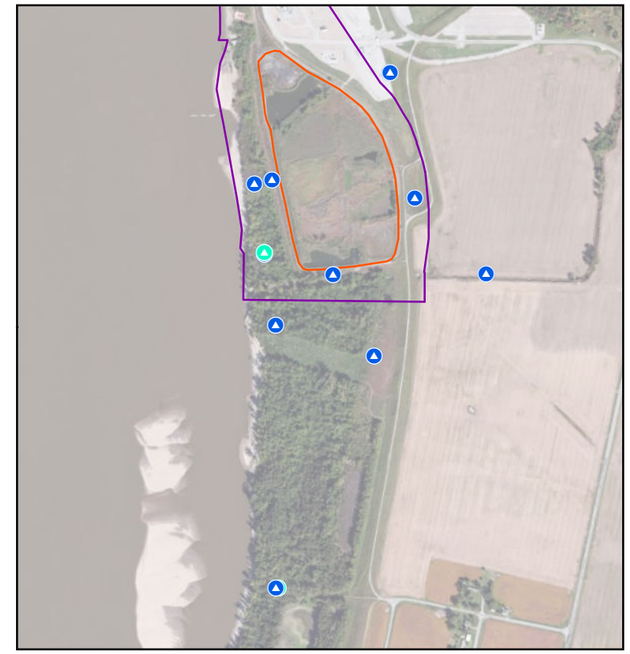
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 25



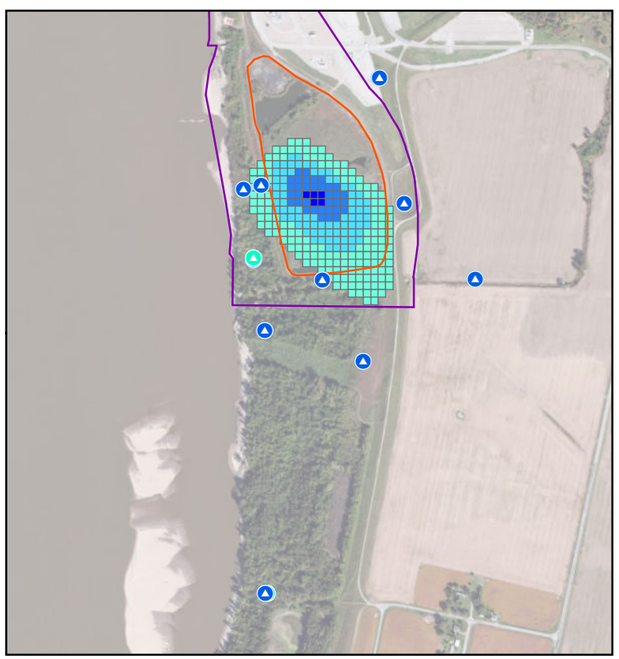
LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 25



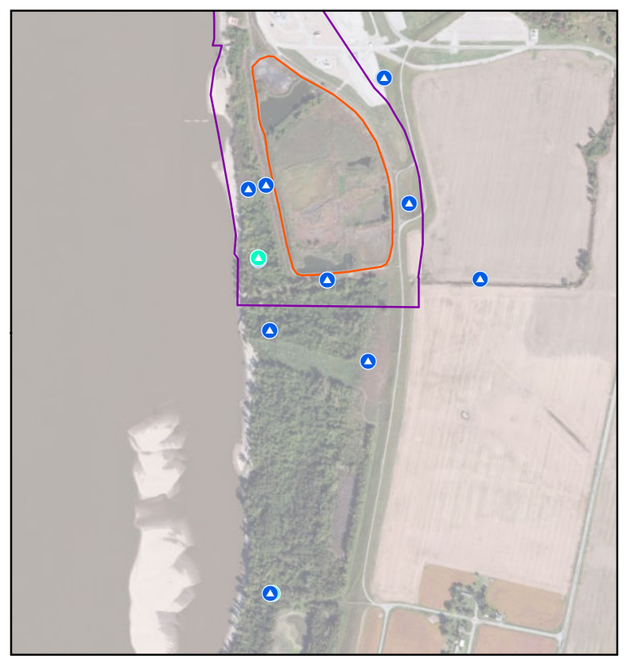
LAYER 6 (Bedrock)
Boron Modeled Results - Year 25



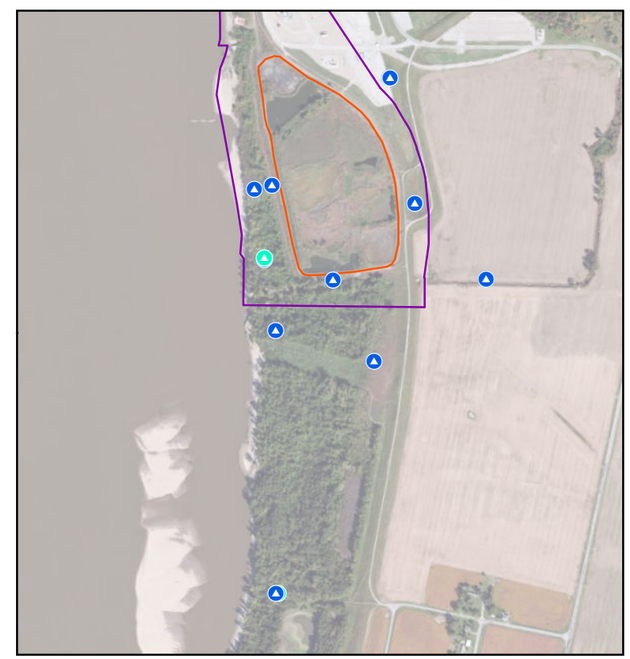
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 30

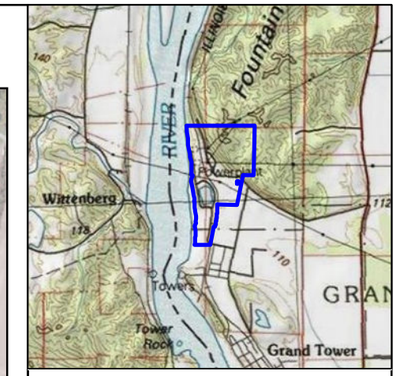


LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 30



LAYER 6 (Bedrock)
Boron Modeled Results - Year 30





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- >8 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 13
Boron Model Results 25 & 30 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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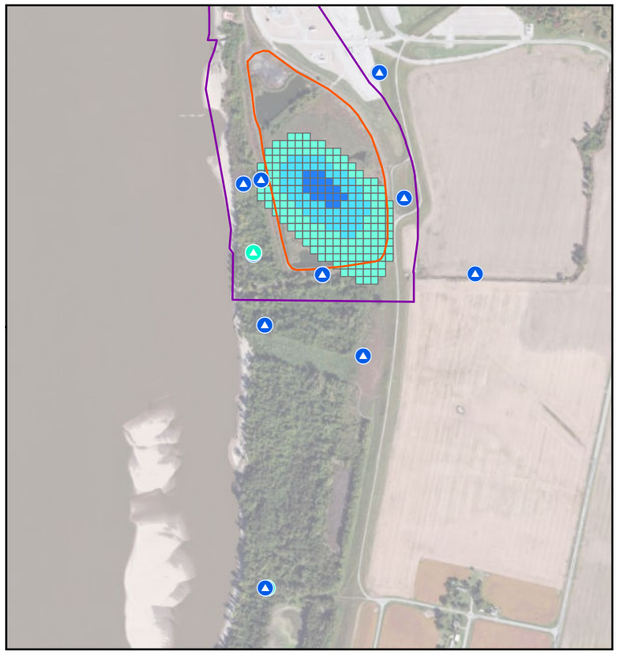
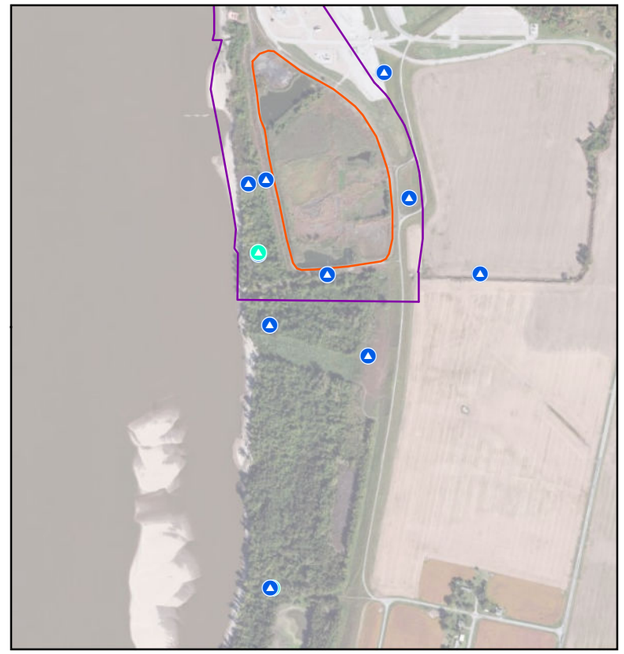
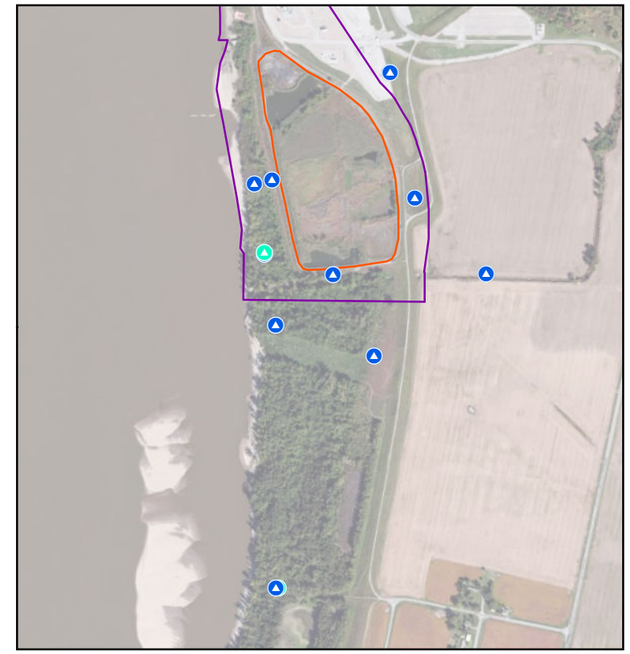
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 35



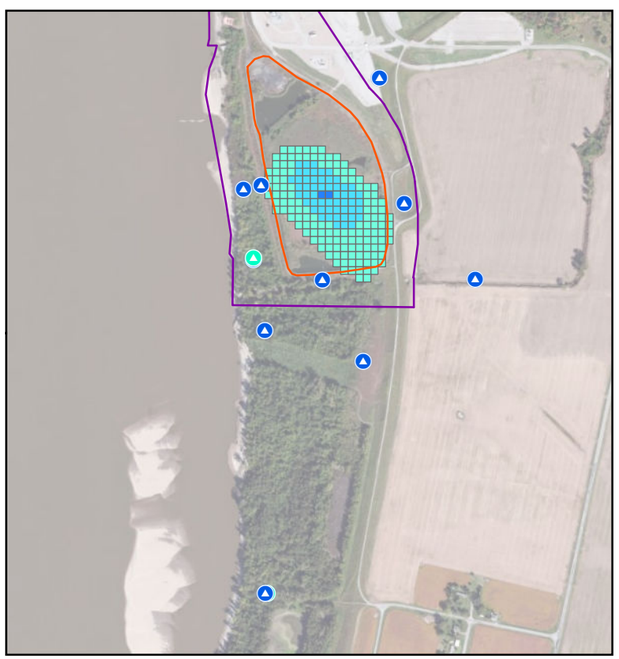
LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 35



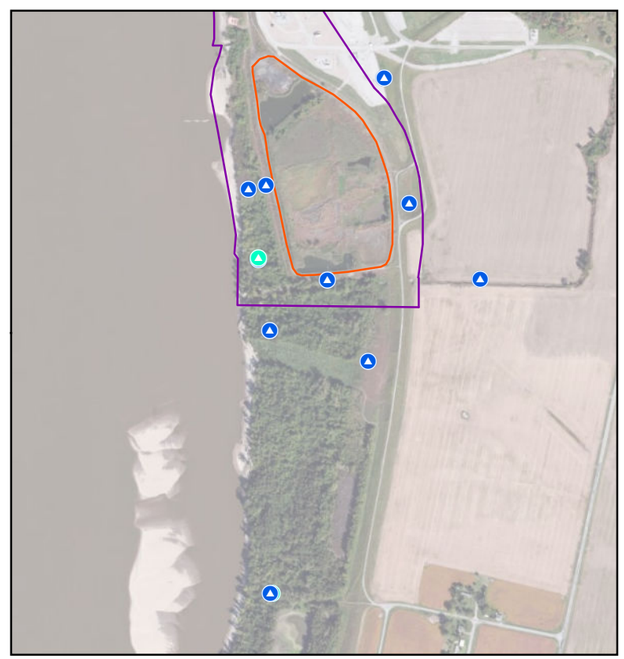
LAYER 6 (Bedrock)
Boron Modeled Results - Year 35



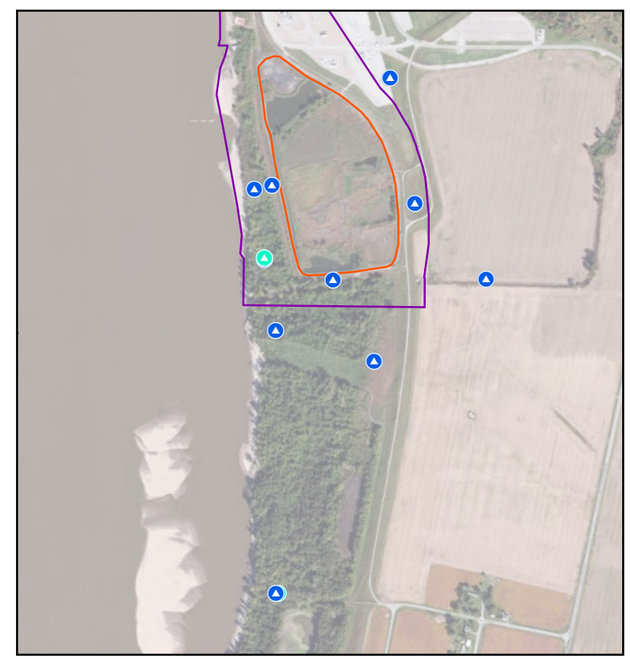
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 40

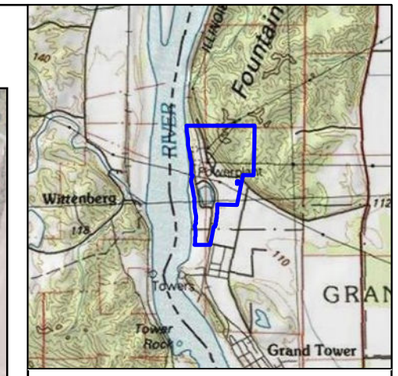


LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 40



LAYER 6 (Bedrock)
Boron Modeled Results - Year 40





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- >8 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 14
Boron Model Results 35 & 40 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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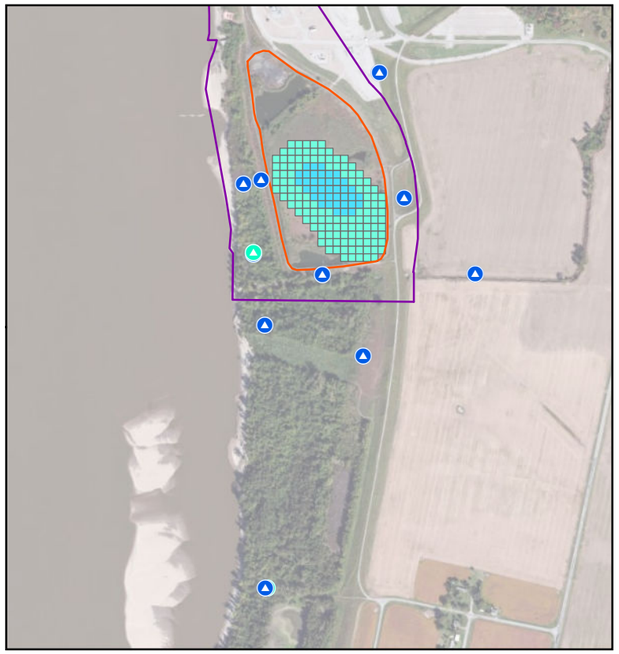
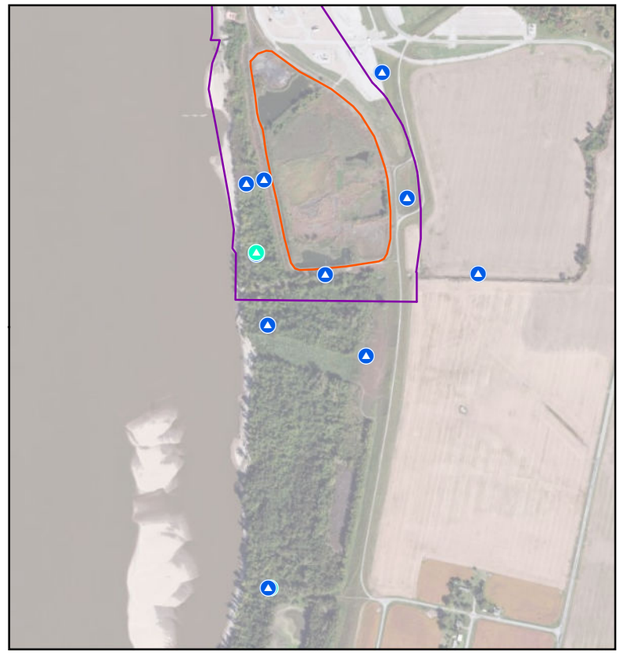
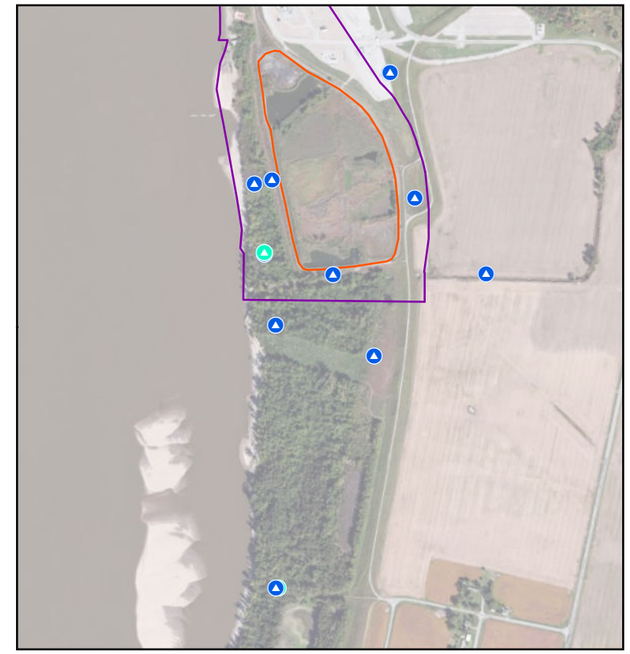
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 45



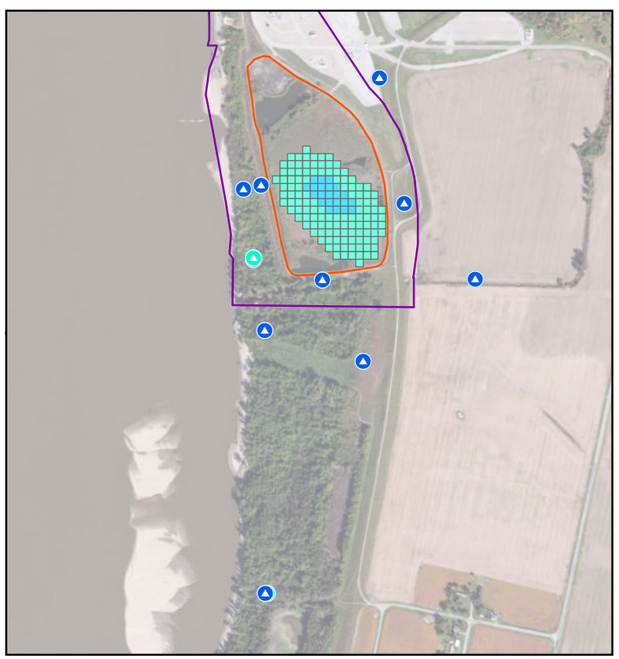
LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 45



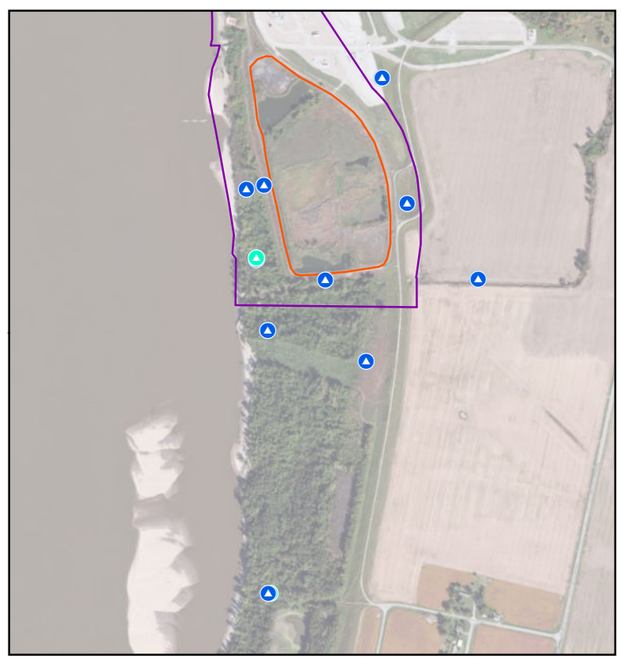
LAYER 6 (Bedrock)
Boron Modeled Results - Year 45



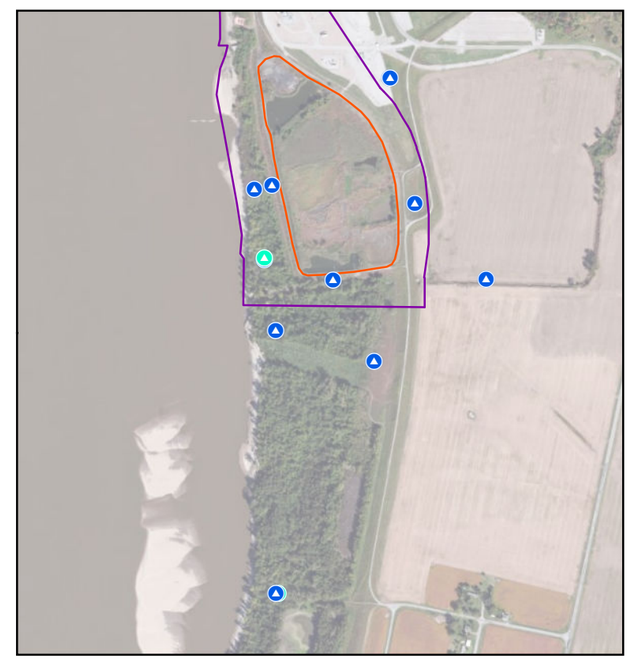
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Boron Modeled Results - Year 50

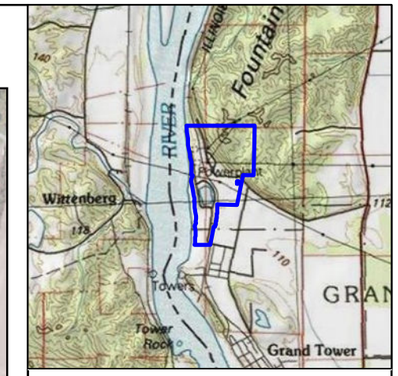


LAYER 5 (Lower Henry Formation)
Boron Modeled Results - Year 50



LAYER 6 (Bedrock)
Boron Modeled Results - Year 50





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Boron Modeled Concentration (Class I GW Standard = 2)

- 2 - 4 mg/L
- 4 - 6 mg/L
- 6 - 8 mg/L
- >8 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 15
Boron Model Results
45 & 50 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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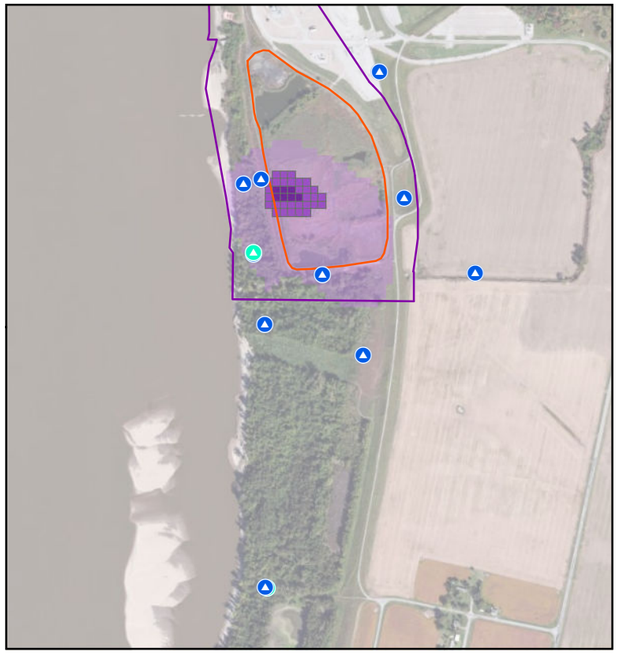
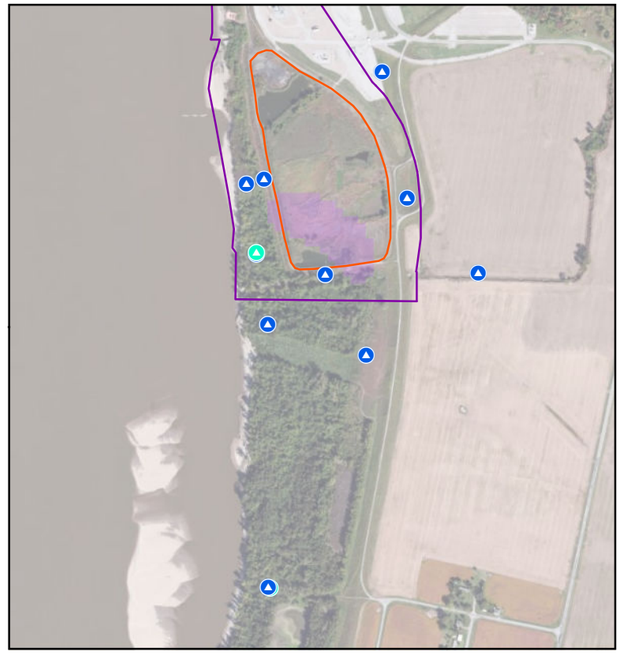
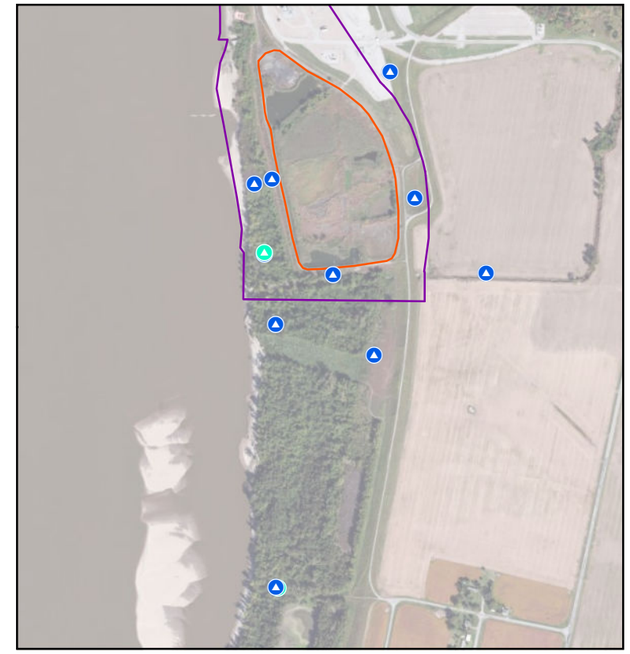
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 5



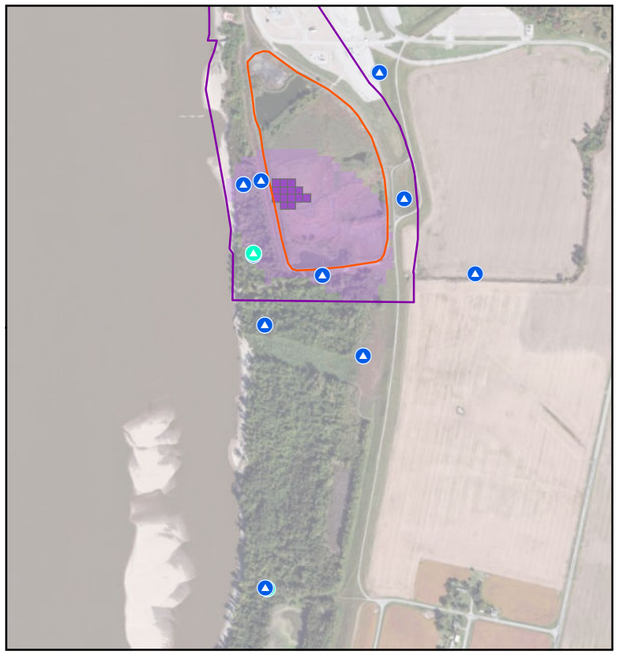
LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 5



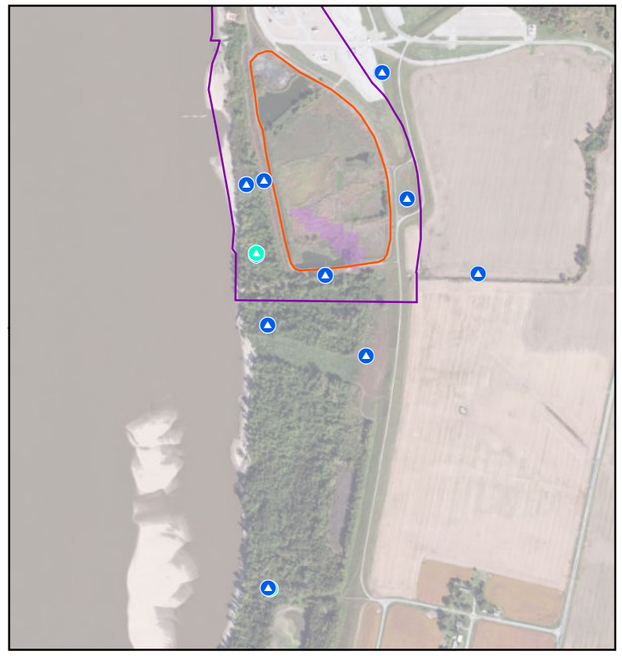
LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 5



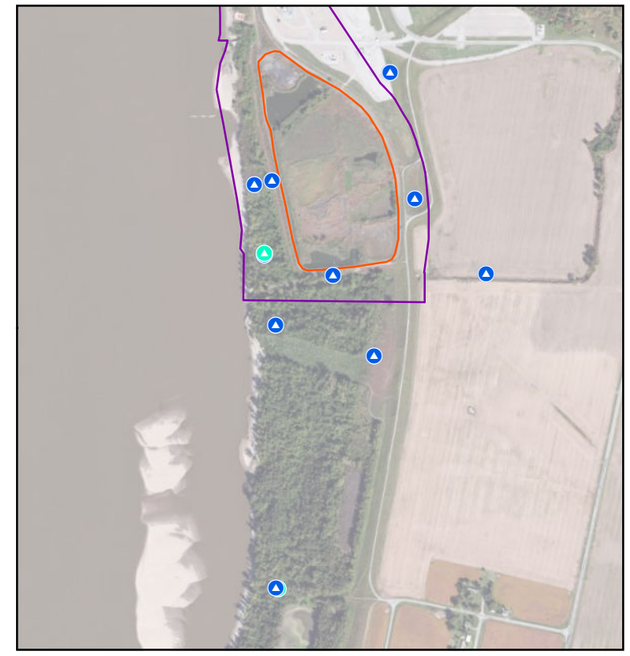
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 10

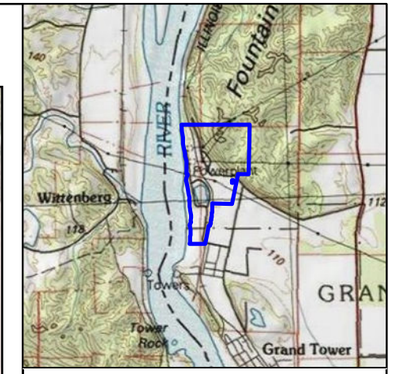


LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 10



LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 10





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 16
Sulfate Model Results
5 & 10 years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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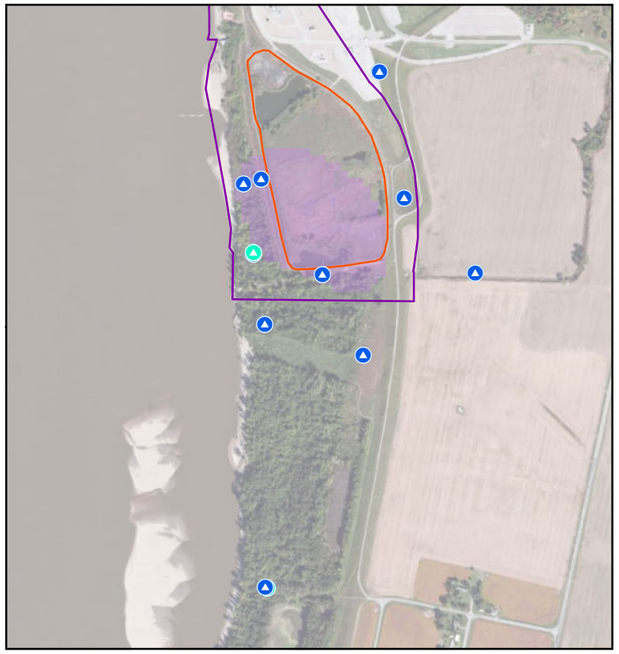
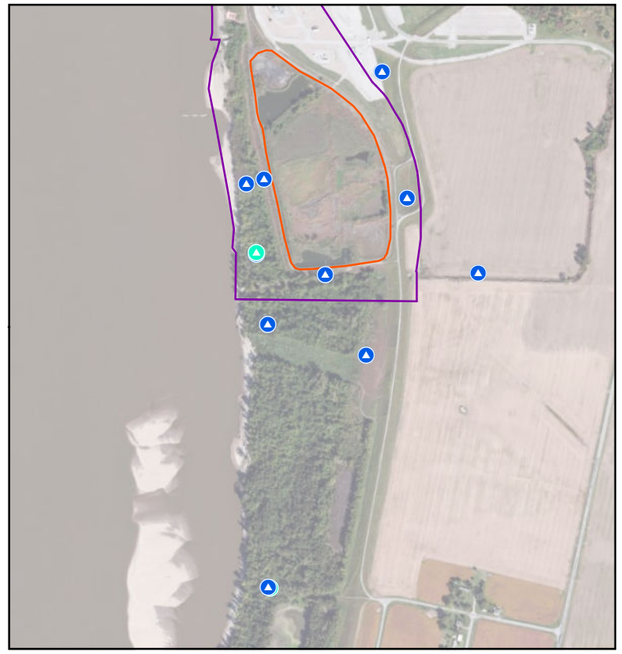
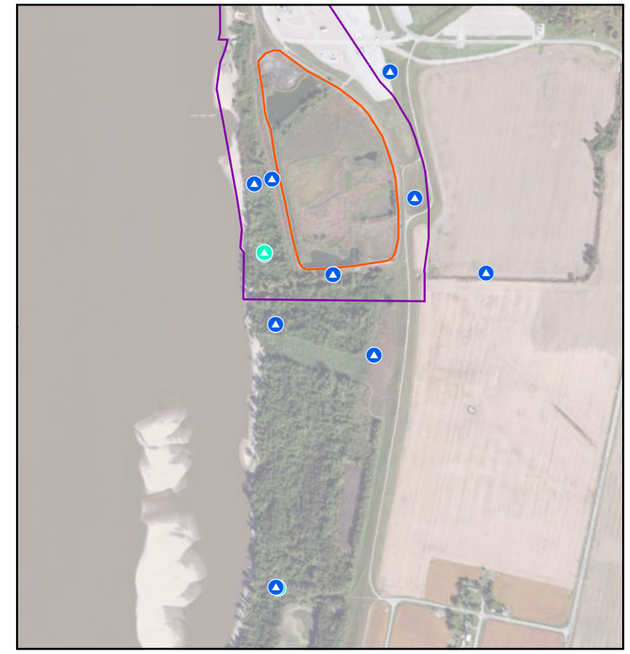
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 15



LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 15

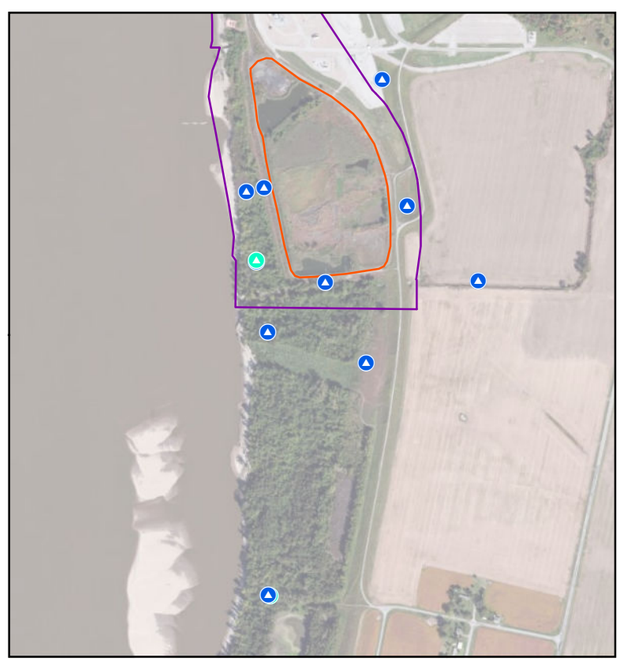


LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 15

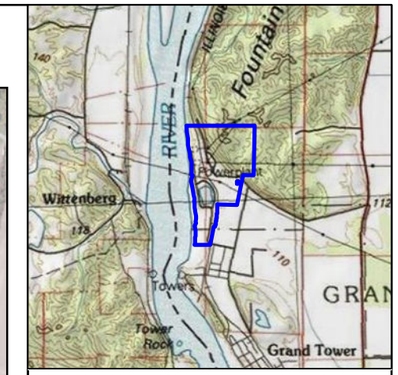


LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 20

LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 20



LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 20



Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 17
Sulfate Model Results
15 & 20 years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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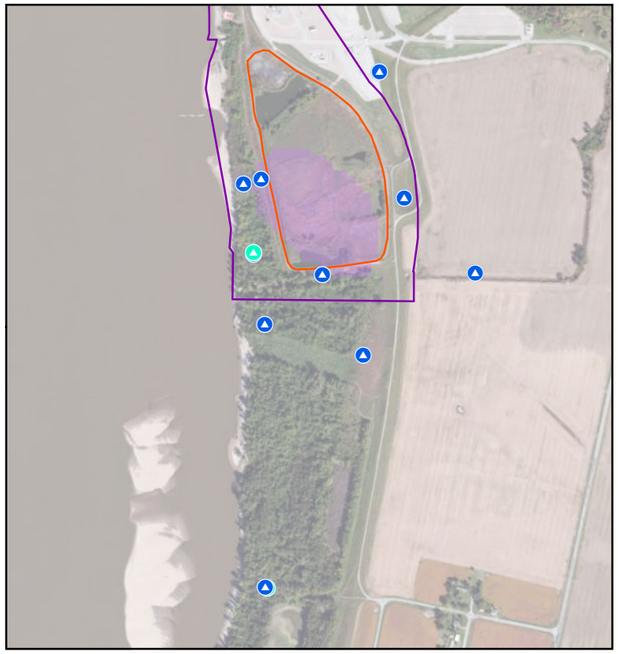
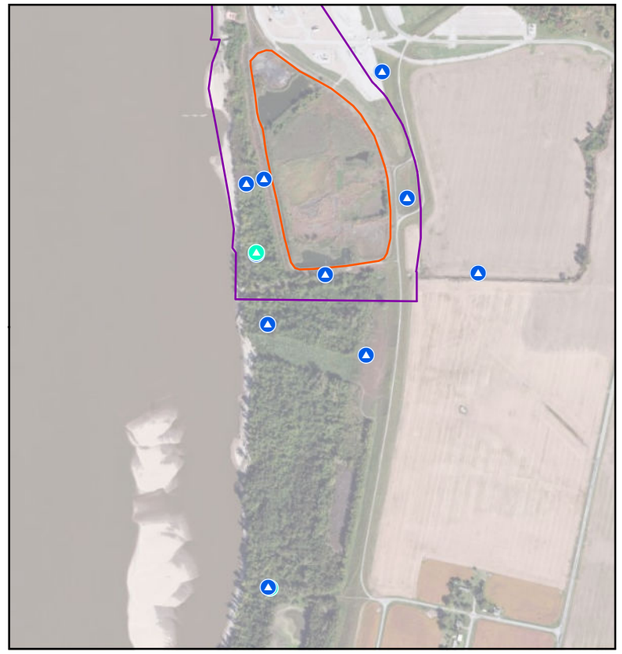
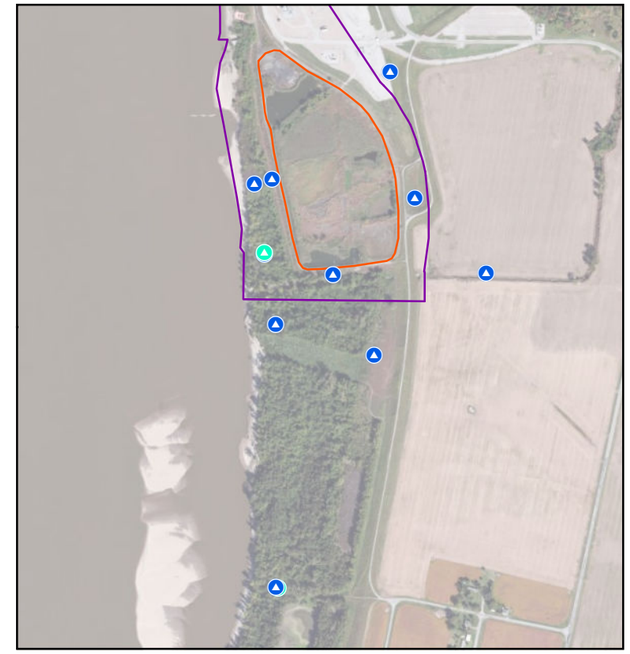
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 25



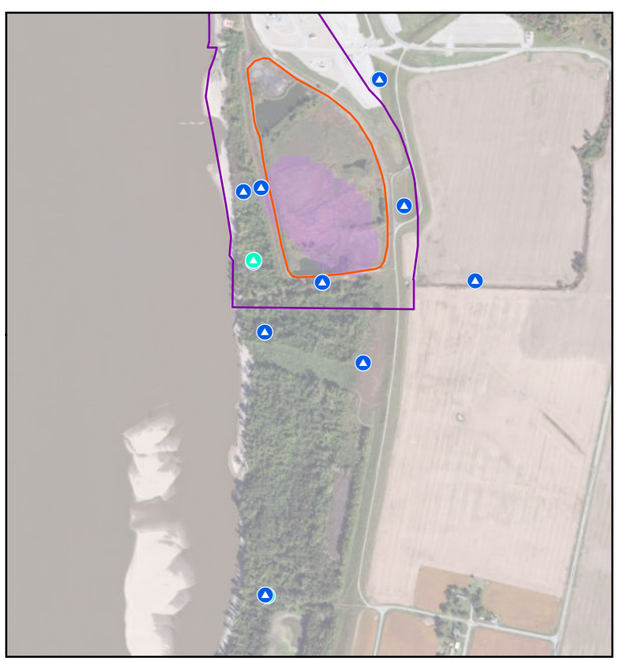
LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 25



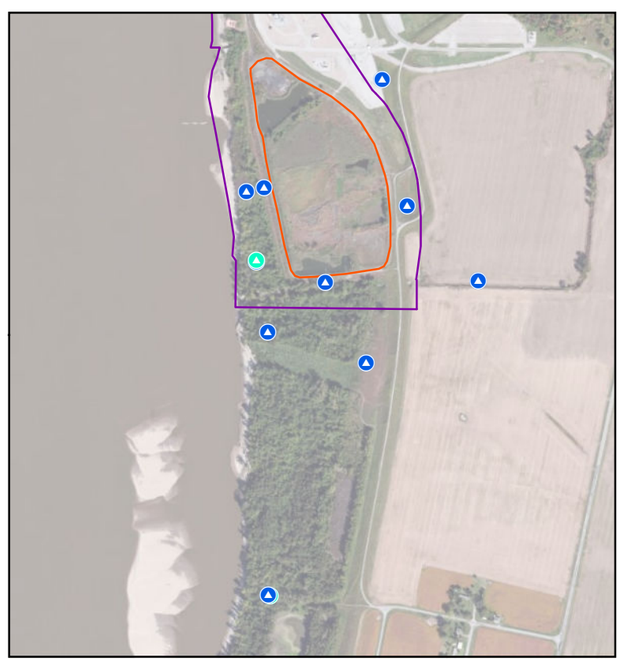
LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 25



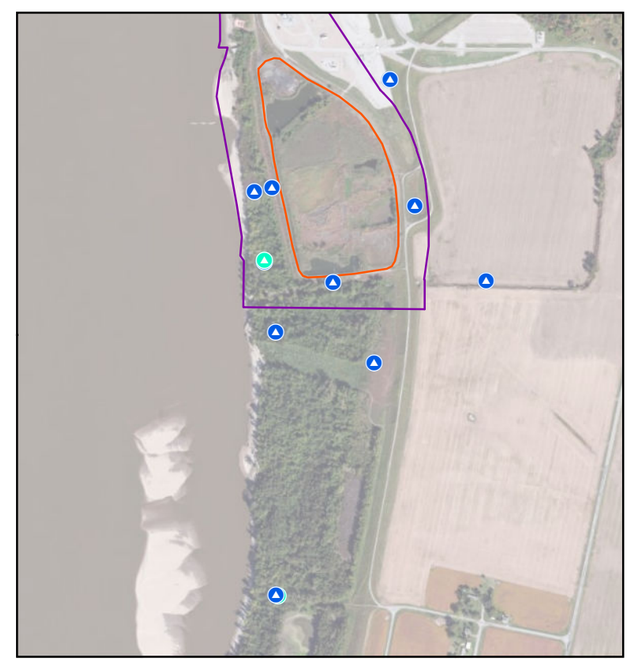
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 30

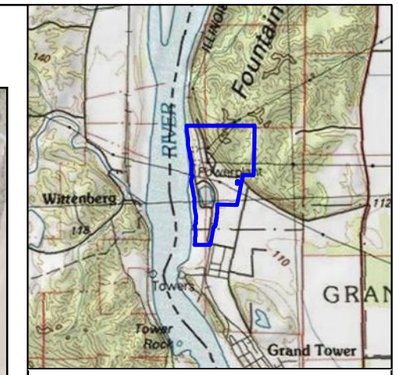


LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 30



LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 30





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 18
Sulfate Model Results
25 & 30 years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
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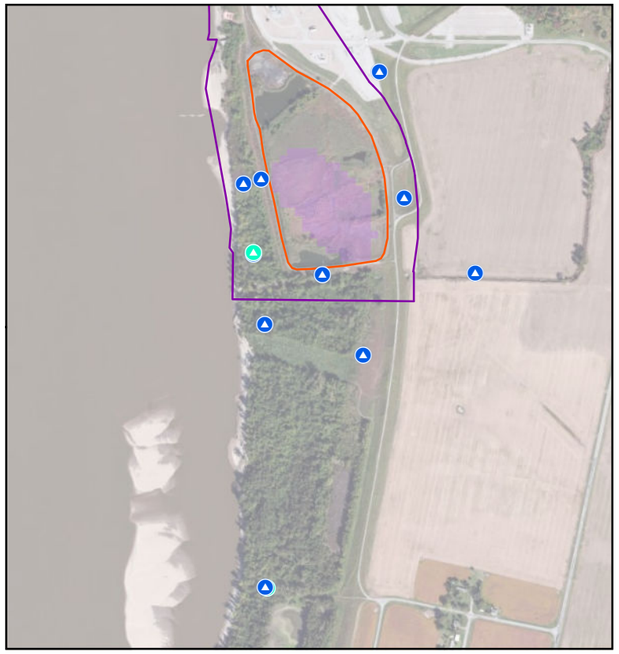
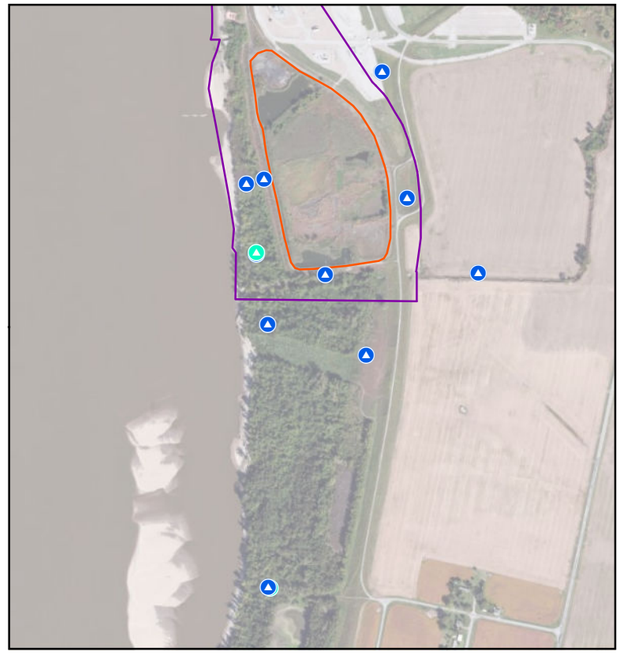
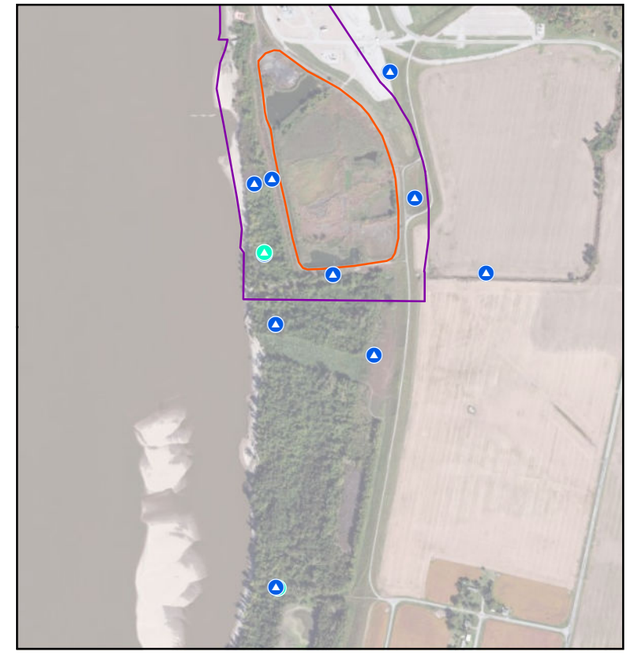
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 35



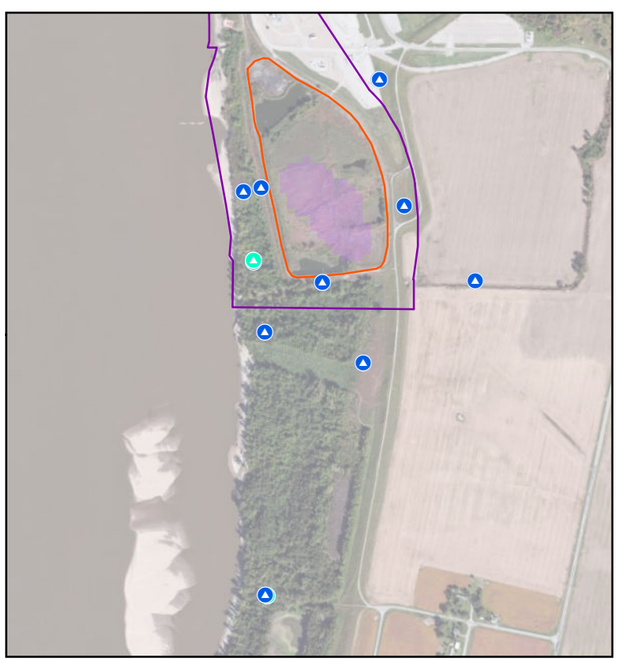
LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 35



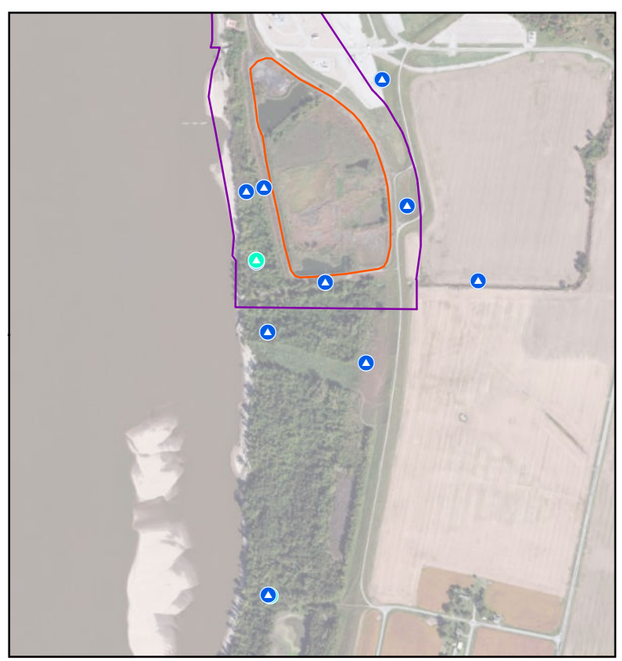
LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 35



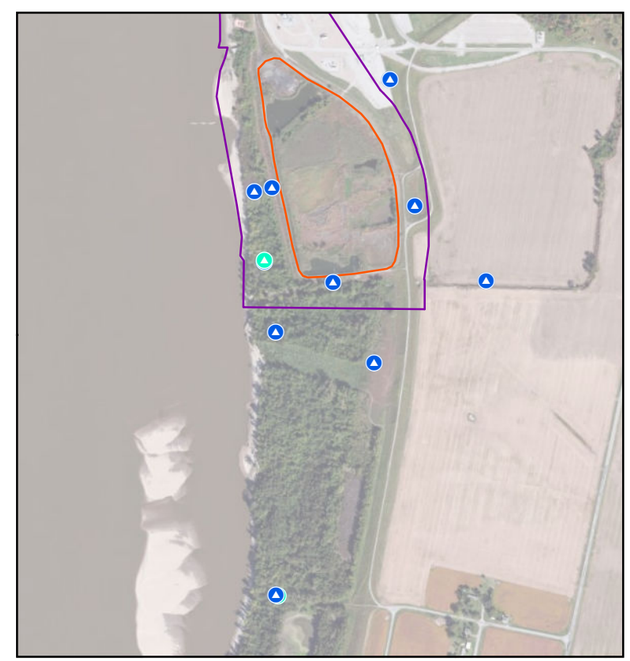
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 40

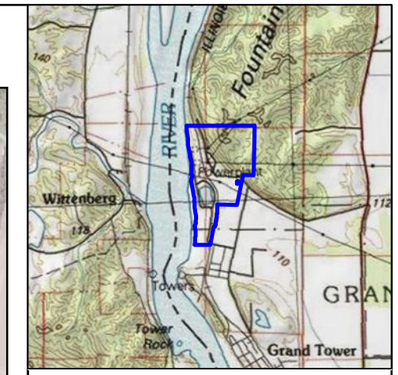


LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 40



LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 40





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 19
Sulfate Model Results
35 & 40 years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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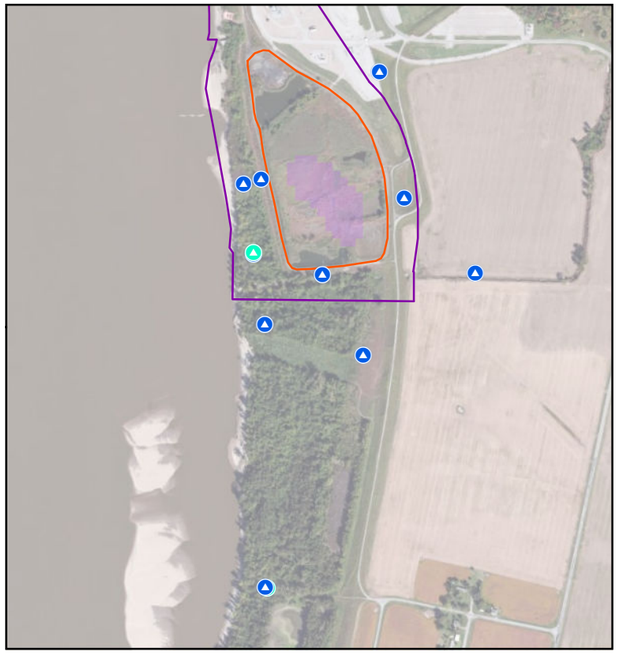
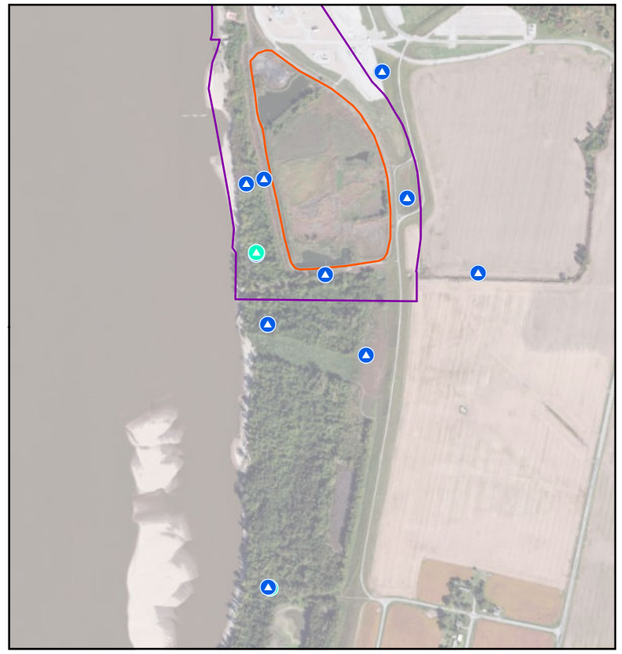
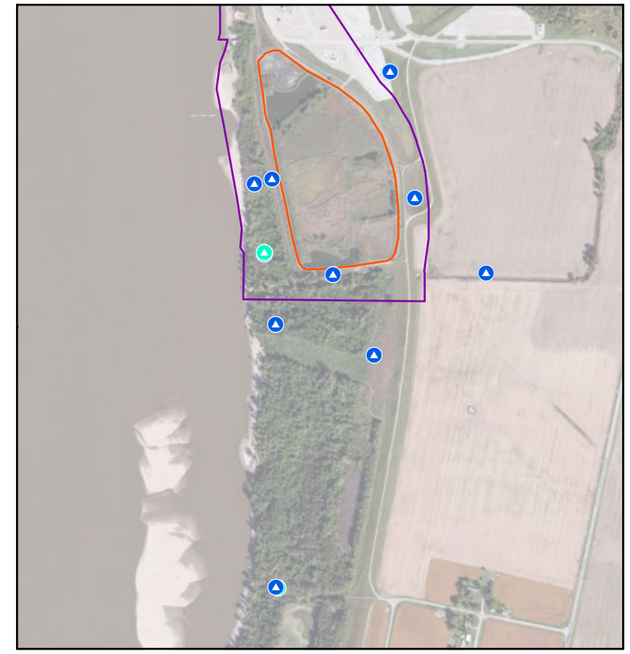
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 45



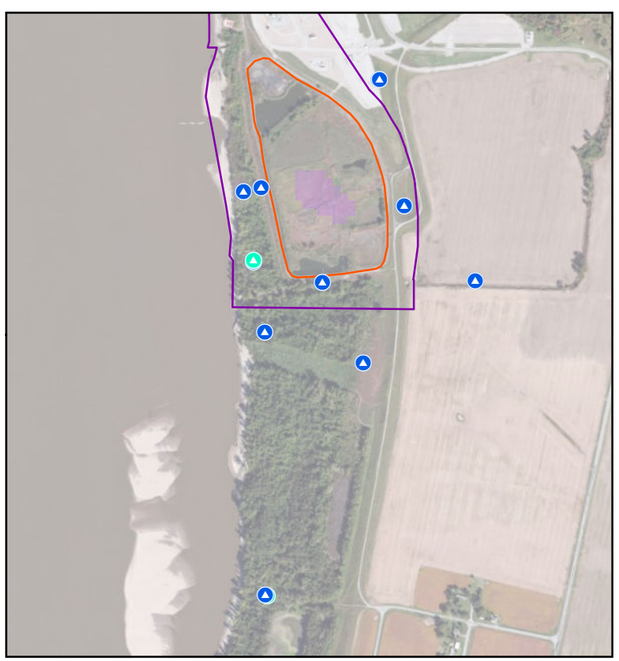
LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 45



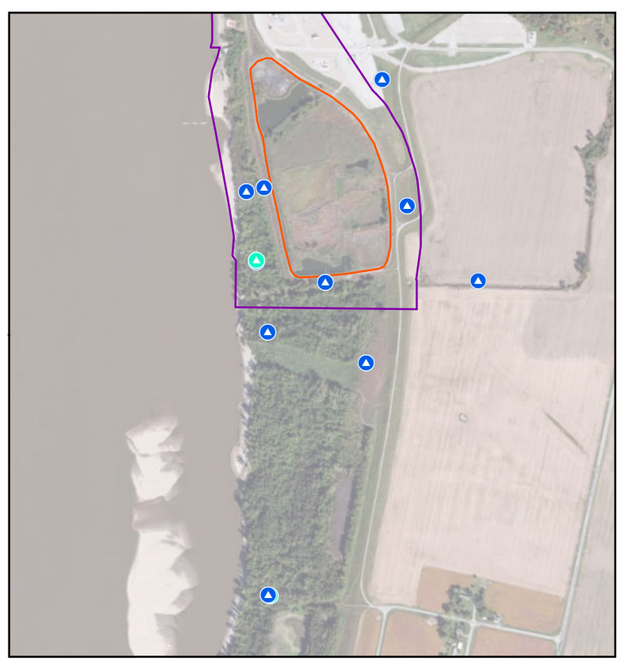
LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 45



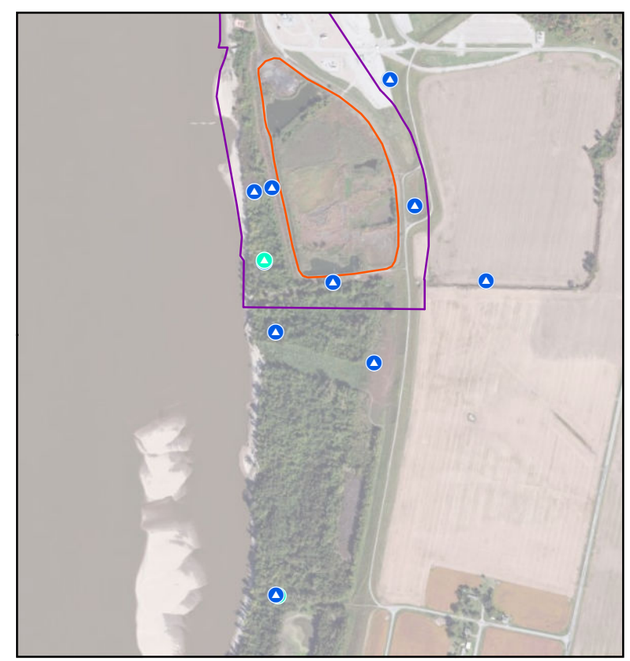
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Sulfate Modeled Results - Year 50

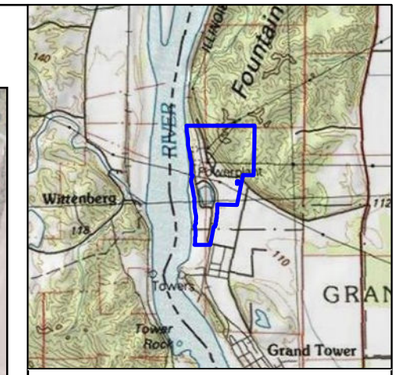


LAYER 5 (Lower Henry Formation)
Sulfate Modeled Results - Year 50



LAYER 6 (Bedrock)
Sulfate Modeled Results - Year 50





Legend

- Shallow Well
- Deep Well
- Inactive Ash
- Proposed Groundwater Management Zone

Sulfate Modeled Concentration (Class I GW Standard = 400)

- <400 mg/L
- 400 - 500 mg/L
- 500 - 600 mg/L
- > 600 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 20
Sulfate Model Results 45 & 50 years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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www.erm.com ERM

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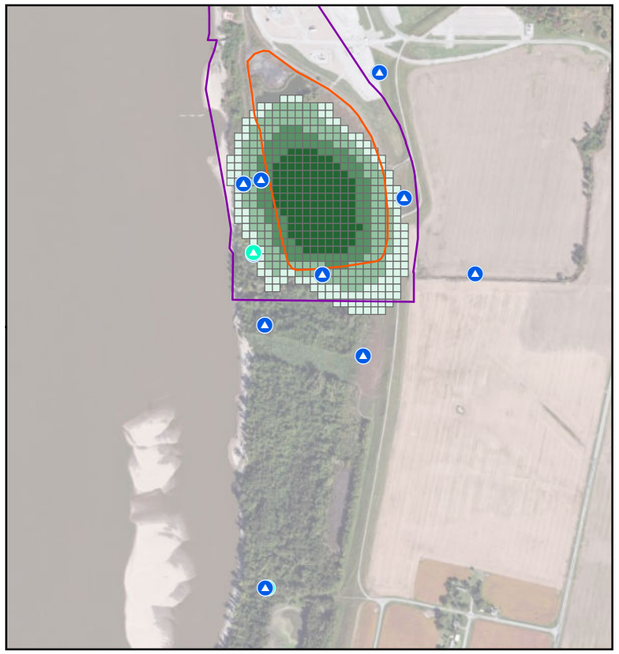
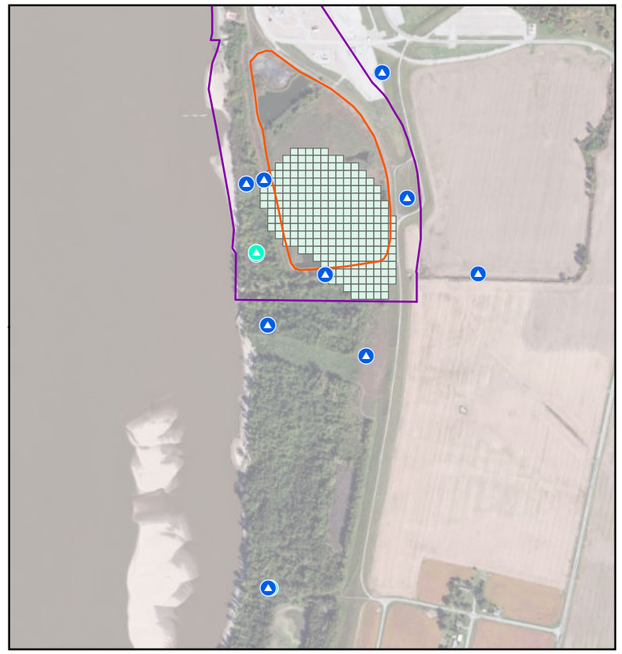
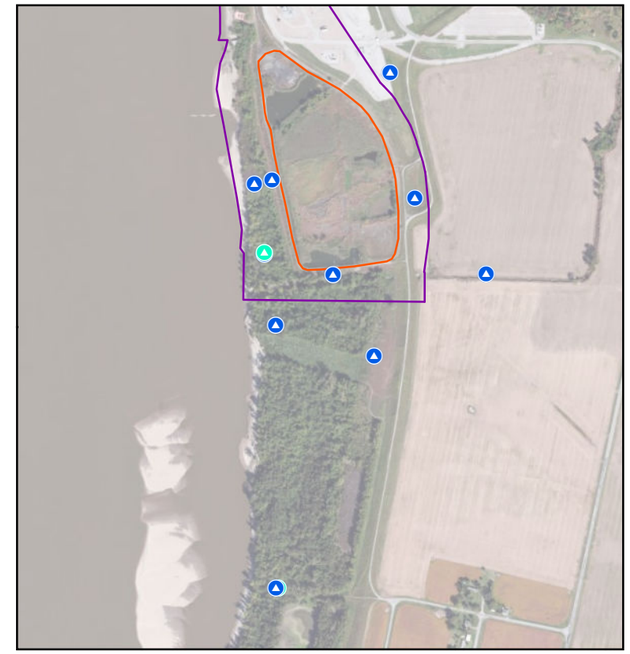
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 5



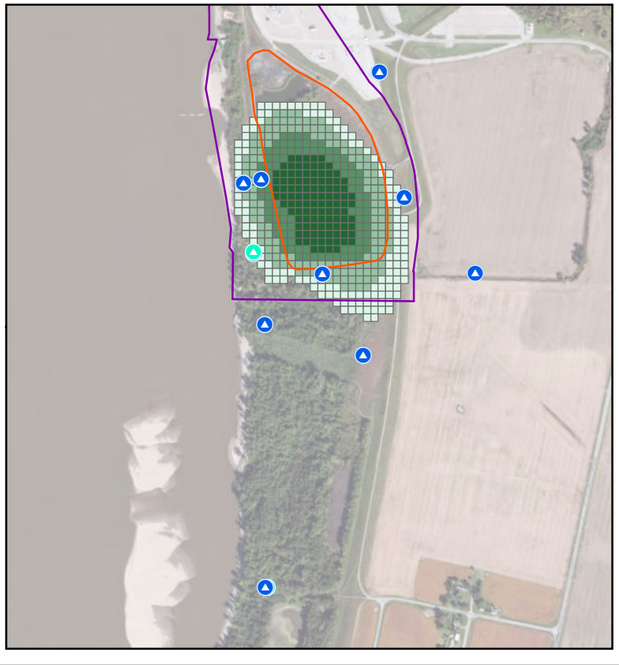
LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 5



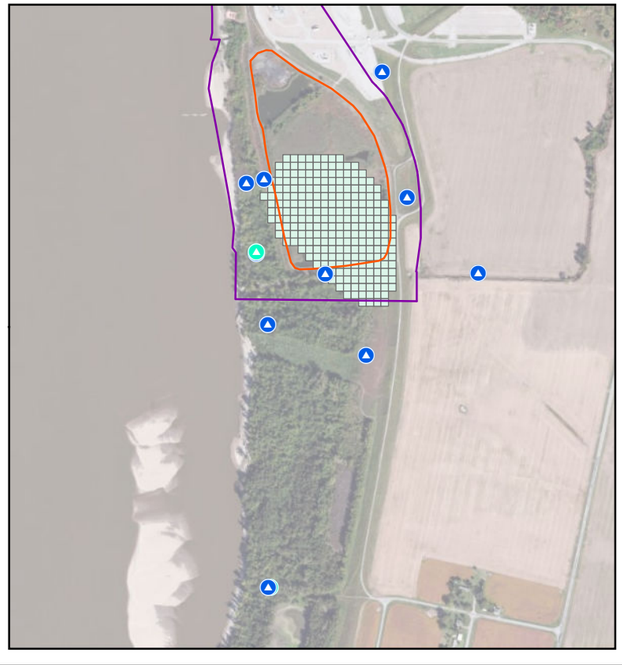
LAYER 6 (Bedrock)
Lithium Modeled Results - Year 5



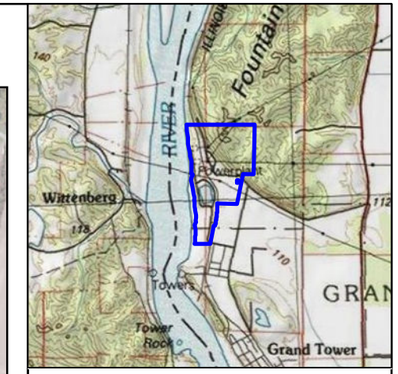
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 10



LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 10



LAYER 6 (Bedrock)
Lithium Modeled Results - Year 10



Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 21
Lithium Model Results
5 & 10 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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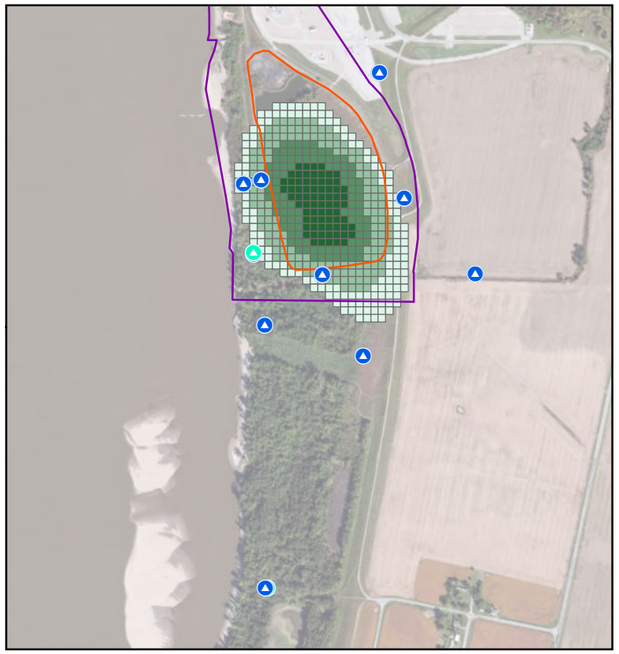
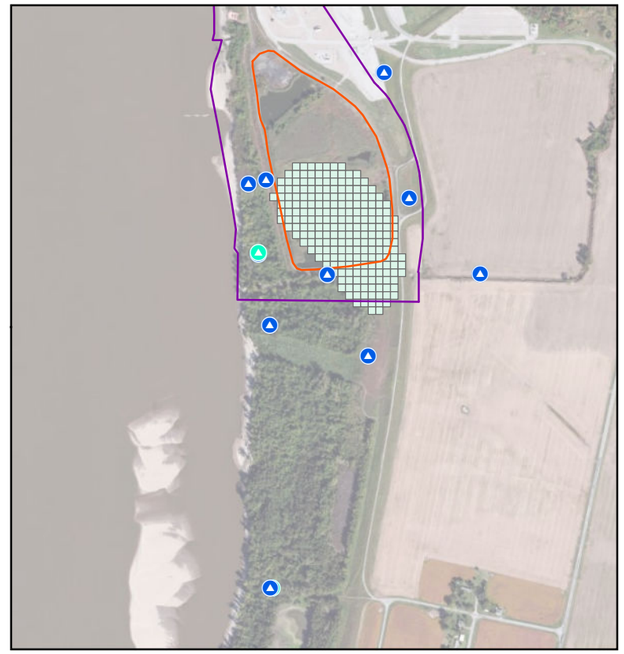
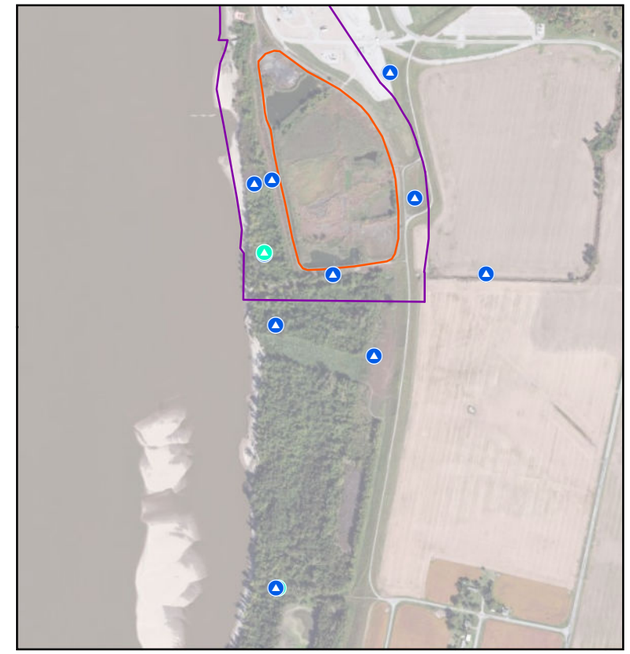
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 15



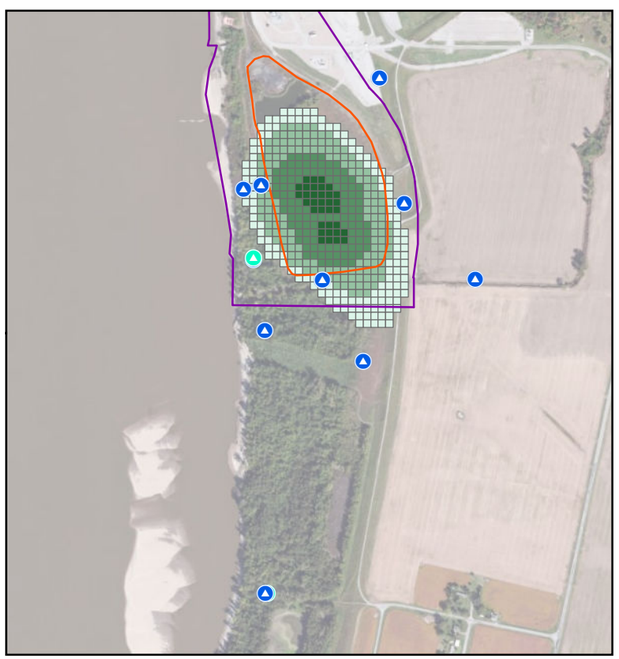
LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 15



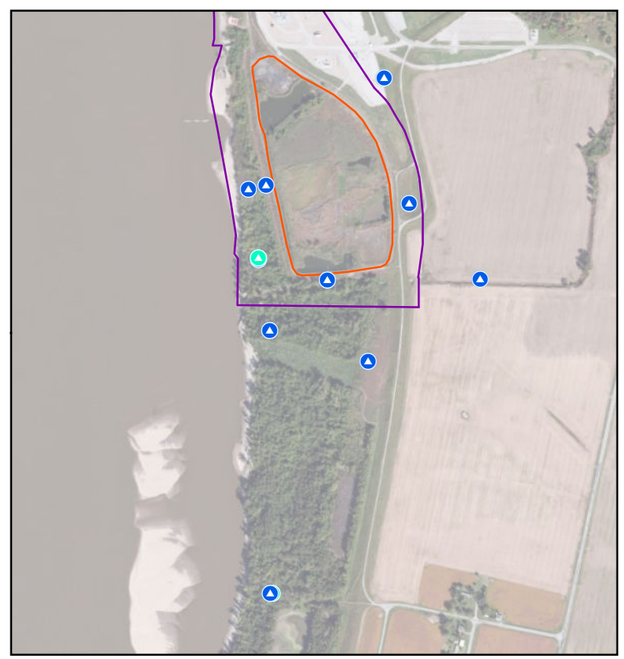
LAYER 6 (Bedrock)
Lithium Modeled Results - Year 15



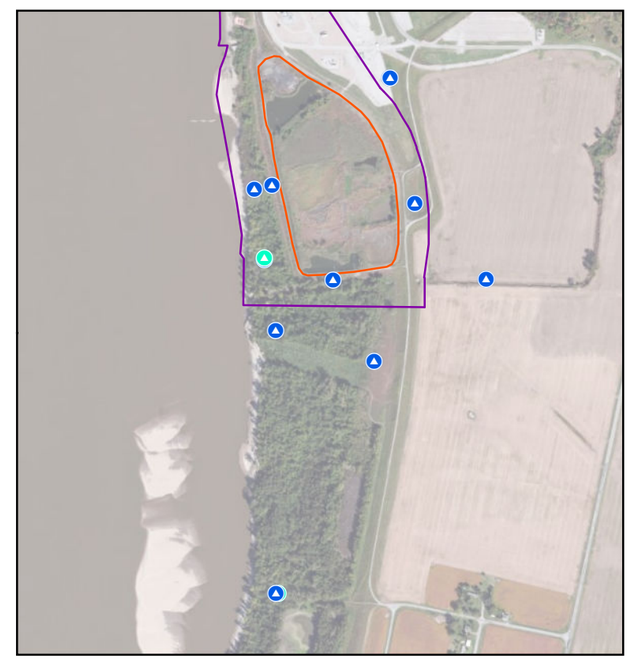
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 20

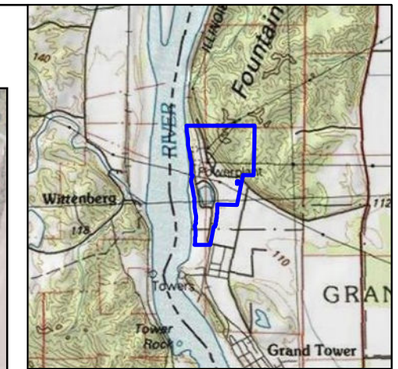


LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 20



LAYER 6 (Bedrock)
Lithium Modeled Results - Year 20





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 22
Lithium Model Results
15 & 20 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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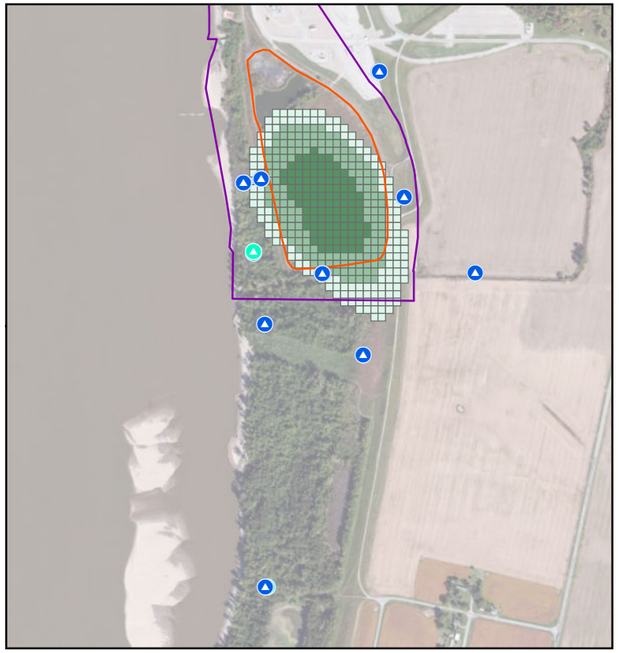
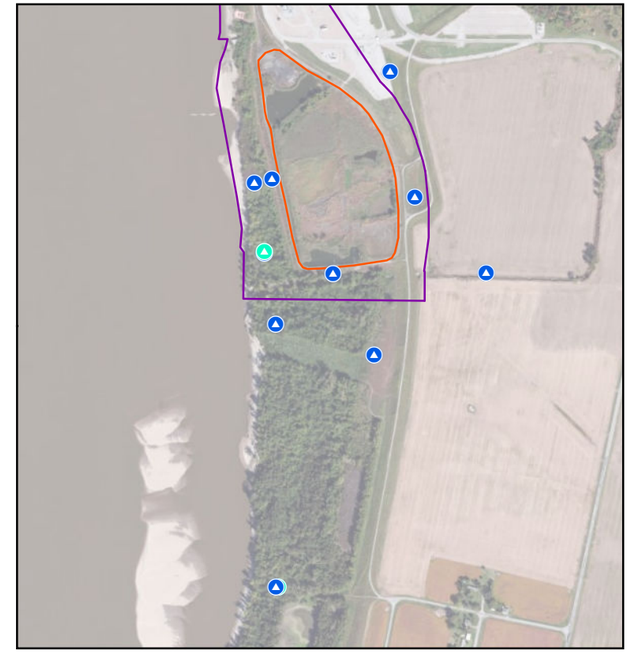
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 25

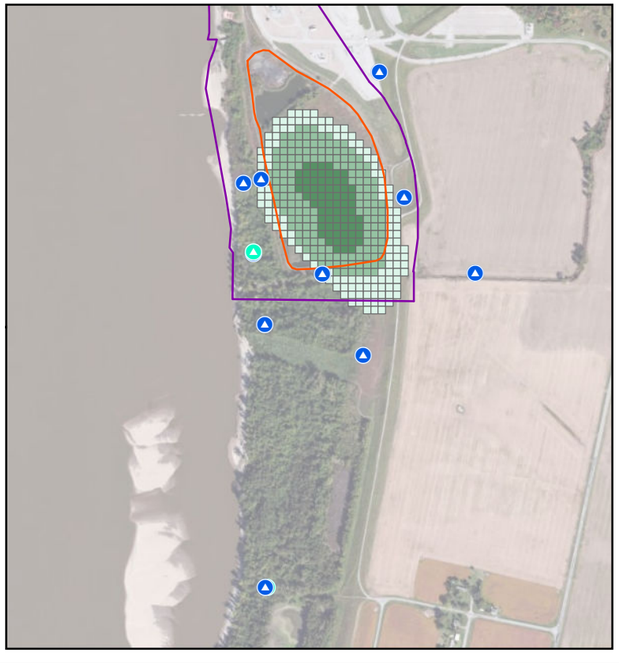


LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 25

LAYER 6 (Bedrock)
Lithium Modeled Results - Year 25

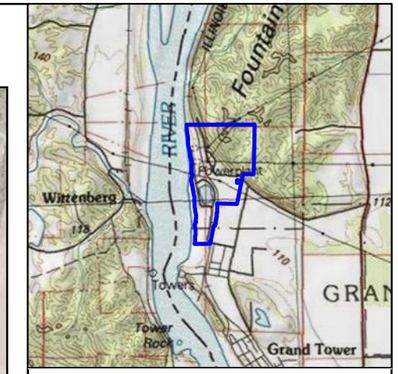


LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 30



LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 30

LAYER 6 (Bedrock)
Lithium Modeled Results - Year 30



Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 23
Lithium Model Results
25 & 30 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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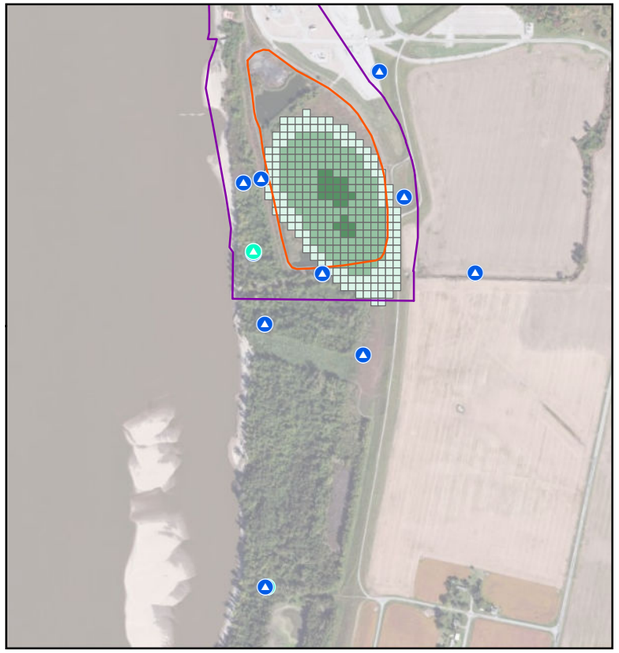
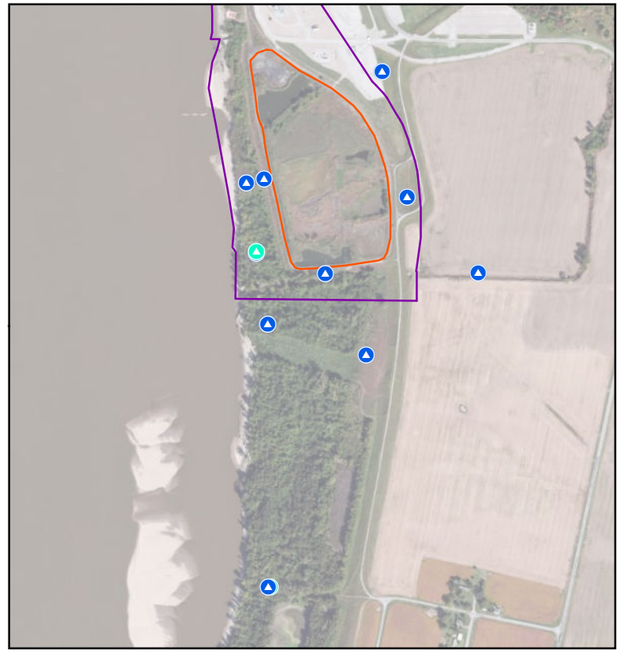
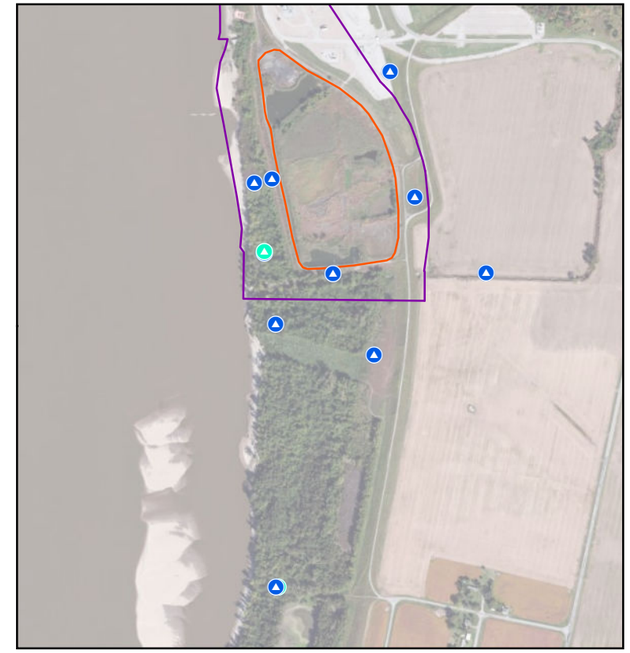
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 35



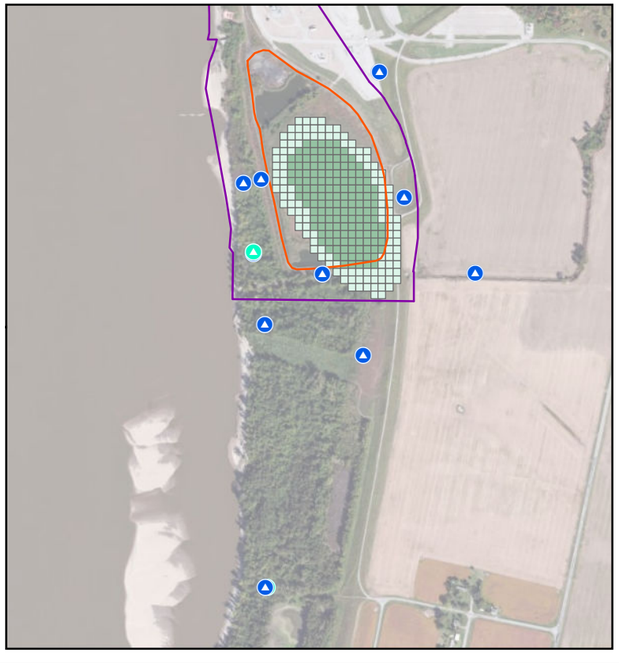
LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 35



LAYER 6 (Bedrock)
Lithium Modeled Results - Year 35

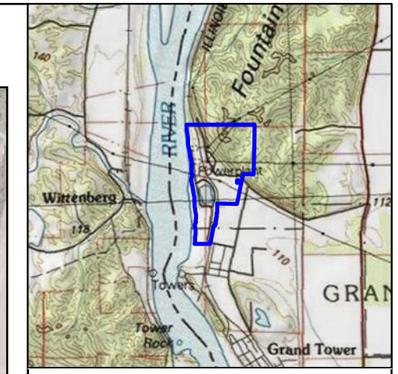


LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 40



LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 40

LAYER 6 (Bedrock)
Lithium Modeled Results - Year 40



Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 24
Lithium Model Results
35 & 40 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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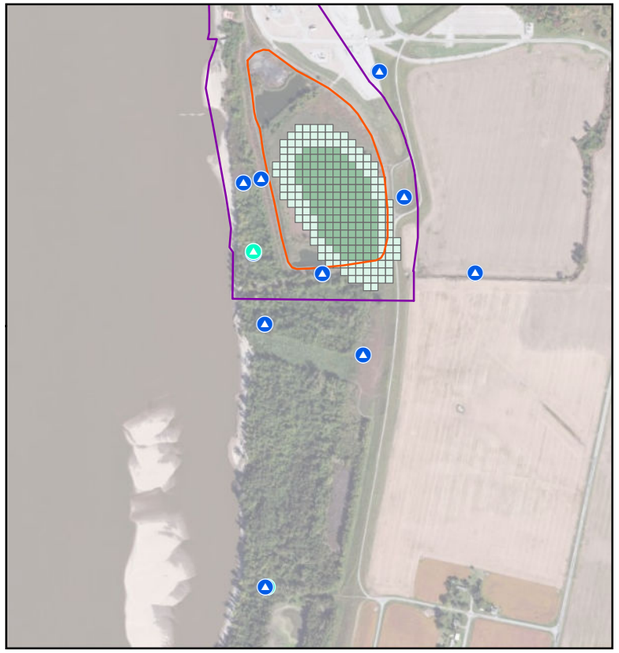
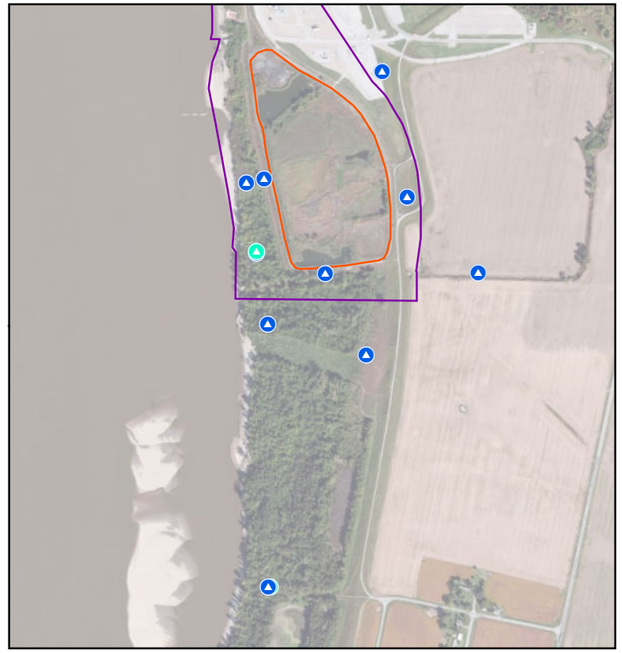
FILE: C:\VMOD_Projects\RocklandCap\GIS\MXD\TechMemoUpdate\F25_PostCap_Li_YR45-50.mxd, REVISED: 07/22/2019 , SCALE: 1:12,000 when printed at 11x17

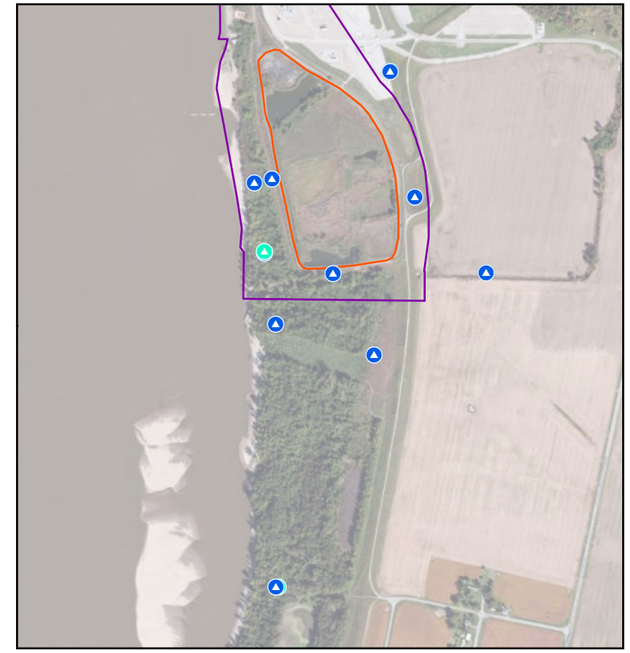
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 45



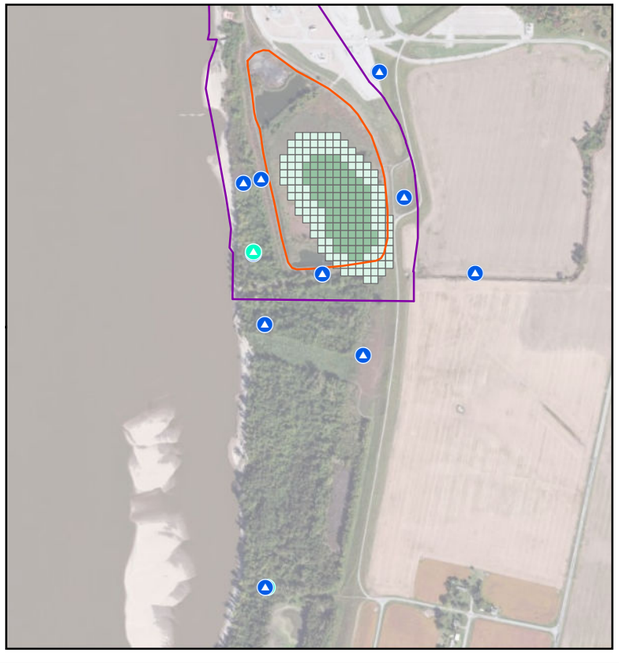
LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 45



LAYER 6 (Bedrock)
Lithium Modeled Results - Year 45

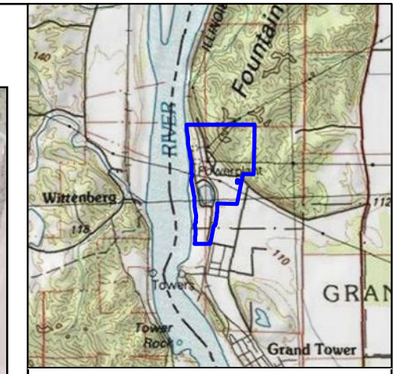


LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Lithium Modeled Results - Year 50



LAYER 5 (Lower Henry Formation)
Lithium Modeled Results - Year 50

LAYER 6 (Bedrock)
Lithium Modeled Results - Year 50



Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Lithium Modeled Concentration (EPA Tapwater Standard = 0.04)

- 0.04 - 0.06 mg/L
- 0.06 - 0.10 mg/L
- 0.10 - 0.14 mg/L
- > 0.14 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 25
Lithium Model Results
45 & 50 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
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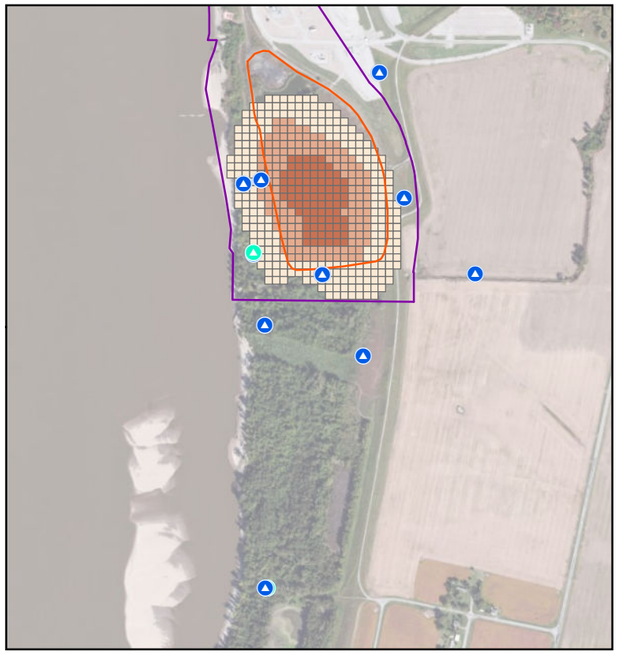
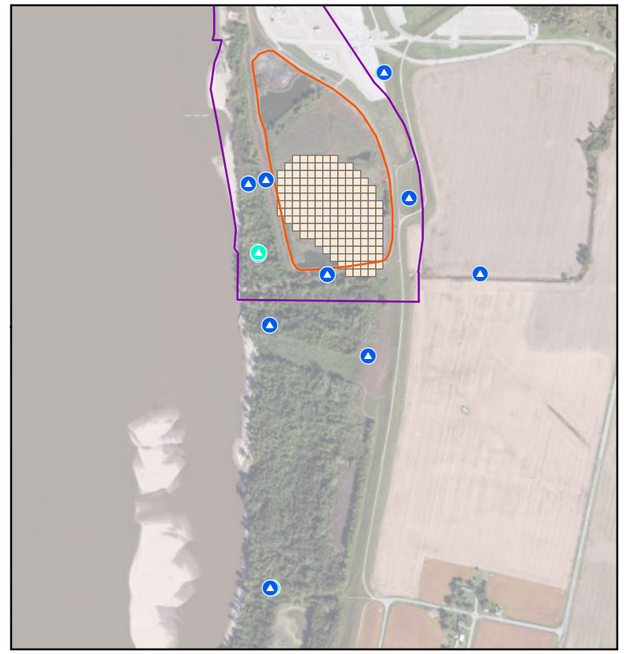
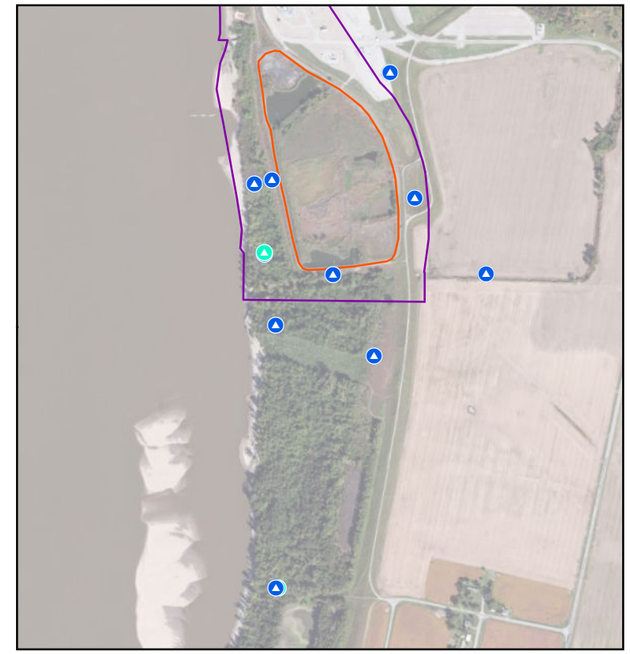
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 5



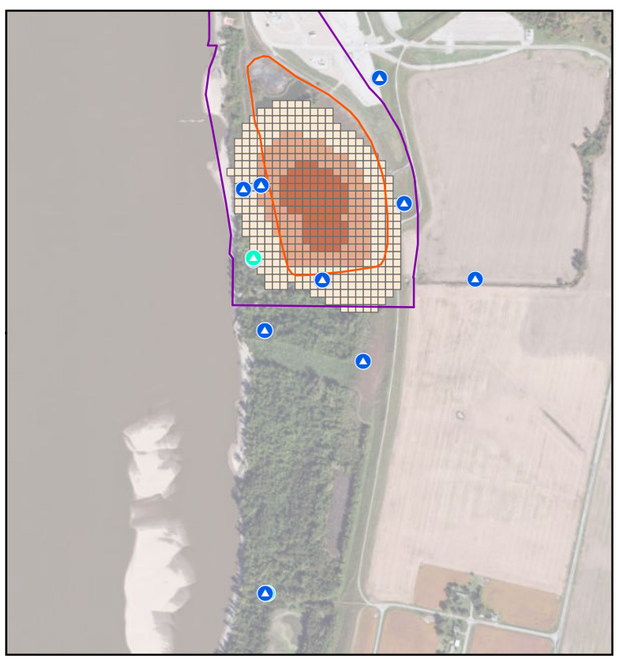
LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 5



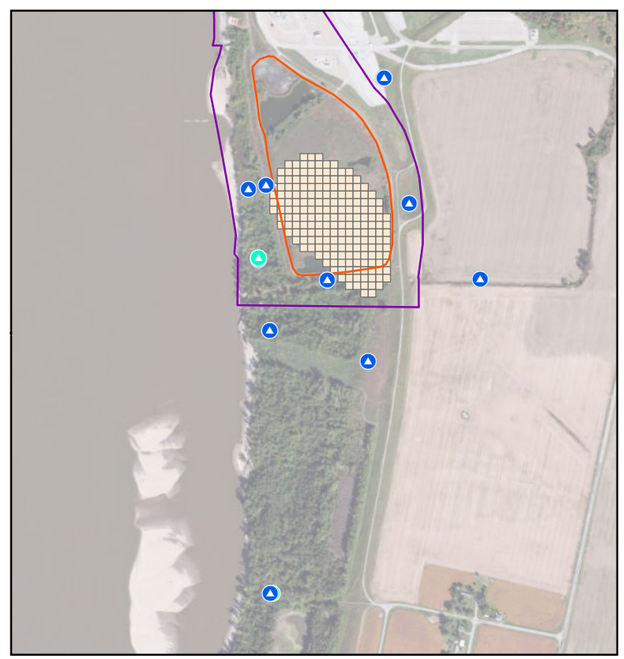
LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 5



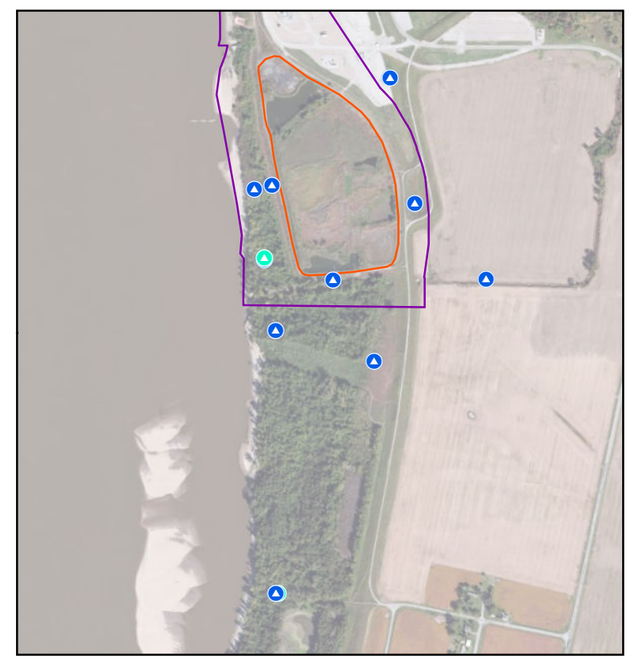
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 10

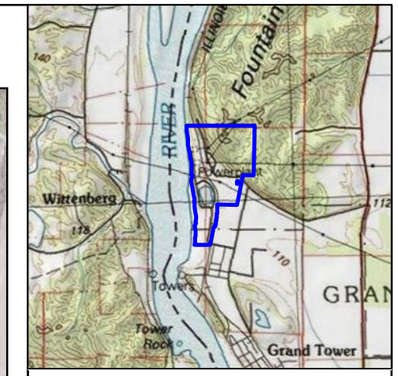


LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 10



LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 10





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 26
Molybdenum Model Results
5 & 10 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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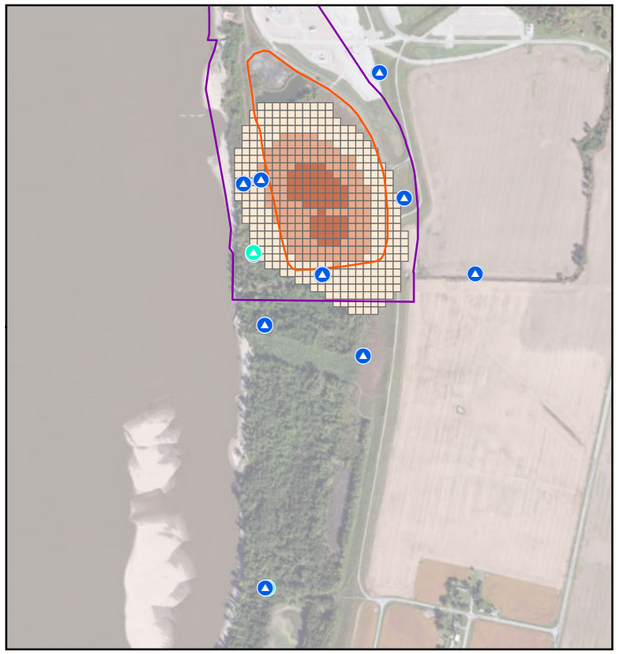
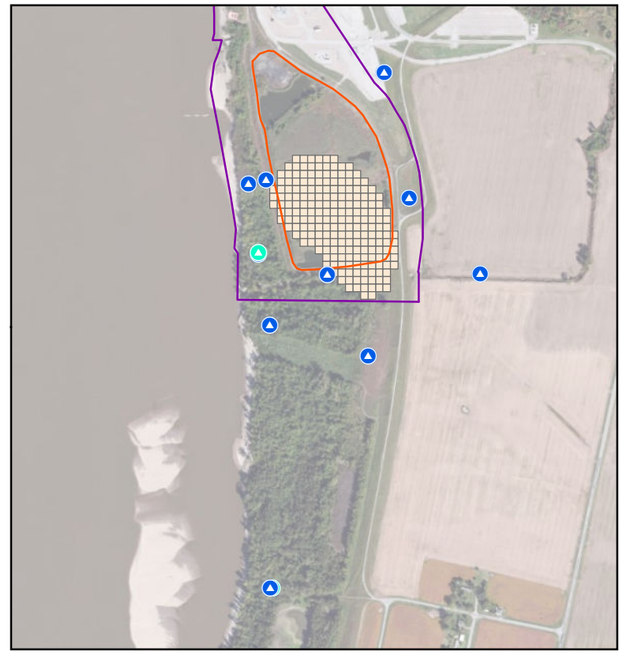
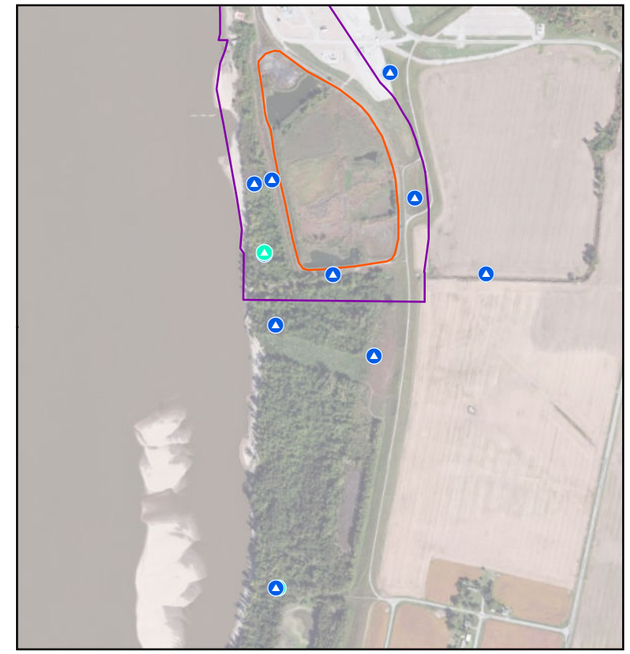
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 15



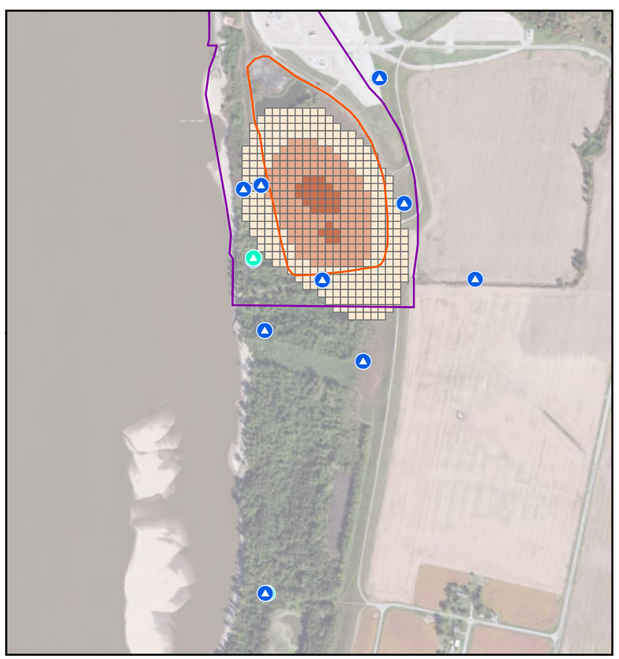
LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 15



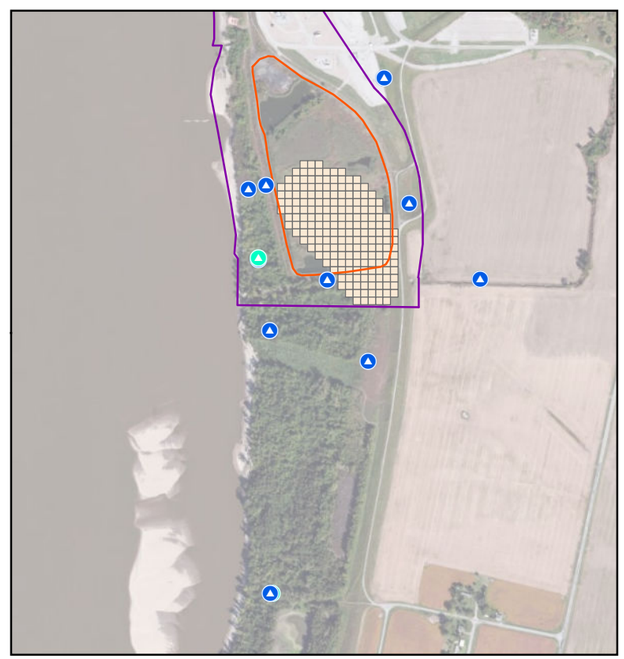
LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 15



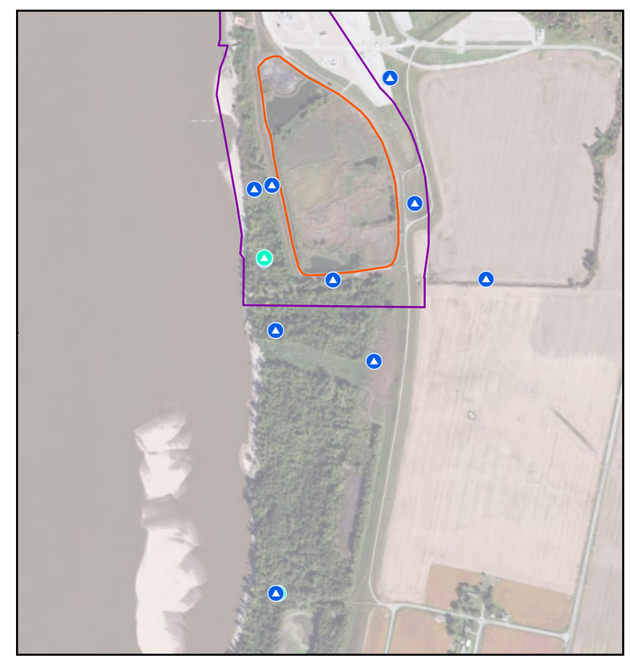
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 20

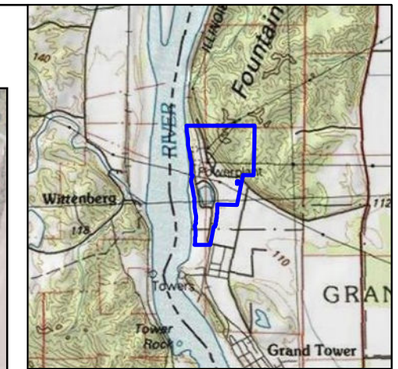


LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 20



LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 20





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 27
Molybdenum Model Results
15 & 20 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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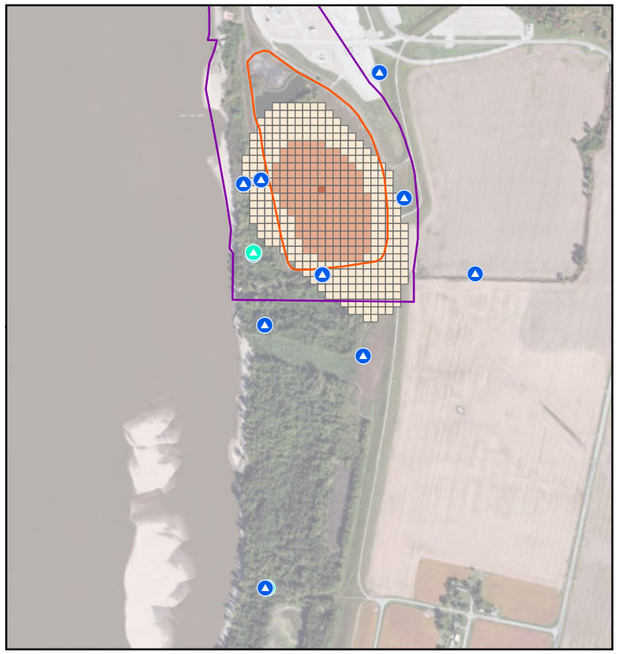
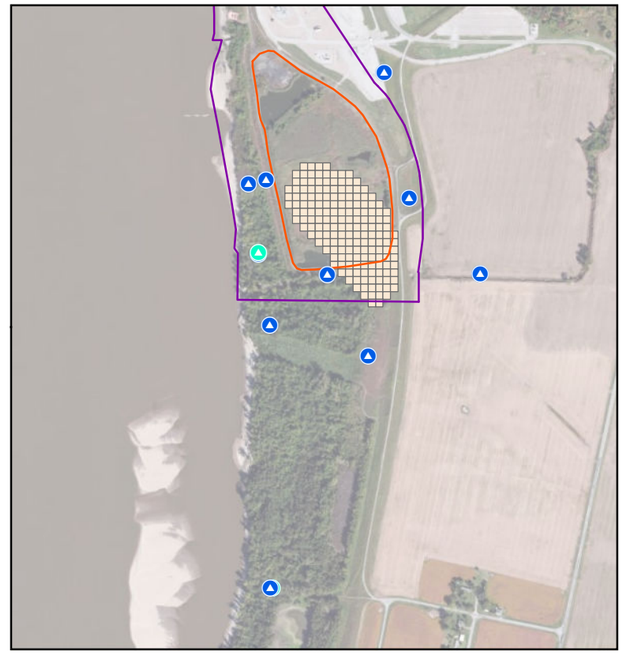
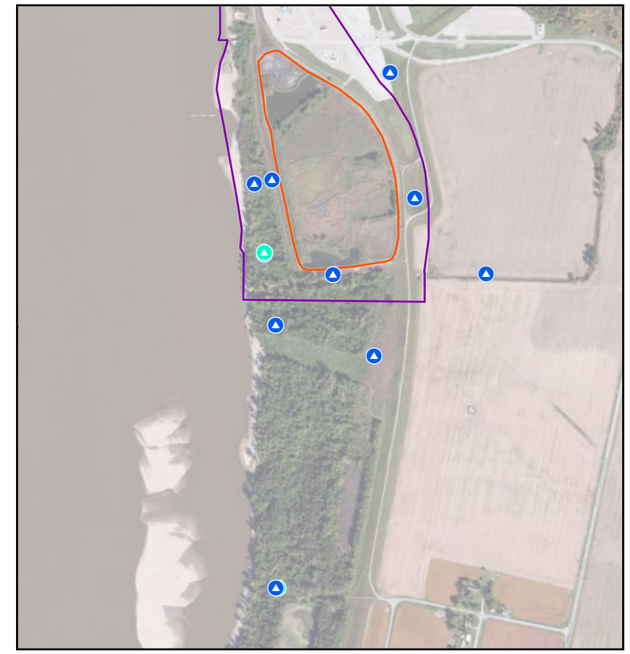
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 25



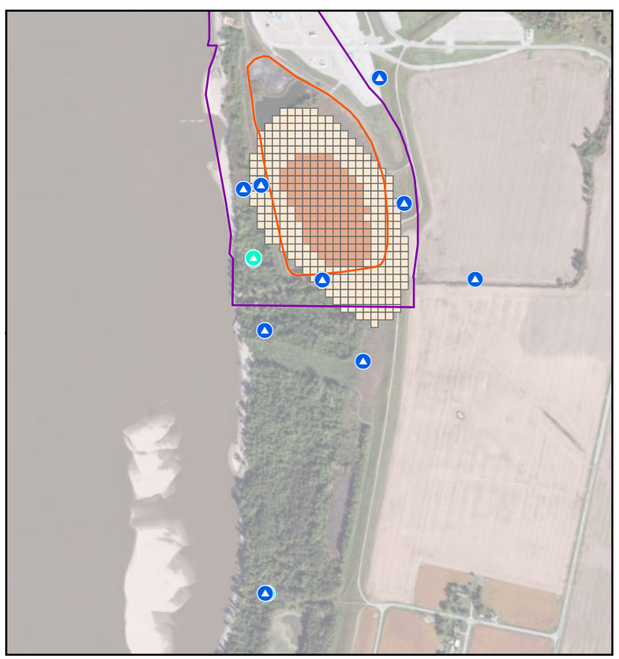
LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 25



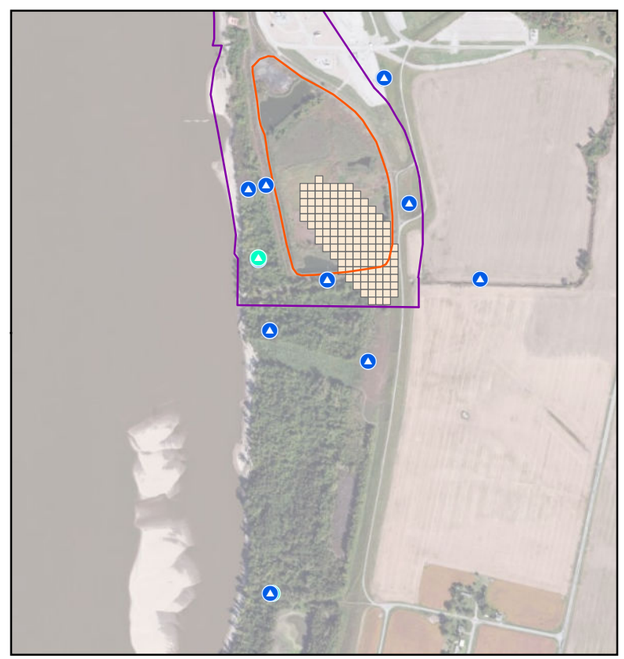
LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 25



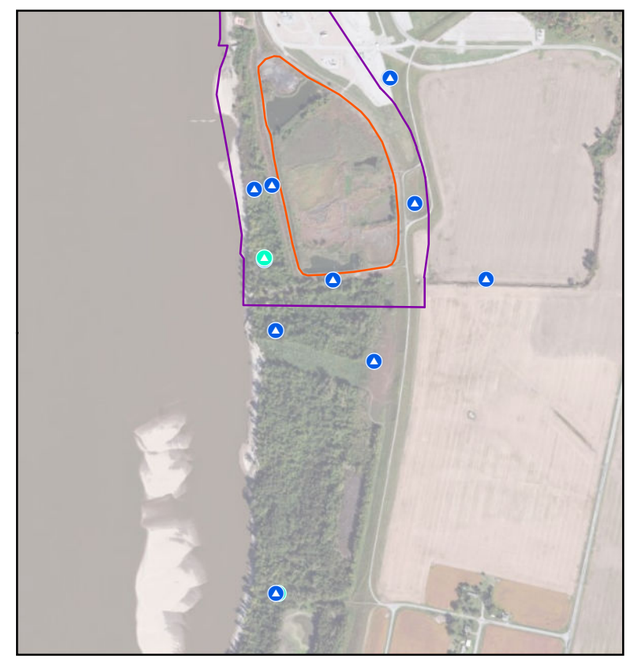
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 30

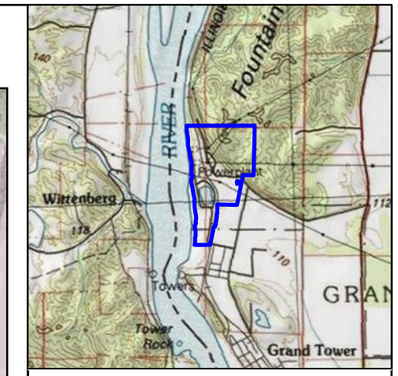


LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 30



LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 30





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 28
Molybdenum Model Results
25 & 30 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

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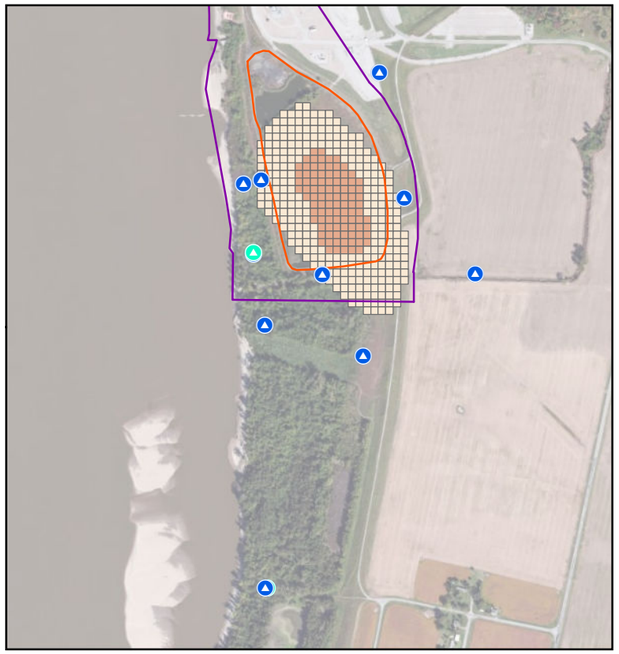
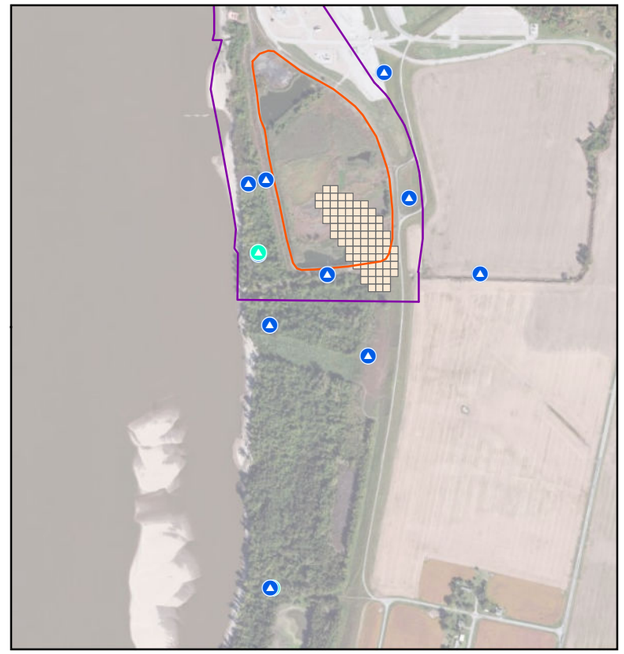
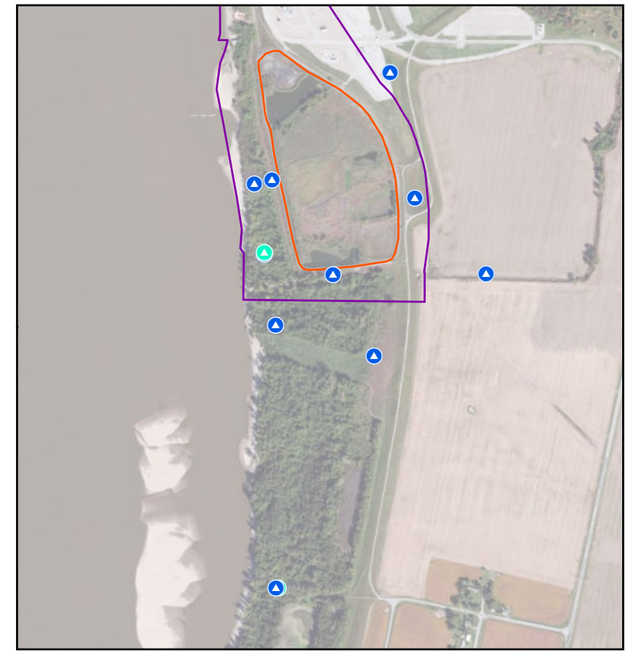
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 35



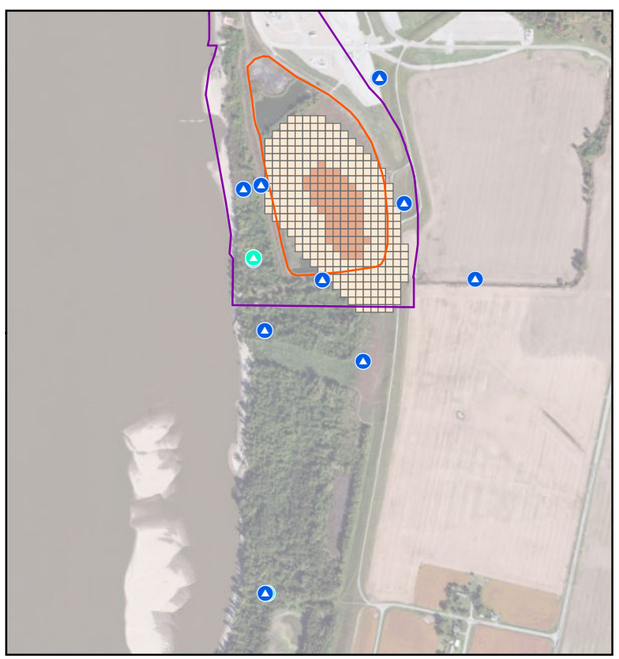
LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 35



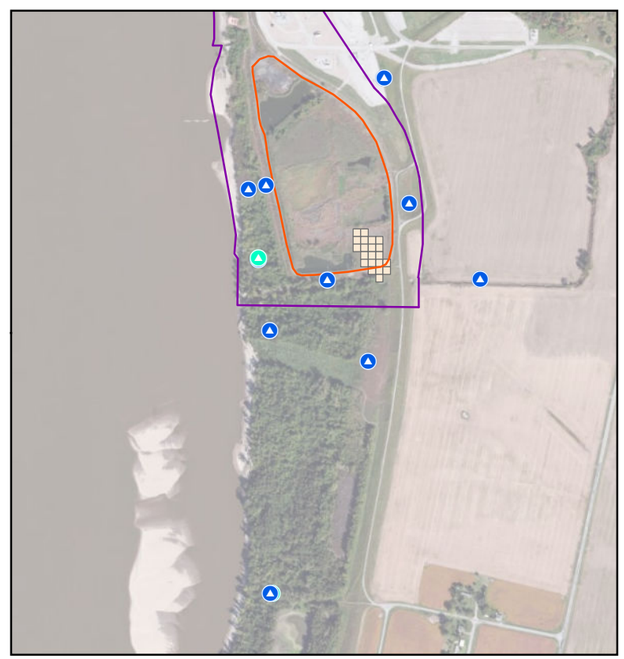
LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 35



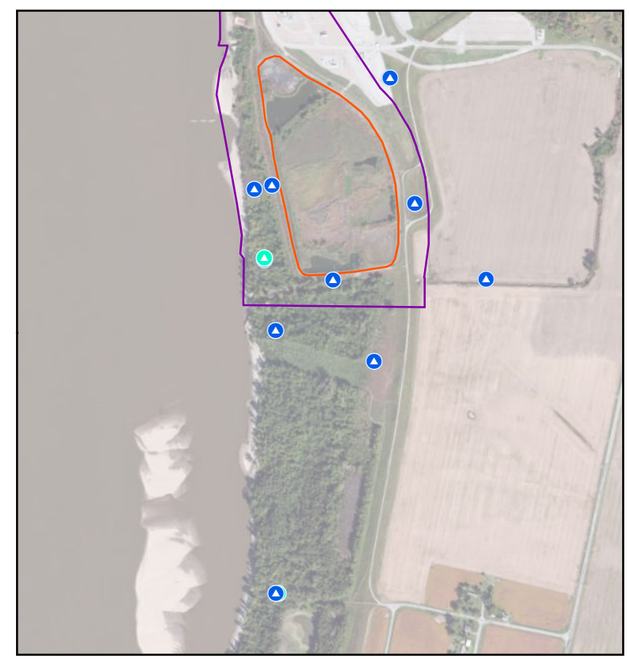
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 40

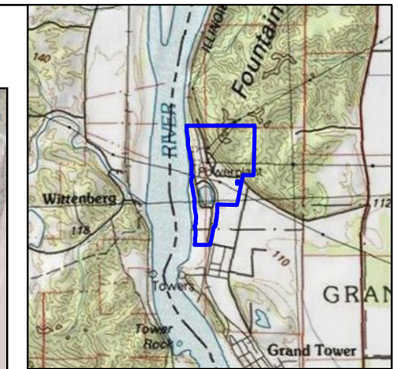


LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 40



LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 40





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 29
Molybdenum Model Results
35 & 40 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

Environmental Resources Management
www.erm.com ERM

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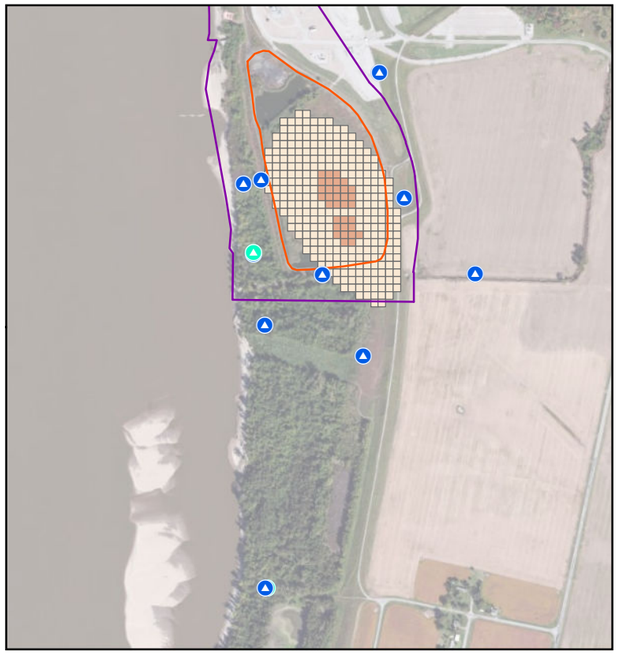
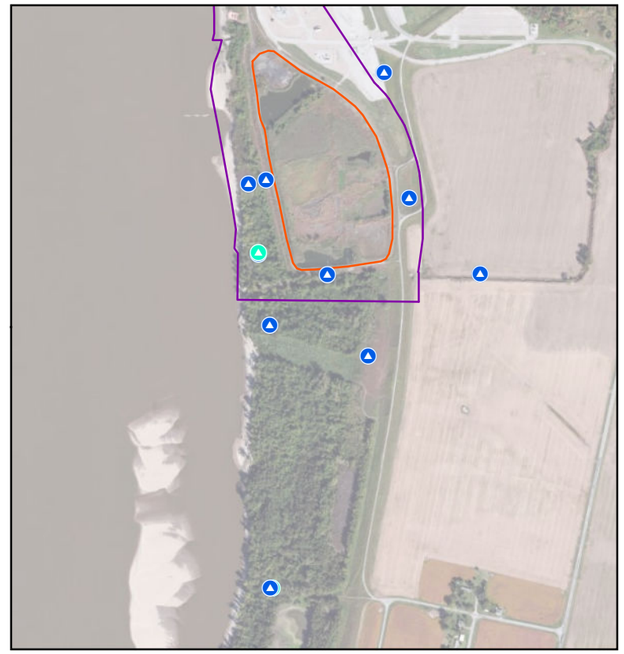
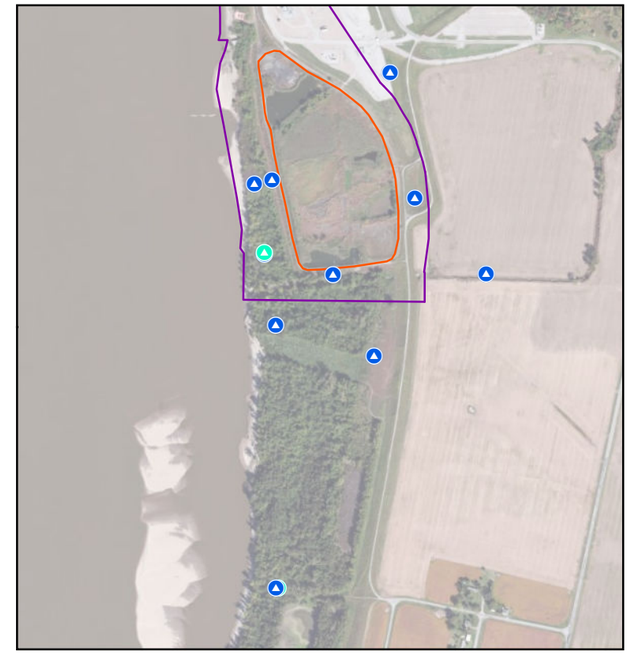
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 45



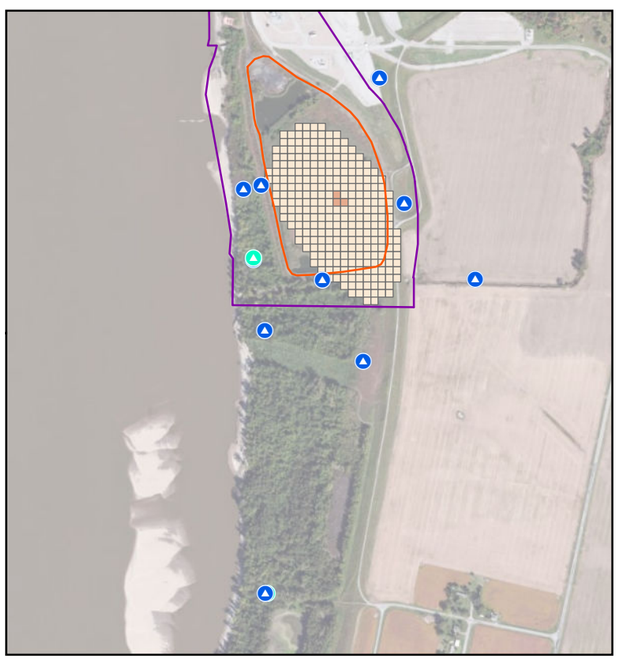
LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 45



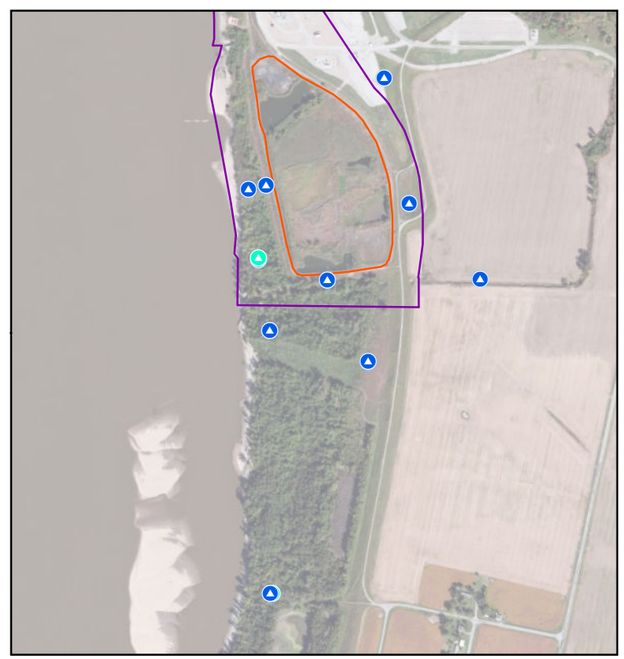
LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 45



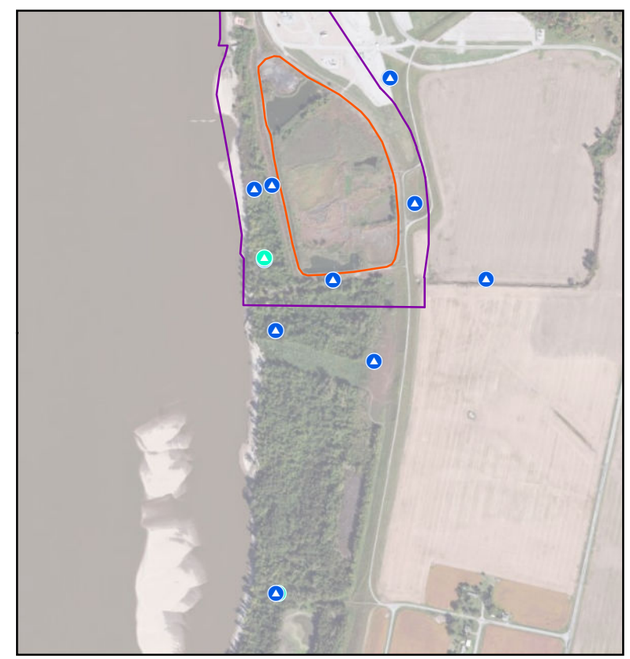
LAYER 4 (Beginning of Saturated Zone-Upper Henry)
Molybdenum Modeled Results - Year 50

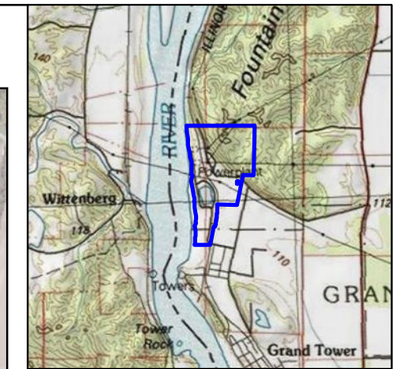


LAYER 5 (Lower Henry Formation)
Molybdenum Modeled Results - Year 50



LAYER 6 (Bedrock)
Molybdenum Modeled Results - Year 50





Legend

- Shallow Well
- Deep Well
- Proposed Groundwater Management Zone
- Inactive Ash Basin

Molybdenum Modeled Concentration (EPA Tapwater Standard = 0.10)

- 0.10 - 0.25 mg/L
- 0.25 - 0.40 mg/L
- 0.40 - 0.55 mg/L
- > 0.55 mg/L

All concentrations shown in milligrams per liter (mg/L).
Concentrations shown for wells screened within each Layer.
The saturated zone of the model begins at Layer 4.

N

0 500 1,000 1,500 Feet

Figure 30
Molybdenum Model Results
45 & 50 Years Post-Cap
Grand Tower Energy Center
Grand Tower
Jackson County, Illinios

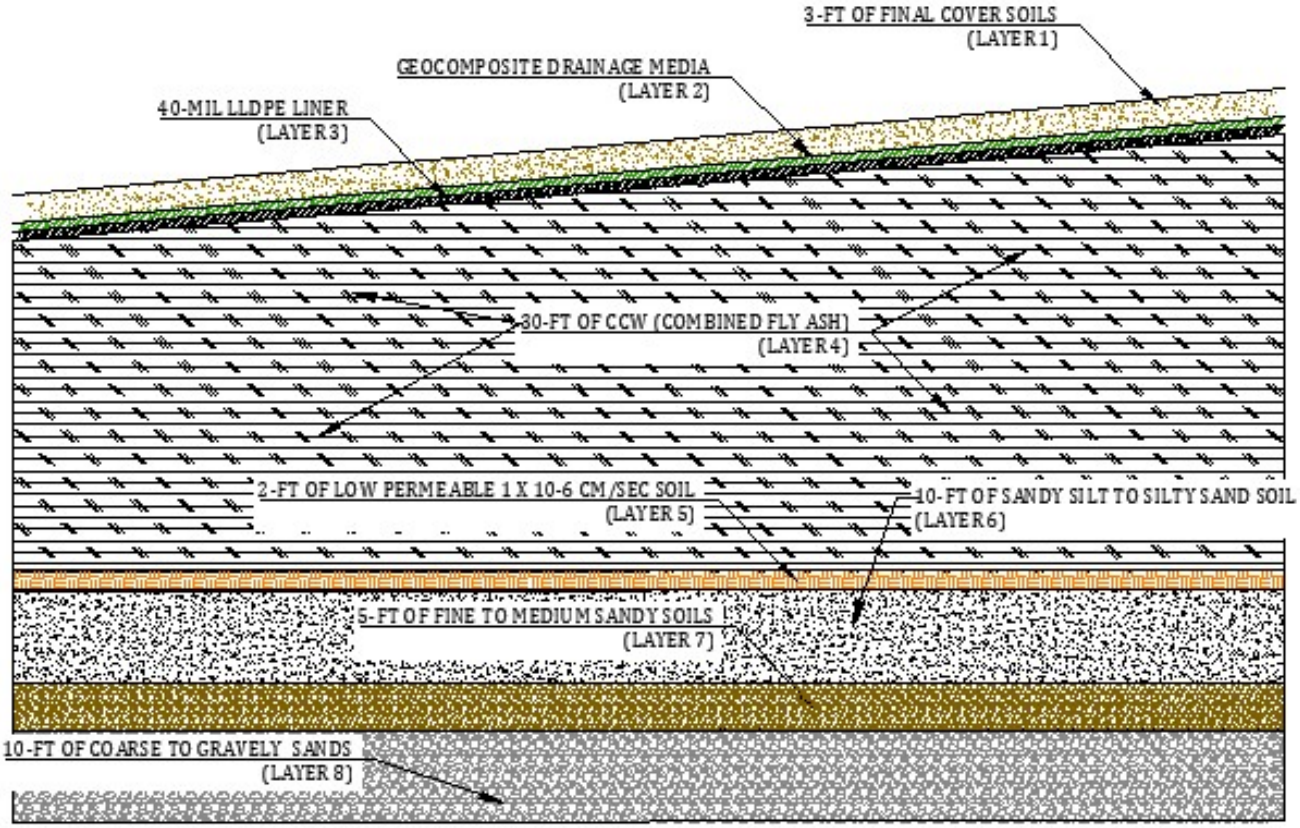
Environmental Resources Management
www.erm.com ERM

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

APPENDIX A HELP MODEL

HELP MODEL INPUT INFORMATION

TYPICAL CROSS SECTION OF CLOSED/CAPPED CCW WASTE WITH CORRESPONDING HELP MODEL LAYER #'S



RESULTS FROM 30-YEAR HELP MODEL SIMULATION:

AVERAGE ANNUAL PERCOLATION/LEAKAGE THROUGH LAYER 5 = 4.4 CF OR 33 GAL.

PEAK DAILY PERCOLATION/LEAKAGE THROUGH LAYER 5 = 0.36 CF OR 2.7 GAL.

30-YR HELP MODEL SIMULATION OUTPUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\GTDATA4.D4
TEMPERATURE DATA FILE:      C:\GTDATA7.D7
SOLAR RADIATION DATA FILE:  C:\GTDATA13.D13
EVAPOTRANSPIRATION DATA:    c:\GTDATA11.D11
SOIL AND DESIGN DATA FILE:  C:\GT30DGN.D10
OUTPUT DATA FILE:           c:\GTREV1.OUT


TIME:   8:22     DATE:   6/12/2019


******************************************************************************

     TITLE:  Grand Tower 30 Year Capped

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
          THICKNESS                  =     36.00   INCHES
          POROSITY                   =      0.4730 VOL/VOL
          FIELD CAPACITY             =      0.2220 VOL/VOL
```

```
  WILTING POINT               =      0.1040 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.2644 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                        LAYER  2
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  20
  THICKNESS                   =      0.25   INCHES
  POROSITY                    =      0.8500 VOL/VOL
  FIELD CAPACITY              =      0.0100 VOL/VOL
  WILTING POINT               =      0.0050 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =   10.0000000000     CM/SEC
  SLOPE                       =      5.00   PERCENT
  DRAINAGE LENGTH             =    300.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
  THICKNESS                   =      0.05   INCHES
  POROSITY                    =      0.0000 VOL/VOL
  FIELD CAPACITY              =      0.0000 VOL/VOL
  WILTING POINT               =      0.0000 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
  FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
  FML INSTALLATION DEFECTS    =      1.00   HOLES/ACRE
  FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  30
  THICKNESS                   =    360.00   INCHES
  POROSITY                    =      0.5410 VOL/VOL
  FIELD CAPACITY              =      0.1870 VOL/VOL
```

```
WILTING POINT               =      0.0470 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.1870 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.499999987000E-04 CM/SEC


                       LAYER  5
                       --------

             TYPE 3 - BARRIER SOIL LINER
             MATERIAL TEXTURE NUMBER  28
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4520 VOL/VOL
FIELD CAPACITY              =      0.4110 VOL/VOL
WILTING POINT               =      0.3110 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4520 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.120000004000E-05 CM/SEC


                       LAYER  6
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
             MATERIAL TEXTURE NUMBER   9
THICKNESS                   =    120.00   INCHES
POROSITY                    =      0.5010 VOL/VOL
FIELD CAPACITY              =      0.2840 VOL/VOL
WILTING POINT               =      0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2840 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.190000006000E-03 CM/SEC


                       LAYER  7
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
             MATERIAL TEXTURE NUMBER   6
THICKNESS                   =     60.00   INCHES
POROSITY                    =      0.4530 VOL/VOL
FIELD CAPACITY              =      0.1900 VOL/VOL
WILTING POINT               =      0.0850 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.1900 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.720000011000E-03 CM/SEC
```

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 3

THICKNESS	=	120.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.0830	VOL/VOL
WILTING POINT	=	0.0330	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0830	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.310000009000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	75.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	14.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.366	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.460	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.080	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	143.129	INCHES
TOTAL INITIAL WATER	=	143.129	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EAST ST. LOUIS ILLINOIS

STATION LATITUDE	=	38.80	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	97	
END OF GROWING SEASON (JULIAN DATE)	=	300	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.40	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	73.00	%

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 67.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 74.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ST. LOUIS MISSOURI

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.72	2.14	3.28	3.55	3.54	3.73
3.63	2.55	2.70	2.32	2.53	2.22

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EAST ST. LOUIS ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
29.80	34.60	43.80	56.20	65.20	74.10
77.70	75.70	69.00	57.60	44.90	35.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EAST ST. LOUIS ILLINOIS
AND STATION LATITUDE = 38.80 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.98	1.06	3.57	2.17	2.13	5.39
	2.13	2.72	2.99	3.19	0.66	3.66
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION	1.055	1.610	2.372	3.017	2.472	5.809
	2.539	2.722	2.911	1.503	1.304	0.827
LATERAL DRAINAGE COLLECTED	0.9755	0.3783	0.1522	0.6072	0.2707	0.0575
FROM LAYER 2	0.0004	0.0005	0.0002	0.0000	0.0003	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.003	0.001	0.001	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.002	0.000	0.000	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.65	1557632.750	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	28.139	1430015.620	91.81
DRAINAGE COLLECTED FROM LAYER 2	2.4429	124145.766	7.97

PERC./LEAKAGE THROUGH LAYER 3	0.000046	2.336	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0007		
PERC./LEAKAGE THROUGH LAYER 5	0.000046	2.336	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000049	2.493	0.00
CHANGE IN WATER STORAGE	0.068	3469.371	0.22
SOIL WATER AT START OF YEAR	145.373	7387877.000	
SOIL WATER AT END OF YEAR	145.442	7391346.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.481	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.74	1.99	4.17	5.70	6.14	7.59
	2.25	1.03	0.73	4.89	1.23	1.13
RUNOFF	0.242	0.553	2.206	0.020	0.009	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.693	0.410	1.792	4.447	5.114	7.011
	2.787	1.030	0.685	1.468	1.490	0.789
LATERAL DRAINAGE COLLECTED	1.0418	0.2671	2.1530	1.7811	2.1121	1.1207
FROM LAYER 2	0.5990	0.1767	0.0000	0.0120	0.6602	0.4247
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.001	0.007	0.006	0.007	0.004
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.002	0.001
STD. DEVIATION OF DAILY	0.002	0.000	0.009	0.004	0.008	0.002
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.001	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.59	2011963.750	100.00
RUNOFF	3.030	153989.937	7.65
EVAPOTRANSPIRATION	27.715	1408466.620	70.00
DRAINAGE COLLECTED FROM LAYER 2	10.3483	525898.250	26.14
PERC./LEAKAGE THROUGH LAYER 3	0.000171	8.710	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0030		
PERC./LEAKAGE THROUGH LAYER 5	0.000171	8.708	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000159	8.082	0.00

CHANGE IN WATER STORAGE	-1.503	-76399.047	-3.80
SOIL WATER AT START OF YEAR	145.442	7391346.000	
SOIL WATER AT END OF YEAR	143.938	7314947.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.013	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.76	4.82	2.54	2.94	0.95	3.56
	6.47	2.31	3.16	1.52	3.39	1.02
RUNOFF	0.213	0.000	0.000	0.000	0.000	0.014
	0.002	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.600	1.462	2.353	3.436	1.943	3.289
	6.582	2.469	1.615	1.765	1.193	0.285
LATERAL DRAINAGE COLLECTED	0.3260	3.4406	1.3909	0.5013	0.3546	0.1008
FROM LAYER 2	0.0000	0.0002	0.0000	0.0009	0.0083	0.7655
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.013	0.005	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.009	0.003	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.44	1801061.120	100.00
RUNOFF	0.229	11655.770	0.65
EVAPOTRANSPIRATION	26.991	1371690.500	76.16
DRAINAGE COLLECTED FROM LAYER 2	6.8891	350104.781	19.44
PERC./LEAKAGE THROUGH LAYER 3	0.000113	5.718	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0021		
PERC./LEAKAGE THROUGH LAYER 5	0.000112	5.716	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000098	4.960	0.00
CHANGE IN WATER STORAGE	1.330	67604.687	3.75
SOIL WATER AT START OF YEAR	143.938	7314947.000	
SOIL WATER AT END OF YEAR	145.010	7369415.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.258	13136.189	0.73

ANNUAL WATER BUDGET BALANCE 0.0000 0.377 0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.15	1.39	3.40	4.39	3.71	4.19
	3.22	2.89	2.12	2.08	3.16	2.52
RUNOFF	0.109	0.173	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.076
EVAPOTRANSPIRATION	0.311	0.983	1.982	4.373	4.820	3.770
	3.830	2.931	2.218	1.534	1.222	0.658
LATERAL DRAINAGE COLLECTED	0.3143	1.0271	1.6560	0.7651	0.4544	0.1429
FROM LAYER 2	0.0001	0.0004	0.0000	0.0000	0.0000	0.1548
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.004	0.006	0.003	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
STD. DEVIATION OF DAILY	0.000	0.004	0.004	0.001	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.22	1739060.120	100.00
RUNOFF	0.359	18219.406	1.05
EVAPOTRANSPIRATION	28.632	1455077.120	83.67
DRAINAGE COLLECTED FROM LAYER 2	4.5153	229466.031	13.19
PERC./LEAKAGE THROUGH LAYER 3	0.000079	4.013	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0013		
PERC./LEAKAGE THROUGH LAYER 5	0.000079	4.015	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000099	5.020	0.00
CHANGE IN WATER STORAGE	0.714	36292.219	2.09
SOIL WATER AT START OF YEAR	145.010	7369415.500	
SOIL WATER AT END OF YEAR	145.572	7397950.500	
SNOW WATER AT START OF YEAR	0.258	13136.189	0.76
SNOW WATER AT END OF YEAR	0.411	20893.338	1.20
ANNUAL WATER BUDGET BALANCE	0.0000	0.224	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.51	0.74	2.69	4.65	4.12	5.22
	2.97	2.35	3.21	0.95	4.85	1.34
RUNOFF	0.125	0.006	0.000	0.000	0.000	0.009
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.190	0.633	2.718	3.849	4.874	4.884
	4.473	0.995	4.026	1.369	1.169	1.044
LATERAL DRAINAGE COLLECTED	0.2276	0.9024	0.7348	0.4146	0.6346	0.4711
FROM LAYER 2	0.2051	0.0433	0.0000	0.0000	0.0071	0.8080
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.003	0.003	0.001	0.002	0.002
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.000	0.003	0.001	0.001	0.002	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	33.60	1707551.750	100.00
RUNOFF	0.140	7126.098	0.42
EVAPOTRANSPIRATION	30.225	1536034.250	89.96
DRAINAGE COLLECTED FROM LAYER 2	4.4486	226078.469	13.24
PERC./LEAKAGE THROUGH LAYER 3	0.000081	4.134	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0013		
PERC./LEAKAGE THROUGH LAYER 5	0.000081	4.129	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000049	2.509	0.00
CHANGE IN WATER STORAGE	-1.214	-61689.074	-3.61
SOIL WATER AT START OF YEAR	145.572	7397950.500	
SOIL WATER AT END OF YEAR	144.769	7357155.000	
SNOW WATER AT START OF YEAR	0.411	20893.338	1.22
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.505	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.21	2.01	2.11	2.40	2.04	5.57
	1.77	5.60	3.77	2.81	4.86	0.54

RUNOFF	0.031	0.121	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.043	0.000
EVAPOTRANSPIRATION	0.510	1.210	2.549	3.216	3.198	4.878
	2.454	5.249	2.214	1.410	1.466	0.954
LATERAL DRAINAGE COLLECTED	1.1364	1.0134	0.7813	0.2430	0.0426	0.0057
FROM LAYER 2	0.0001	0.0057	0.0002	0.0083	2.0738	1.5246
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.004	0.003	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.007	0.005
STD. DEVIATION OF DAILY	0.003	0.003	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.006	0.003
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.69	1813766.120	100.00
RUNOFF	0.195	9925.547	0.55
EVAPOTRANSPIRATION	29.308	1489419.250	82.12

DRAINAGE COLLECTED FROM LAYER 2	6.8351	347359.844	19.15
PERC./LEAKAGE THROUGH LAYER 3	0.000114	5.789	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0020		
PERC./LEAKAGE THROUGH LAYER 5	0.000114	5.791	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000124	6.296	0.00
CHANGE IN WATER STORAGE	-0.648	-32945.840	-1.82
SOIL WATER AT START OF YEAR	144.769	7357155.000	
SOIL WATER AT END OF YEAR	144.121	7324209.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.965	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.61	2.58	4.19	1.66	4.83	4.40
	2.62	0.40	0.24	1.25	2.62	2.07
RUNOFF	0.045	1.136	0.000	0.000	0.080	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.602	0.484	2.416	3.257	3.208	6.222
	3.090	0.515	0.242	0.529	0.957	0.979
LATERAL DRAINAGE COLLECTED	0.4837	0.1575	0.7925	1.7992	0.3320	0.1698
FROM LAYER 2	0.1309	0.0006	0.0001	0.0001	0.0001	0.0092
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.003	0.006	0.001	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.003	0.004	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.47	1446845.370	100.00
RUNOFF	1.261	64083.531	4.43
EVAPOTRANSPIRATION	22.502	1143571.500	79.04
DRAINAGE COLLECTED FROM LAYER 2	3.8757	196964.000	13.61
PERC./LEAKAGE THROUGH LAYER 3	0.000069	3.501	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0011		
PERC./LEAKAGE THROUGH LAYER 5	0.000069	3.507	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		

PERC./LEAKAGE THROUGH LAYER 8	0.000073	3.687	0.00
CHANGE IN WATER STORAGE	0.831	42222.566	2.92
SOIL WATER AT START OF YEAR	144.121	7324209.000	
SOIL WATER AT END OF YEAR	144.951	7366431.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.020	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.60	4.18	2.94	5.82	2.64	2.74
	7.57	2.56	1.84	1.53	2.31	1.98
RUNOFF	0.000	0.027	0.000	0.015	0.000	0.000
	0.124	0.000	0.000	0.000	0.000	0.078
EVAPOTRANSPIRATION	1.109	1.438	2.639	4.640	2.884	3.725
	5.201	3.291	2.413	1.253	1.063	0.507
LATERAL DRAINAGE COLLECTED	1.3900	1.0842	1.3736	1.7488	1.0246	0.2438
FROM LAYER 2	0.0448	0.7137	0.2103	0.0115	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.005	0.004	0.005	0.006	0.004	0.001
TOP OF LAYER 3	0.000	0.002	0.001	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.004	0.003	0.002	0.008	0.002	0.000
HEAD ON TOP OF LAYER 3	0.000	0.002	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.71	1916422.370	100.00
RUNOFF	0.245	12455.164	0.65
EVAPOTRANSPIRATION	30.162	1532846.250	79.98
DRAINAGE COLLECTED FROM LAYER 2	7.8453	398696.312	20.80
PERC./LEAKAGE THROUGH LAYER 3	0.000132	6.714	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0023		
PERC./LEAKAGE THROUGH LAYER 5	0.000132	6.714	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000128	6.485	0.00
CHANGE IN WATER STORAGE	-0.543	-27582.041	-1.44
SOIL WATER AT START OF YEAR	144.951	7366431.500	
SOIL WATER AT END OF YEAR	144.409	7338849.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.175	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.17	1.87	2.36	4.90	2.47	4.46
	3.89	2.51	2.28	2.23	3.92	1.89
RUNOFF	1.118	1.036	1.134	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.032	0.000
EVAPOTRANSPIRATION	0.177	0.340	1.378	3.518	3.907	3.847
	4.465	2.913	1.339	1.400	0.900	0.503
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	1.0024	0.7605	1.3784	0.4349
FROM LAYER 2	0.1416	0.0006	0.0000	0.0000	0.0004	1.7423
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.003	0.003	0.005	0.002
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.006
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.002	0.003	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.95	1776159.000	100.00
RUNOFF	3.320	168724.281	9.50
EVAPOTRANSPIRATION	24.688	1254642.250	70.64
DRAINAGE COLLECTED FROM LAYER 2	5.4612	277536.562	15.63
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.656	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0016		
PERC./LEAKAGE THROUGH LAYER 5	0.000091	4.648	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000101	5.108	0.00
CHANGE IN WATER STORAGE	1.481	75250.742	4.24
SOIL WATER AT START OF YEAR	144.409	7338849.500	
SOIL WATER AT END OF YEAR	145.411	7389806.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.478	24294.266	1.37
ANNUAL WATER BUDGET BALANCE	0.0000	0.022	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.93	1.12	2.97	3.94	3.29	1.98
	5.28	0.89	2.36	2.85	1.96	3.66
RUNOFF	0.862	0.000	0.000	0.000	0.000	0.000
	0.006	0.000	0.000	0.000	0.000	0.048
EVAPOTRANSPIRATION	0.165	1.320	2.434	4.085	3.477	2.857
	4.343	1.829	2.192	1.621	0.960	0.765
LATERAL DRAINAGE COLLECTED	0.4727	2.0718	0.6051	0.4951	0.5932	0.1833
FROM LAYER 2	0.0000	0.0000	0.0000	0.0001	0.0000	0.9020
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.008	0.002	0.002	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.006	0.001	0.002	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.23	1637928.750	100.00
RUNOFF	0.916	46550.125	2.84
EVAPOTRANSPIRATION	26.049	1323818.000	80.82
DRAINAGE COLLECTED FROM LAYER 2	5.3231	270519.937	16.52
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.661	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0016		
PERC./LEAKAGE THROUGH LAYER 5	0.000092	4.653	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000078	3.983	0.00
CHANGE IN WATER STORAGE	-0.058	-2963.785	-0.18
SOIL WATER AT START OF YEAR	145.411	7389806.000	
SOIL WATER AT END OF YEAR	145.514	7394998.500	
SNOW WATER AT START OF YEAR	0.478	24294.266	1.48
SNOW WATER AT END OF YEAR	0.318	16138.057	0.99
ANNUAL WATER BUDGET BALANCE	0.0000	0.482	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.27	2.35	1.84	2.13	4.80	4.83

	1.27	3.10	2.48	2.50	1.70	4.27
RUNOFF	0.178	0.676	0.000	0.000	0.000	0.201
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.384	0.511	3.117	1.967	3.973	5.348
	2.629	2.711	1.349	1.696	1.498	0.859
LATERAL DRAINAGE COLLECTED	0.4674	0.4343	2.3114	0.4655	0.1566	0.0003
FROM LAYER 2	0.0005	0.0003	0.0013	0.0000	0.0103	0.8712
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.002	0.008	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.004	0.006	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.004
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.54	1653682.620	100.00
RUNOFF	1.055	53612.176	3.24

EVAPOTRANSPIRATION	26.043	1323481.620	80.03
DRAINAGE COLLECTED FROM LAYER 2	4.7190	239819.469	14.50
PERC./LEAKAGE THROUGH LAYER 3	0.000079	4.033	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0014		
PERC./LEAKAGE THROUGH LAYER 5	0.000079	4.034	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.307	0.00
CHANGE IN WATER STORAGE	0.723	36765.367	2.22
SOIL WATER AT START OF YEAR	145.514	7394998.500	
SOIL WATER AT END OF YEAR	145.533	7395994.500	
SNOW WATER AT START OF YEAR	0.318	16138.057	0.98
SNOW WATER AT END OF YEAR	1.021	51907.746	3.14
ANNUAL WATER BUDGET BALANCE	0.0000	-0.346	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.53	1.47	1.97	1.10	7.85	1.55
	3.35	2.49	1.92	2.13	1.91	1.38
RUNOFF	0.196	0.387	0.000	0.000	0.009	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.629	0.317	2.638	2.073	5.891	3.673
	3.301	2.352	1.483	1.428	1.420	0.984
LATERAL DRAINAGE COLLECTED	0.6609	0.1823	1.5629	0.3866	0.1219	0.4897
FROM LAYER 2	0.2310	0.0204	0.0001	0.0000	0.0100	0.2858

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.005	0.001	0.000	0.002
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.001
STD. DEVIATION OF DAILY	0.001	0.000	0.004	0.001	0.000	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.65	1405173.370	100.00
RUNOFF	0.591	30049.133	2.14
EVAPOTRANSPIRATION	26.190	1330969.370	94.72
DRAINAGE COLLECTED FROM LAYER 2	3.9517	200824.312	14.29
PERC./LEAKAGE THROUGH LAYER 3	0.000073	3.703	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0011		
PERC./LEAKAGE THROUGH LAYER 5	0.000073	3.716	0.00

AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.299	0.00
CHANGE IN WATER STORAGE	-3.083	-156674.719	-11.15
SOIL WATER AT START OF YEAR	145.533	7395994.500	
SOIL WATER AT END OF YEAR	143.458	7290518.000	
SNOW WATER AT START OF YEAR	1.021	51907.746	3.69
SNOW WATER AT END OF YEAR	0.014	709.195	0.05
ANNUAL WATER BUDGET BALANCE	0.0000	0.999	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.59	0.56	1.38	3.97	2.81	1.96
	1.67	5.05	4.35	2.72	0.06	2.30
RUNOFF	0.000	0.003	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.944	0.043	2.152	3.370	3.549	3.025
	1.460	4.422	3.912	1.764	1.186	0.737
LATERAL DRAINAGE COLLECTED	0.1088	0.0000	0.0011	0.0005	0.0499	0.0106
FROM LAYER 2	0.0001	0.0000	0.0044	0.1739	0.0010	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.42	1393484.370	100.00
RUNOFF	0.003	143.992	0.01
EVAPOTRANSPIRATION	26.563	1349925.870	96.87
DRAINAGE COLLECTED FROM LAYER 2	0.3503	17804.482	1.28
PERC./LEAKAGE THROUGH LAYER 3	0.000008	0.421	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 5	0.000008	0.423	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.504	25610.408	1.84
SOIL WATER AT START OF YEAR	143.458	7290518.000	
SOIL WATER AT END OF YEAR	143.976	7316837.500	

SNOW WATER AT START OF YEAR	0.014	709.195	0.05
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.406	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.06	2.03	3.57	2.50	1.67	4.08
	1.12	1.63	4.21	1.11	3.68	2.09
RUNOFF	0.000	0.297	0.000	0.000	0.000	0.002
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.300	0.392	2.888	2.336	2.481	4.740
	1.433	1.618	2.531	1.946	1.177	0.924
LATERAL DRAINAGE COLLECTED	0.0002	0.0000	1.7931	0.6379	0.2089	0.0065
FROM LAYER 2	0.0000	0.0000	0.0011	0.0000	0.0000	0.7433
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.006	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.001	0.000	0.000

HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.75	1410255.250	100.00
RUNOFF	0.299	15171.110	1.08
EVAPOTRANSPIRATION	22.766	1156968.750	82.04
DRAINAGE COLLECTED FROM LAYER 2	3.3910	172332.500	12.22
PERC./LEAKAGE THROUGH LAYER 3	0.000058	2.930	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0010		
PERC./LEAKAGE THROUGH LAYER 5	0.000058	2.924	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000088	4.453	0.00
CHANGE IN WATER STORAGE	1.294	65777.805	4.66
SOIL WATER AT START OF YEAR	143.976	7316837.500	
SOIL WATER AT END OF YEAR	145.236	7380895.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.034	1720.071	0.12
ANNUAL WATER BUDGET BALANCE	0.0000	0.584	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.66	1.86	3.69	2.36	1.63	9.51
	0.68	3.44	3.50	0.35	0.24	2.62
RUNOFF	0.234	0.451	0.000	0.000	0.000	0.488
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.397	0.561	2.706	3.927	2.116	6.804
	0.680	2.502	3.362	1.423	0.164	0.527
LATERAL DRAINAGE COLLECTED	0.5616	0.1950	1.6504	1.1481	0.3153	2.1999
FROM LAYER 2	0.5723	0.1663	0.0004	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.006	0.004	0.001	0.008
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.004	0.002	0.000	0.009
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.54	1602863.250	100.00
RUNOFF	1.174	59638.680	3.72
EVAPOTRANSPIRATION	25.170	1279117.120	79.80
DRAINAGE COLLECTED FROM LAYER 2	6.8094	346052.562	21.59
PERC./LEAKAGE THROUGH LAYER 3	0.000114	5.806	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0020		
PERC./LEAKAGE THROUGH LAYER 5	0.000114	5.812	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.781	0.00
CHANGE IN WATER STORAGE	-1.613	-81951.406	-5.11
SOIL WATER AT START OF YEAR	145.236	7380895.500	
SOIL WATER AT END OF YEAR	143.657	7300664.000	
SNOW WATER AT START OF YEAR	0.034	1720.071	0.11
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.518	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	1.60	2.52	3.94	4.93	1.26	2.83
	6.92	1.69	3.82	2.86	0.61	1.13
RUNOFF	0.000	1.231	0.713	0.000	0.000	0.000
	0.157	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.694	0.247	2.513	3.339	3.434	2.911
	5.051	3.383	3.014	1.467	0.955	0.900
LATERAL DRAINAGE COLLECTED	0.0916	0.1468	1.8954	0.6256	1.0007	0.3191
FROM LAYER 2	0.0908	0.0000	0.0000	0.0000	0.0000	0.0042
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.001	0.006	0.002	0.003	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.001	0.002	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.11	1733470.250	100.00

RUNOFF	2.100	106738.023	6.16
EVAPOTRANSPIRATION	27.907	1418256.500	81.82
DRAINAGE COLLECTED FROM LAYER 2	4.1743	212135.422	12.24
PERC./LEAKAGE THROUGH LAYER 3	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0012		
PERC./LEAKAGE THROUGH LAYER 5	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000036	1.821	0.00
CHANGE IN WATER STORAGE	-0.072	-3662.458	-0.21
SOIL WATER AT START OF YEAR	143.657	7300664.000	
SOIL WATER AT END OF YEAR	143.585	7297001.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.929	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.17	2.44	3.18	3.45	1.75	2.16
	1.07	1.10	0.60	1.50	0.43	2.76
RUNOFF	0.000	1.105	0.741	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.729	0.644	2.734	3.639	2.570	2.703
	1.014	0.911	0.812	1.535	0.173	0.790

LATERAL DRAINAGE COLLECTED	0.0151	0.0890	1.5767	0.5105	0.1668	0.0245
FROM LAYER 2	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.005	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.001	0.004	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.61	1149040.370	100.00
RUNOFF	1.846	93797.977	8.16
EVAPOTRANSPIRATION	18.253	927606.625	80.73
DRAINAGE COLLECTED FROM LAYER 2	2.3828	121091.648	10.54
PERC./LEAKAGE THROUGH LAYER 3	0.000042	2.124	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0007		

PERC./LEAKAGE THROUGH LAYER 5	0.000042	2.124	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000038	1.913	0.00
CHANGE IN WATER STORAGE	0.129	6542.278	0.57
SOIL WATER AT START OF YEAR	143.585	7297001.500	
SOIL WATER AT END OF YEAR	143.293	7282143.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.421	21400.707	1.86
ANNUAL WATER BUDGET BALANCE	0.0000	-0.106	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.40	2.85	3.11	4.06	4.06	9.18
	1.84	2.80	3.42	1.56	4.17	4.40
RUNOFF	0.015	0.001	1.789	0.000	0.000	0.065
	0.000	0.000	0.000	0.000	0.034	0.004
EVAPOTRANSPIRATION	0.474	0.404	2.208	3.802	4.301	7.659
	4.264	2.909	2.644	1.170	1.201	0.694
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.6897	0.7707	0.2341	0.0545
FROM LAYER 2	0.6051	0.2461	0.0337	0.0000	0.0012	3.5051
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.002	0.003	0.001	0.000
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.000	0.012
STD. DEVIATION OF DAILY	0.000	0.000	0.003	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.011
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.85	2126817.000	100.00
RUNOFF	1.908	96974.906	4.56
EVAPOTRANSPIRATION	31.731	1612559.370	75.82
DRAINAGE COLLECTED FROM LAYER 2	6.1404	312054.281	14.67
PERC./LEAKAGE THROUGH LAYER 3	0.000100	5.084	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0018		
PERC./LEAKAGE THROUGH LAYER 5	0.000099	5.055	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000155	7.867	0.00
CHANGE IN WATER STORAGE	2.070	105221.242	4.95
SOIL WATER AT START OF YEAR	143.293	7282143.000	

SOIL WATER AT END OF YEAR	145.784	7408765.000	
SNOW WATER AT START OF YEAR	0.421	21400.707	1.01
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.563	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.69	1.92	3.72	4.18	2.29	5.62
	3.63	2.36	4.06	0.74	0.40	2.87
RUNOFF	0.219	0.138	0.027	0.000	0.000	0.136
	0.000	0.000	0.030	0.000	0.000	0.006
EVAPOTRANSPIRATION	0.619	0.731	1.943	4.685	2.756	5.948
	4.240	2.517	1.267	1.598	1.179	0.732
LATERAL DRAINAGE COLLECTED	1.4948	0.5340	1.0660	2.0457	0.4490	0.1595
FROM LAYER 2	0.0003	0.0000	0.0000	0.0347	0.1269	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.005	0.002	0.004	0.007	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.003	0.002	0.004	0.004	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	33.48	1701453.370	100.00
RUNOFF	0.557	28311.867	1.66
EVAPOTRANSPIRATION	28.214	1433820.250	84.27
DRAINAGE COLLECTED FROM LAYER 2	5.9113	300410.062	17.66
PERC./LEAKAGE THROUGH LAYER 3	0.000100	5.104	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000101	5.133	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000074	3.780	0.00
CHANGE IN WATER STORAGE	-1.202	-61093.184	-3.59
SOIL WATER AT START OF YEAR	145.784	7408765.000	
SOIL WATER AT END OF YEAR	144.582	7347672.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.648	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.25	1.22	1.19	1.45	3.65	3.42
	5.50	3.01	6.23	5.38	1.21	3.14
RUNOFF	0.338	0.000	0.003	0.000	0.000	0.000
	0.000	0.000	0.000	0.032	0.000	0.000
EVAPOTRANSPIRATION	0.265	1.334	1.644	2.012	3.911	4.368
	5.476	3.020	2.592	1.899	1.165	1.292
LATERAL DRAINAGE COLLECTED	0.2781	1.2462	0.4270	0.2826	0.1367	0.0299
FROM LAYER 2	0.0131	0.0003	0.0002	0.6101	3.5629	0.9736
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.005	0.001	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.002	0.013	0.003
STD. DEVIATION OF DAILY	0.000	0.003	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.015	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.65	1913373.120	100.00
RUNOFF	0.373	18977.084	0.99
EVAPOTRANSPIRATION	28.979	1472718.000	76.97
DRAINAGE COLLECTED FROM LAYER 2	7.5608	384238.187	20.08
PERC./LEAKAGE THROUGH LAYER 3	0.000124	6.293	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0022		
PERC./LEAKAGE THROUGH LAYER 5	0.000123	6.275	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000124	6.323	0.00
CHANGE IN WATER STORAGE	0.737	37433.379	1.96
SOIL WATER AT START OF YEAR	144.582	7347672.000	
SOIL WATER AT END OF YEAR	145.319	7385105.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.087	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.37	0.96	3.65	2.76	2.54	6.66
	4.14	3.21	1.29	0.34	3.64	3.07
RUNOFF	0.000	0.435	0.352	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	1.039	0.344	2.762	2.954	2.815	7.094
	4.336	3.418	0.774	0.825	1.068	0.947
LATERAL DRAINAGE COLLECTED	1.1448	0.4111	2.8904	0.7240	0.2286	0.0595
FROM LAYER 2	0.1130	0.0007	0.0001	0.0000	0.0001	0.6575
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.002	0.010	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
STD. DEVIATION OF DAILY	0.002	0.001	0.007	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT

PRECIPITATION	35.63	1810716.870	100.00
RUNOFF	0.787	40007.133	2.21
EVAPOTRANSPIRATION	28.376	1442079.500	79.64
DRAINAGE COLLECTED FROM LAYER 2	6.2297	316595.531	17.48
PERC./LEAKAGE THROUGH LAYER 3	0.000105	5.311	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0018		
PERC./LEAKAGE THROUGH LAYER 5	0.000105	5.320	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000074	3.760	0.00
CHANGE IN WATER STORAGE	0.237	12030.357	0.66
SOIL WATER AT START OF YEAR	145.319	7385105.500	
SOIL WATER AT END OF YEAR	145.556	7397135.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.523	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.41	3.52	2.70	3.69	2.58	5.97
	4.36	1.73	2.50	3.52	2.55	0.83
RUNOFF	0.000	1.052	0.000	0.000	0.000	0.003
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.931	0.316	2.562	3.530	3.951	5.869

	4.418	2.056	2.246	1.604	1.280	0.879
LATERAL DRAINAGE COLLECTED	1.0254	0.3868	1.4666	0.8485	0.4154	0.1898
FROM LAYER 2	0.0086	0.0005	0.0000	0.0000	0.0002	0.4571
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.001	0.005	0.003	0.001	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
STD. DEVIATION OF DAILY	0.001	0.001	0.004	0.002	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.36	1746175.250	100.00
RUNOFF	1.055	53605.242	3.07
EVAPOTRANSPIRATION	29.642	1506410.250	86.27
DRAINAGE COLLECTED FROM LAYER 2	4.7991	243890.094	13.97
PERC./LEAKAGE THROUGH LAYER 3	0.000085	4.310	0.00

AVG. HEAD ON TOP OF LAYER 3	0.0014		
PERC./LEAKAGE THROUGH LAYER 5	0.000085	4.313	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000092	4.670	0.00
CHANGE IN WATER STORAGE	-1.136	-57734.871	-3.31
SOIL WATER AT START OF YEAR	145.556	7397135.500	
SOIL WATER AT END OF YEAR	144.261	7331320.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.159	8080.812	0.46
ANNUAL WATER BUDGET BALANCE	0.0000	-0.126	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.44	3.01	3.45	3.14	4.02	2.44
	4.32	1.37	3.20	2.36	1.60	1.06
RUNOFF	0.114	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.408	1.178	2.984	3.918	4.505	3.106
	4.312	1.349	2.251	1.903	1.252	1.026
LATERAL DRAINAGE COLLECTED	0.3531	0.5676	1.8765	0.9505	0.3612	0.1061
FROM LAYER 2	0.0004	0.0001	0.0000	0.0006	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.002	0.006	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.004	0.005	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.41	1596256.500	100.00
RUNOFF	0.114	5798.639	0.36
EVAPOTRANSPIRATION	28.194	1432811.870	89.76
DRAINAGE COLLECTED FROM LAYER 2	4.2162	214265.531	13.42
PERC./LEAKAGE THROUGH LAYER 3	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0012		
PERC./LEAKAGE THROUGH LAYER 5	0.000072	3.684	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.344	0.00
CHANGE IN WATER STORAGE	-1.114	-56624.086	-3.55

SOIL WATER AT START OF YEAR	144.261	7331320.000	
SOIL WATER AT END OF YEAR	143.305	7282777.000	
SNOW WATER AT START OF YEAR	0.159	8080.812	0.51
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.231	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.35	3.18	5.19	5.51	3.62	3.99
	4.01	0.70	4.60	4.51	1.11	1.29
RUNOFF	0.000	0.502	0.000	0.000	0.011	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.522	0.466	2.658	4.238	4.725	3.888
	4.390	0.711	2.463	1.809	1.280	0.726
LATERAL DRAINAGE COLLECTED	0.0001	0.0000	2.6746	1.6390	1.5227	0.3253
FROM LAYER 2	0.0954	0.0001	0.0002	0.0116	2.0194	0.5449
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.009	0.006	0.005	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.007	0.002
STD. DEVIATION OF DAILY	0.000	0.000	0.007	0.004	0.003	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.004	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.06	1934209.250	100.00
RUNOFF	0.513	26072.764	1.35
EVAPOTRANSPIRATION	27.877	1416716.250	73.25
DRAINAGE COLLECTED FROM LAYER 2	8.8332	448900.719	23.21
PERC./LEAKAGE THROUGH LAYER 3	0.000143	7.281	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0026		
PERC./LEAKAGE THROUGH LAYER 5	0.000143	7.278	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000145	7.386	0.00
CHANGE IN WATER STORAGE	0.837	42513.363	2.20
SOIL WATER AT START OF YEAR	143.305	7282777.000	
SOIL WATER AT END OF YEAR	144.142	7325290.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.225	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.54	0.34	4.50	4.51	4.08	5.92
	1.88	4.34	5.24	2.68	0.87	1.60
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.017
	0.000	0.000	0.000	0.000	0.000	0.081
EVAPOTRANSPIRATION	0.972	0.276	2.451	4.062	3.311	7.625
	1.949	4.028	3.167	1.571	1.367	0.802
LATERAL DRAINAGE COLLECTED	0.1615	0.4925	0.2899	2.5201	0.8096	0.3411
FROM LAYER 2	0.1034	0.0002	0.0001	0.0888	0.4940	0.4502
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.002	0.001	0.009	0.003	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.002	0.002
STD. DEVIATION OF DAILY	0.001	0.001	0.001	0.003	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.001	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000

HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.50	1905750.250	100.00
RUNOFF	0.098	4999.769	0.26
EVAPOTRANSPIRATION	31.581	1604960.000	84.22
DRAINAGE COLLECTED FROM LAYER 2	5.7514	292284.719	15.34
PERC./LEAKAGE THROUGH LAYER 3	0.000101	5.111	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000101	5.111	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000101	5.149	0.00
CHANGE IN WATER STORAGE	0.069	3500.867	0.18
SOIL WATER AT START OF YEAR	144.142	7325290.000	
SOIL WATER AT END OF YEAR	144.141	7325227.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.070	3563.679	0.19
ANNUAL WATER BUDGET BALANCE	0.0000	-0.268	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 26

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.85	2.01	2.39	2.09	3.90	1.95
	4.43	3.23	1.89	3.23	2.88	3.19
RUNOFF	1.224	1.712	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.297	1.335	2.706	2.327	4.394	2.549
	4.092	2.079	2.049	1.994	1.611	1.061
LATERAL DRAINAGE COLLECTED	0.1584	1.2960	0.6780	0.2155	0.0177	0.0047
FROM LAYER 2	0.0000	0.0028	0.0000	0.0044	0.4425	2.1200
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.005	0.002	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.002	0.007
STD. DEVIATION OF DAILY	0.000	0.005	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.001	0.005
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.04	1780732.870	100.00
RUNOFF	2.935	149170.516	8.38
EVAPOTRANSPIRATION	26.494	1346435.120	75.61
DRAINAGE COLLECTED FROM LAYER 2	4.9400	251048.500	14.10
PERC./LEAKAGE THROUGH LAYER 3	0.000083	4.231	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0015		
PERC./LEAKAGE THROUGH LAYER 5	0.000083	4.220	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.800	0.00
CHANGE IN WATER STORAGE	0.670	34073.645	1.91
SOIL WATER AT START OF YEAR	144.141	7325227.500	
SOIL WATER AT END OF YEAR	144.881	7362864.500	
SNOW WATER AT START OF YEAR	0.070	3563.679	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.753	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 27

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.39	1.33	2.46	1.95	3.55	2.96
	1.91	3.68	0.49	1.44	1.75	0.58
RUNOFF	0.000	0.027	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION	1.425	0.472	1.941	2.746	4.017	3.533
	2.114	2.950	1.228	1.380	1.082	0.897
LATERAL DRAINAGE COLLECTED	0.9212	0.2467	0.0787	0.9503	0.3590	0.1018
FROM LAYER 2	0.0018	0.0007	0.0000	0.0006	0.0001	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.003	0.001	0.000	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.000	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	23.49	1193761.750	100.00
RUNOFF	0.027	1390.530	0.12
EVAPOTRANSPIRATION	23.785	1208743.370	101.25
DRAINAGE COLLECTED FROM LAYER 2	2.6612	135243.359	11.33

PERC./LEAKAGE THROUGH LAYER 3	0.000050	2.518	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0008		
PERC./LEAKAGE THROUGH LAYER 5	0.000050	2.530	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-2.983	-151616.312	-12.70
SOIL WATER AT START OF YEAR	144.881	7362864.500	
SOIL WATER AT END OF YEAR	141.898	7211248.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.885	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.78	3.09	3.88	4.57	4.52	4.01
	5.81	6.25	2.70	0.97	2.45	0.42
RUNOFF	0.000	0.574	0.722	0.379	0.000	0.000
	0.024	0.052	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.674	0.675	0.970	3.345	5.219	4.678
	5.356	4.791	4.052	1.317	1.025	0.578
LATERAL DRAINAGE COLLECTED	0.0000	0.0067	2.0917	2.8878	0.4687	0.2560
FROM LAYER 2	0.0725	0.0000	0.0001	0.0021	0.0048	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.007	0.010	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.004	0.012	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.45	2106488.750	100.00
RUNOFF	1.751	88978.602	4.22
EVAPOTRANSPIRATION	32.680	1660797.000	78.84
DRAINAGE COLLECTED FROM LAYER 2	5.7903	294265.125	13.97
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.689	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000092	4.689	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.769	0.00

CHANGE IN WATER STORAGE	1.229	62442.469	2.96
SOIL WATER AT START OF YEAR	141.898	7211248.500	
SOIL WATER AT END OF YEAR	143.127	7273691.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.153	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 29

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.32	4.01	3.51	2.71	4.02	3.12
	4.04	2.02	0.87	1.52	3.11	0.54
RUNOFF	0.018	2.028	0.390	0.000	0.016	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.576	0.225	2.379	2.830	4.074	4.657
	3.538	2.518	0.833	1.048	0.836	0.666
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	1.9095	0.9163	0.2334	0.0775
FROM LAYER 2	0.0008	0.0022	0.0000	0.0001	0.0002	0.0959
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.007	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.79	1564748.250	100.00
RUNOFF	2.452	124599.914	7.96
EVAPOTRANSPIRATION	24.179	1228796.870	78.53
DRAINAGE COLLECTED FROM LAYER 2	3.2359	164448.281	10.51
PERC./LEAKAGE THROUGH LAYER 3	0.000055	2.797	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0009		
PERC./LEAKAGE THROUGH LAYER 5	0.000055	2.793	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000042	2.132	0.00
CHANGE IN WATER STORAGE	0.923	46900.867	3.00
SOIL WATER AT START OF YEAR	143.127	7273691.000	
SOIL WATER AT END OF YEAR	144.049	7320591.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 0.146 0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.49	1.98	2.50	1.59	6.25	5.30
	1.16	3.20	2.30	0.76	1.44	2.53
RUNOFF	0.000	0.449	0.076	0.000	0.001	0.034
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.127	0.456	2.548	2.035	4.409	7.505
	1.447	3.033	2.466	0.688	0.748	0.748
LATERAL DRAINAGE COLLECTED	0.2415	0.0285	0.8995	0.8515	0.2771	0.2410
FROM LAYER 2	0.2073	0.0000	0.0005	0.0001	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.000	0.003	0.003	0.001	0.001
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.003	0.001	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.50	1499190.120	100.00
RUNOFF	0.560	28449.311	1.90
EVAPOTRANSPIRATION	26.210	1331989.620	88.85
DRAINAGE COLLECTED FROM LAYER 2	2.7471	139605.672	9.31
PERC./LEAKAGE THROUGH LAYER 3	0.000051	2.593	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0008		
PERC./LEAKAGE THROUGH LAYER 5	0.000051	2.596	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000041	2.076	0.00
CHANGE IN WATER STORAGE	-0.017	-856.874	-0.06
SOIL WATER AT START OF YEAR	144.049	7320591.500	
SOIL WATER AT END OF YEAR	144.033	7319735.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.274	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56	2.15	3.09	3.37	3.44	4.42
	3.38	2.66	2.75	2.18	2.16	2.06
STD. DEVIATIONS	0.95	1.09	0.92	1.36	1.56	2.04
	1.87	1.38	1.45	1.28	1.38	1.14
RUNOFF						
TOTALS	0.176	0.471	0.272	0.014	0.004	0.032
	0.010	0.002	0.001	0.001	0.004	0.010
STD. DEVIATIONS	0.321	0.552	0.557	0.069	0.015	0.097
	0.036	0.009	0.005	0.006	0.011	0.025
EVAPOTRANSPIRATION						
TOTALS	0.594	0.694	2.371	3.366	3.743	4.799
	3.509	2.574	2.145	1.464	1.113	0.803
STD. DEVIATIONS	0.324	0.449	0.477	0.806	0.986	1.615
	1.485	1.165	1.014	0.351	0.327	0.204
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.4684	0.5535	1.2824	0.9498	0.4910	0.2643
	0.1080	0.0461	0.0084	0.0320	0.3141	0.5680
STD. DEVIATIONS	0.4601	0.7428	0.7700	0.7024	0.4824	0.4296
	0.1788	0.1399	0.0386	0.1147	0.8095	0.7924
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

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                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  PERCOLATION/LEAKAGE THROUGH LAYER  8
  -------------------------------------
    TOTALS                0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS       0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
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  DAILY AVERAGE HEAD ON TOP OF LAYER  3
  -------------------------------------
    AVERAGES              0.0016   0.0021   0.0044   0.0034   0.0017   0.0009
                          0.0004   0.0002   0.0000   0.0001   0.0011   0.0019

    STD. DEVIATIONS       0.0016   0.0028   0.0026   0.0025   0.0017   0.0015
                          0.0006   0.0005   0.0001   0.0004   0.0029   0.0027

  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  -------------------------------------
    AVERAGES              0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS       0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET       PERCENT
                                 -------------------   -------------   ---------
 PRECIPITATION                    33.21    (   4.731)    1687867.6     100.00

 RUNOFF                            0.996   (  0.9827)      50640.57      3.000

 EVAPOTRANSPIRATION               27.175   (  3.0366)    1381024.87     81.821

 LATERAL DRAINAGE COLLECTED        5.08598 (  2.10634)    258469.328   15.31336
   FROM LAYER  2

 PERCOLATION/LEAKAGE THROUGH       0.00009 (  0.00003)         4.398     0.00026
```

```
  LAYER  3

 AVERAGE HEAD ON TOP             0.001 (    0.001)
   OF LAYER  3

 PERCOLATION/LEAKAGE THROUGH     0.00009 (  0.00003)         4.398     0.00026
   LAYER  5

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER  5

 PERCOLATION/LEAKAGE THROUGH     0.00009 (  0.00004)         4.342     0.00026
   LAYER  8

 CHANGE IN WATER STORAGE        -0.045   (  1.2514)      -2271.40     -0.135

******************************************************************************
```

```
*****************************************************************************

              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ---------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              3.44        174820.797

      RUNOFF                                     1.542        78341.5625

      DRAINAGE COLLECTED FROM LAYER  2           0.57912      29430.85940

      PERCOLATION/LEAKAGE THROUGH LAYER  3       0.000007         0.37043

      AVERAGE HEAD ON TOP OF LAYER  3            0.061

      MAXIMUM HEAD ON TOP OF LAYER  3            0.123

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)                0.0 FEET

      PERCOLATION/LEAKAGE THROUGH LAYER  5       0.000007         0.36136

      AVERAGE HEAD ON TOP OF LAYER  5            0.000

      PERCOLATION/LEAKAGE THROUGH LAYER  8       0.000033         1.67392

      SNOW WATER                                 2.13        108084.5230


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.3844

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1040

       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

*****************************************************************************
```

****

FINAL WATER STORAGE AT END OF YEAR 30

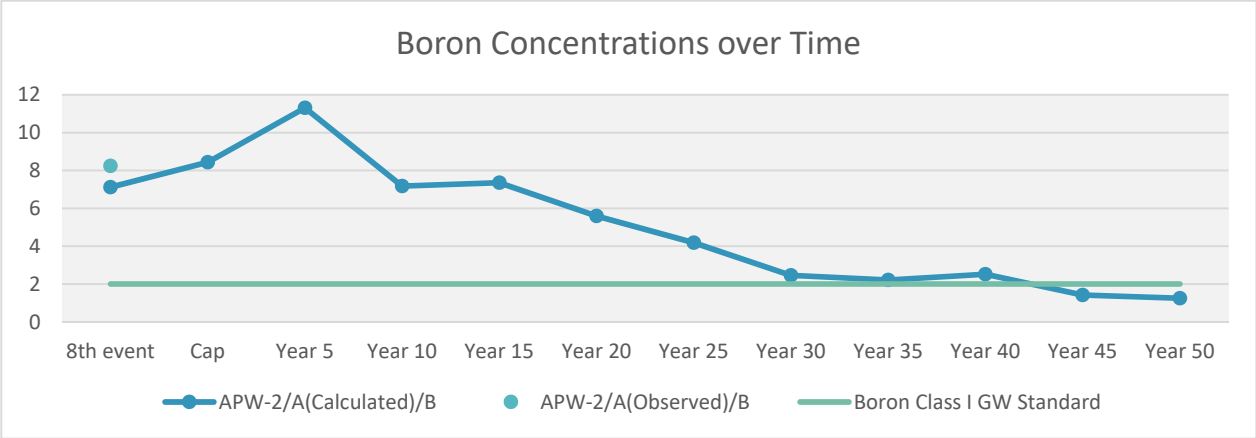
LAYER	(INCHES)	(VOL/VOL)
1	8.1781	0.2272
2	0.0025	0.0100
3	0.0000	0.0000
4	67.3200	0.1870
5	10.8480	0.4520
6	34.0800	0.2840
7	11.4000	0.1900
8	9.9600	0.0830
SNOW WATER	0.000	

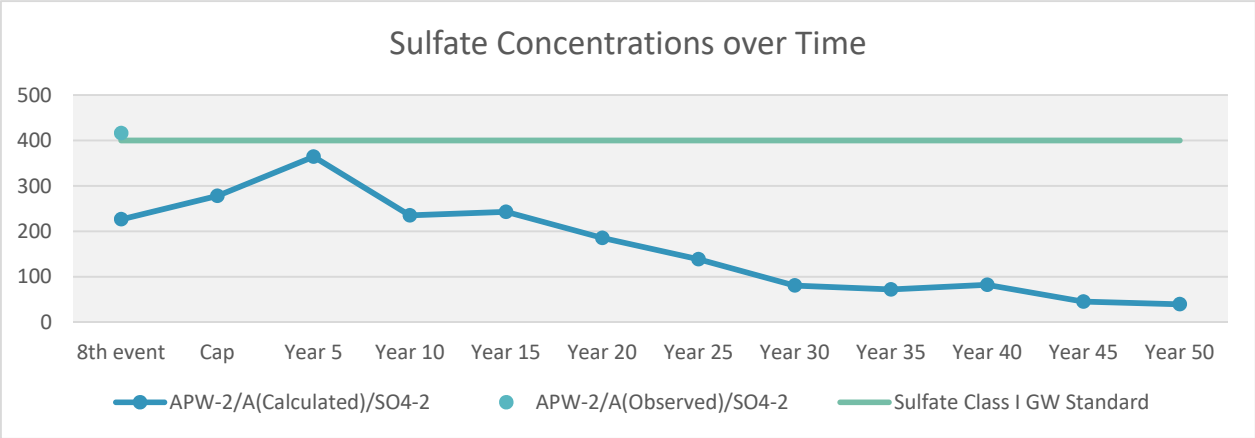
****
****

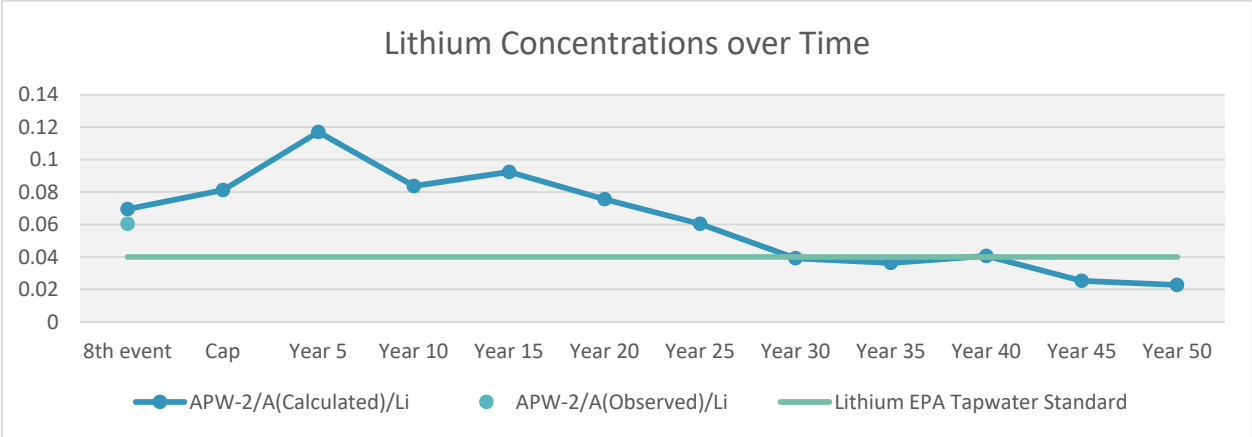
APPENDIX B MODELED CONCENTRATION TREND GRAPHS (PERIMETER WELLS)

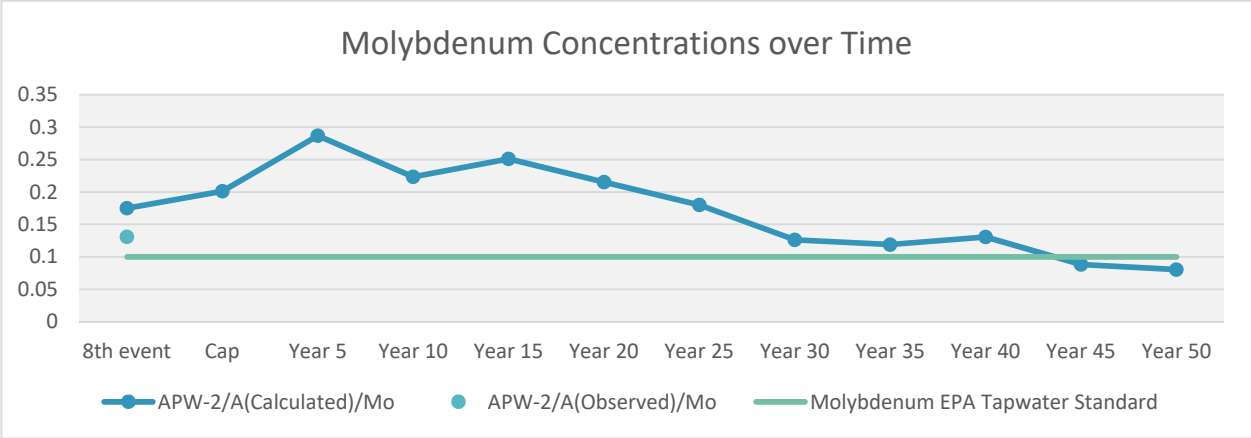
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-2



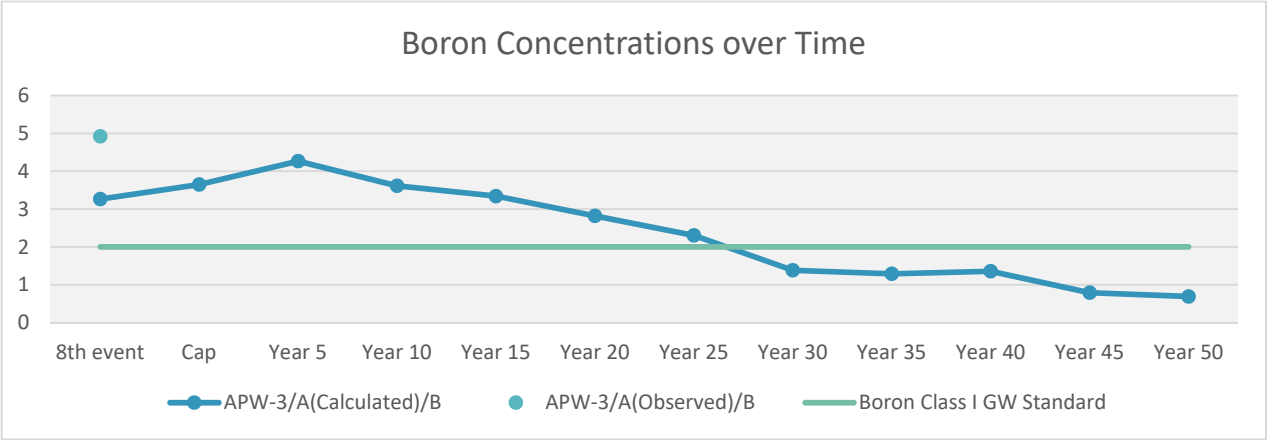


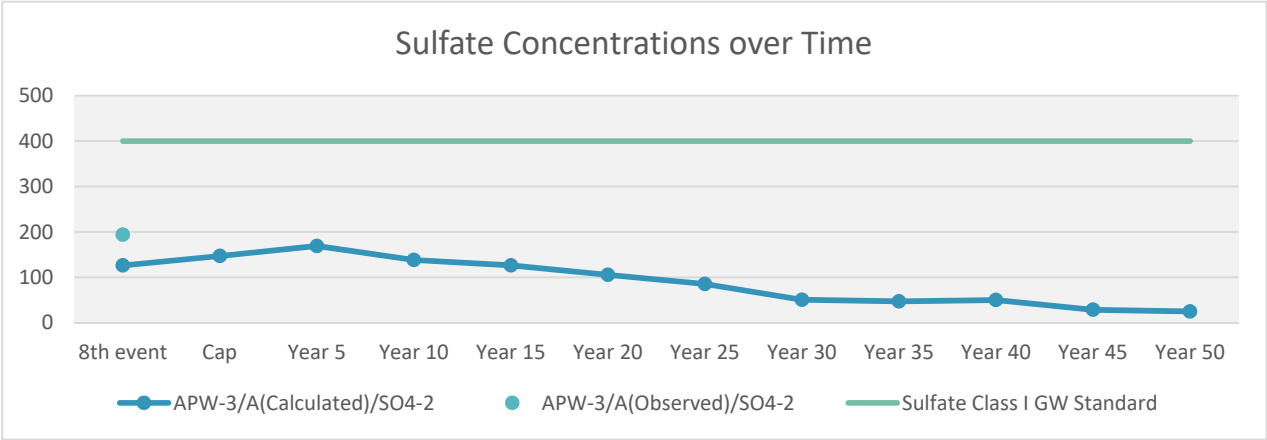


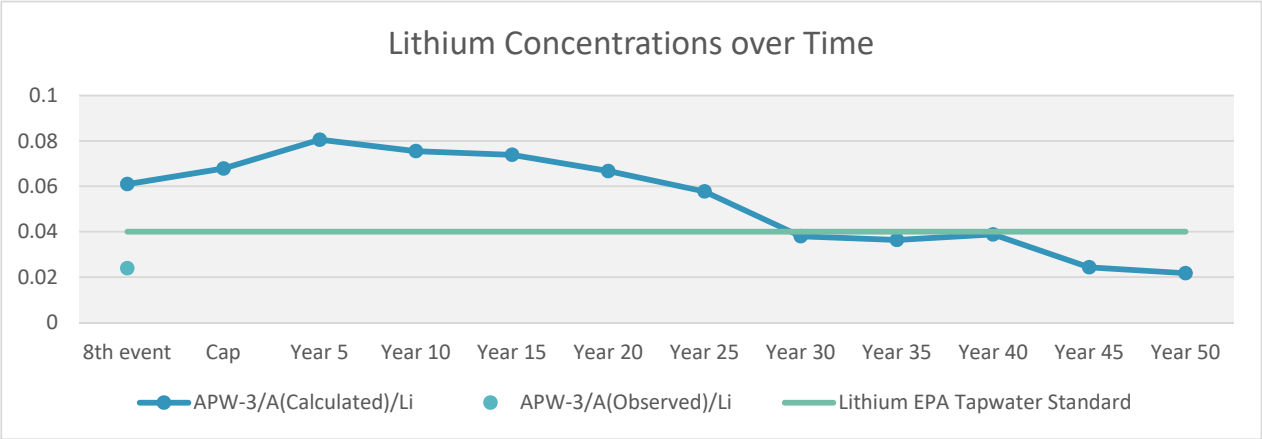


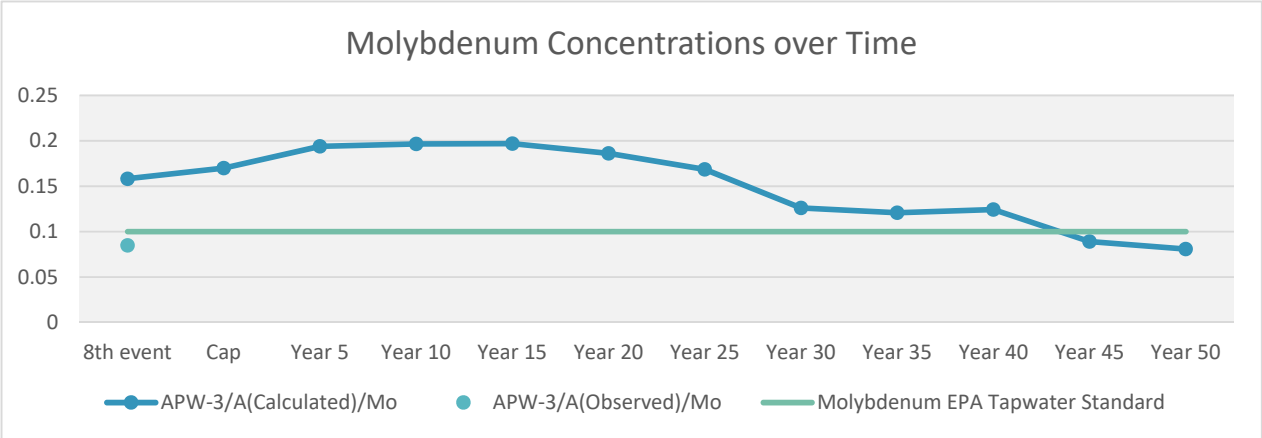
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-3



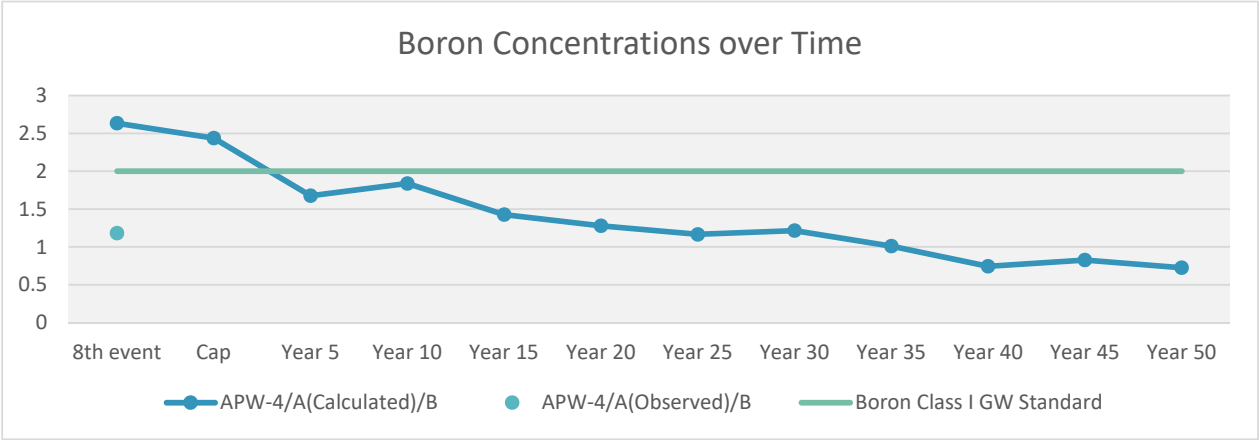


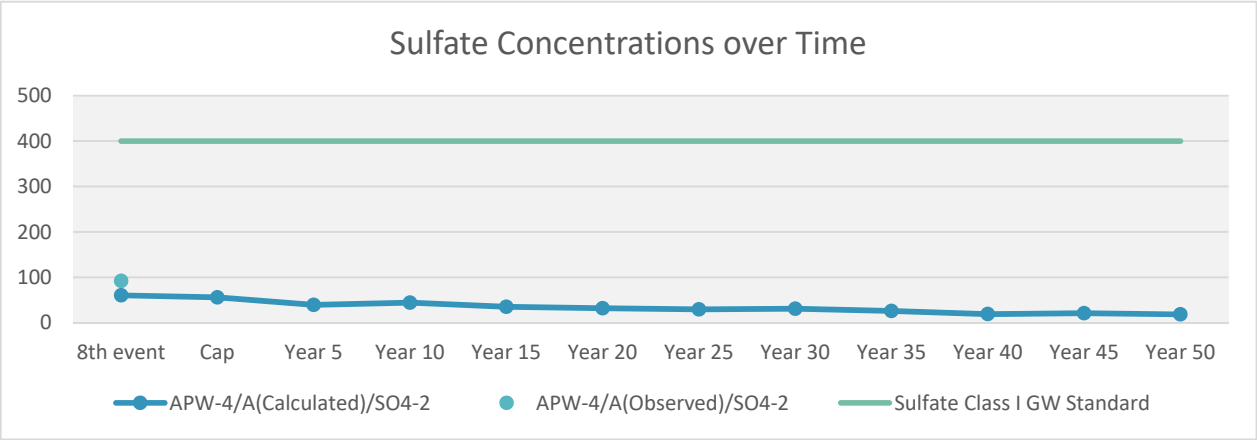


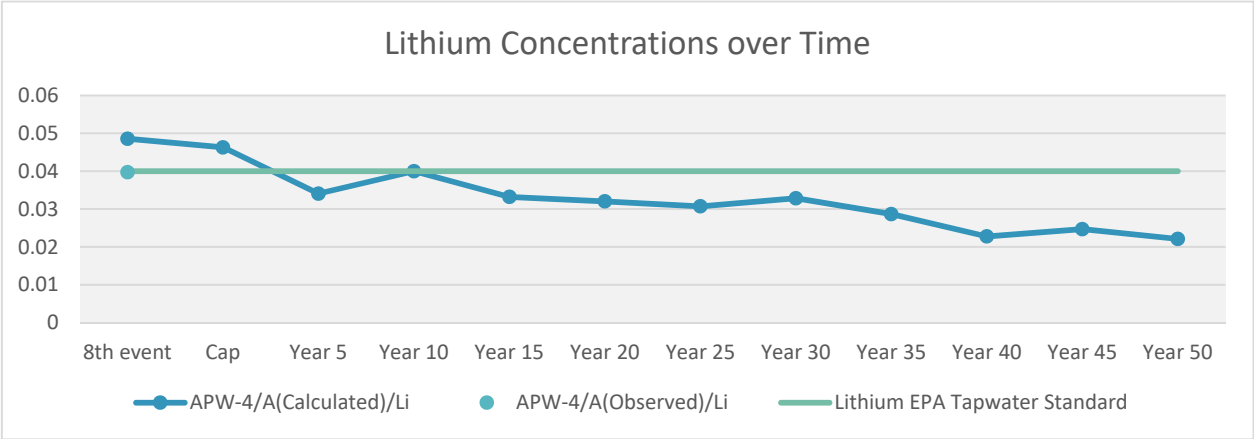


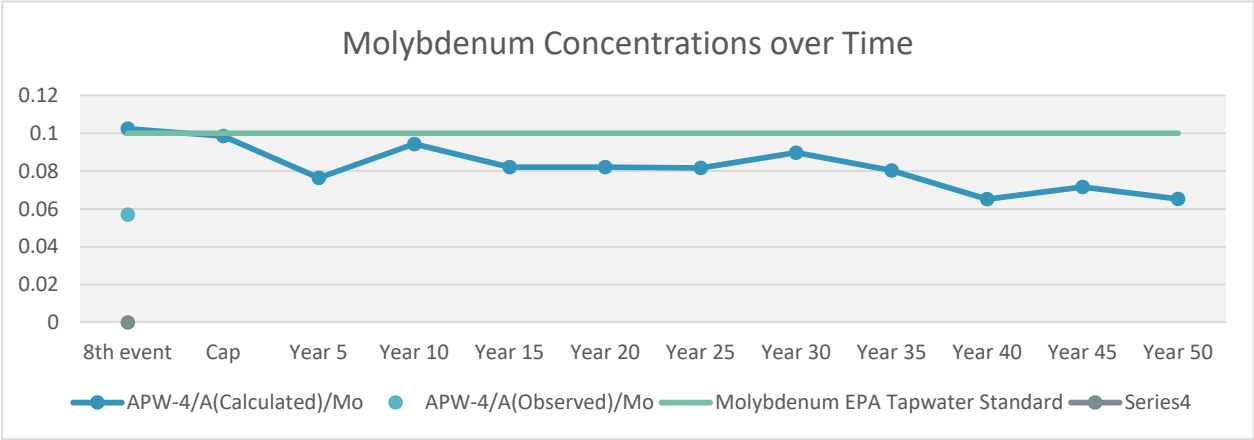
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-4



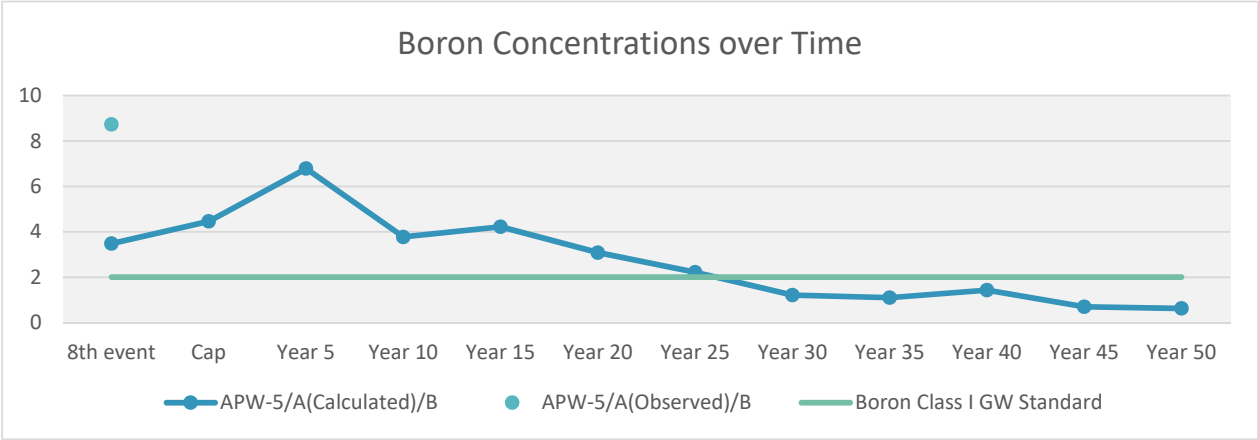


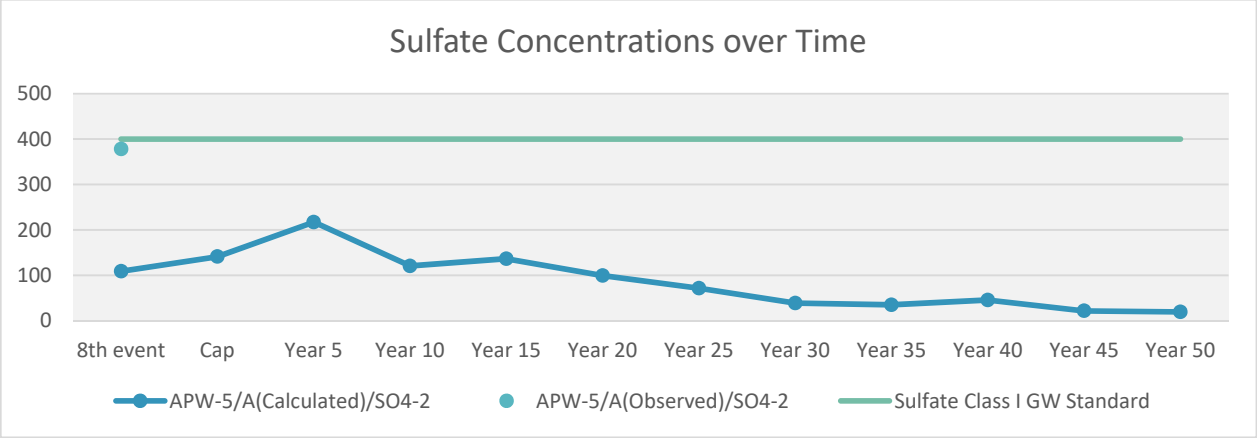


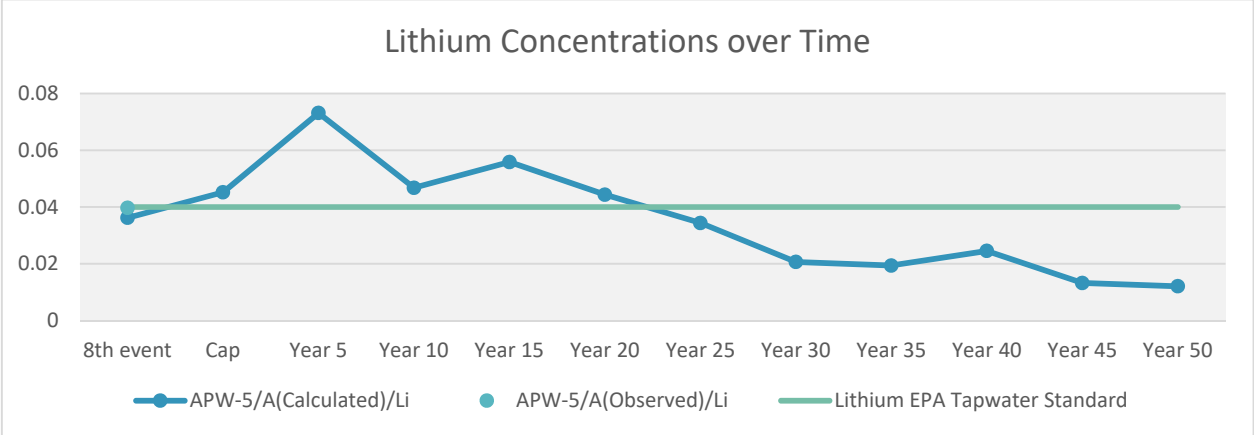


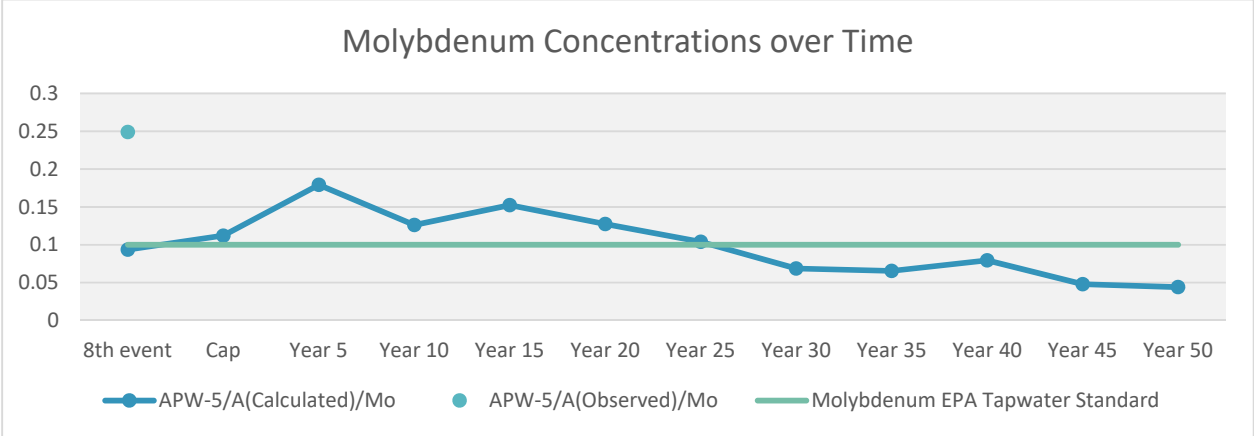
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-5



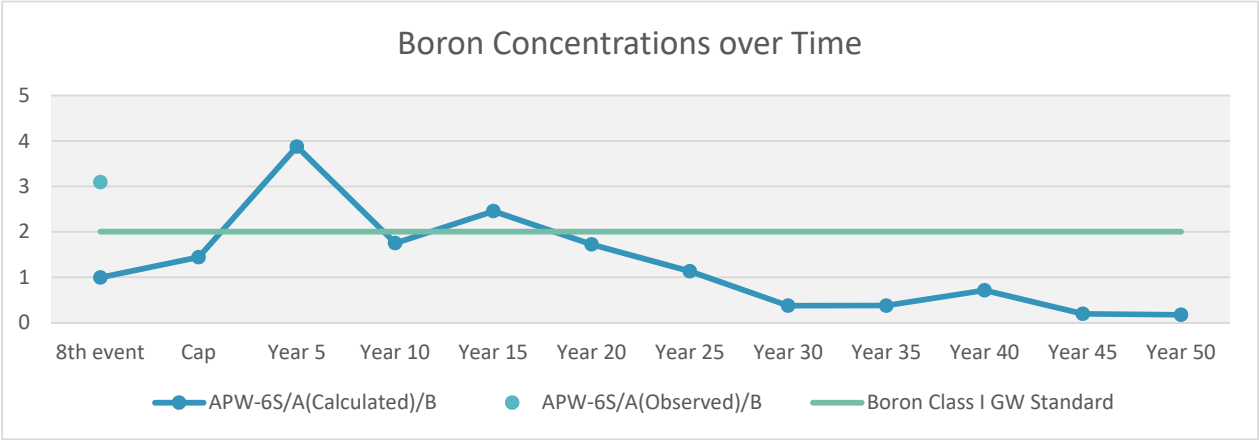


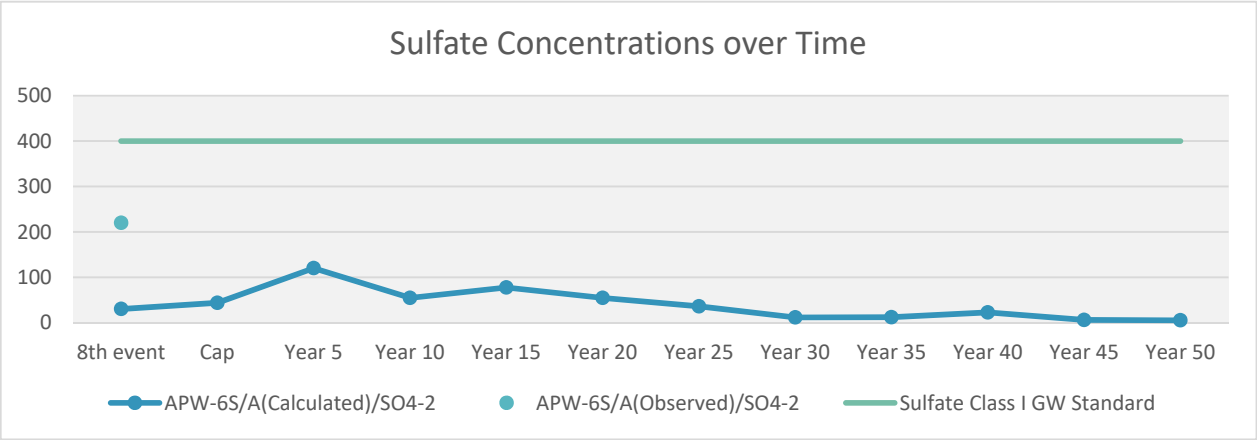


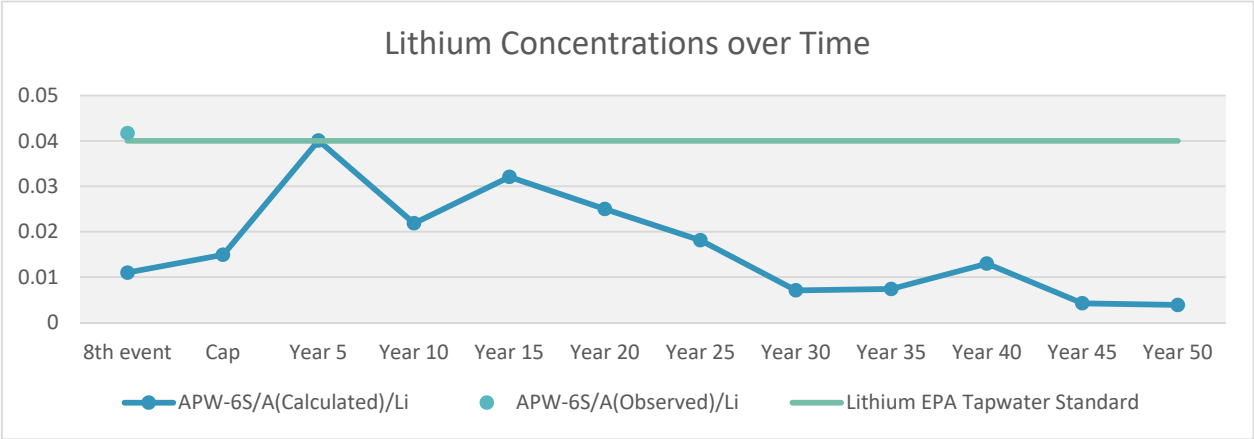


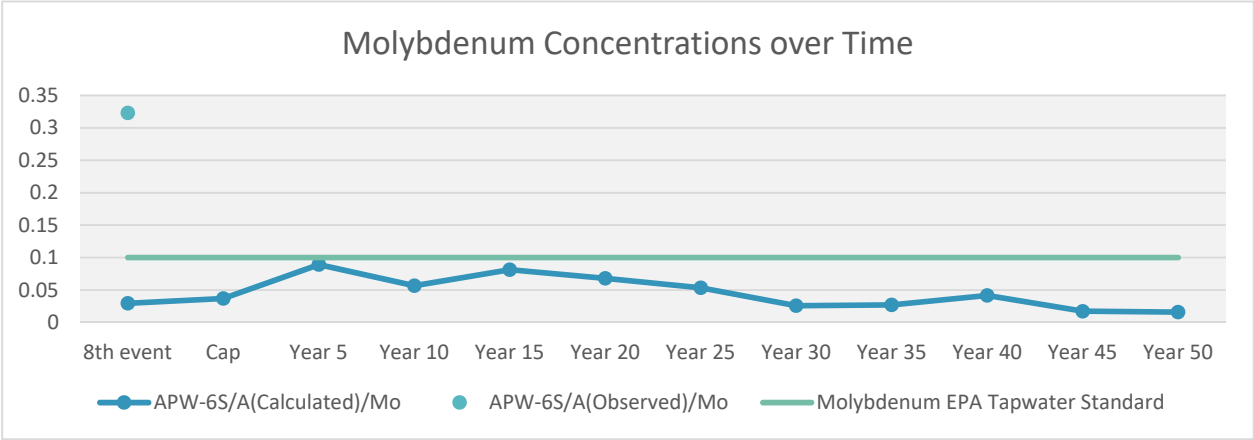
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-6S



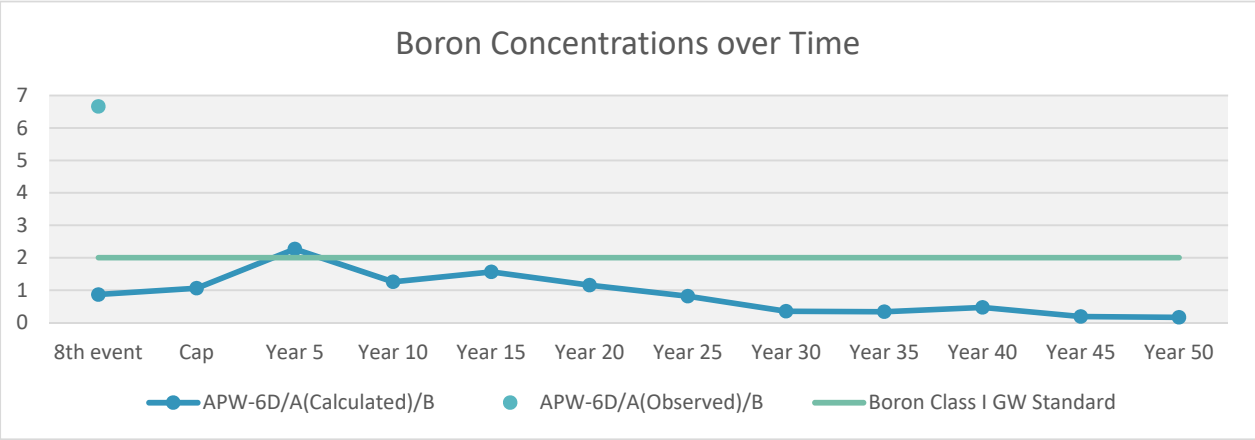


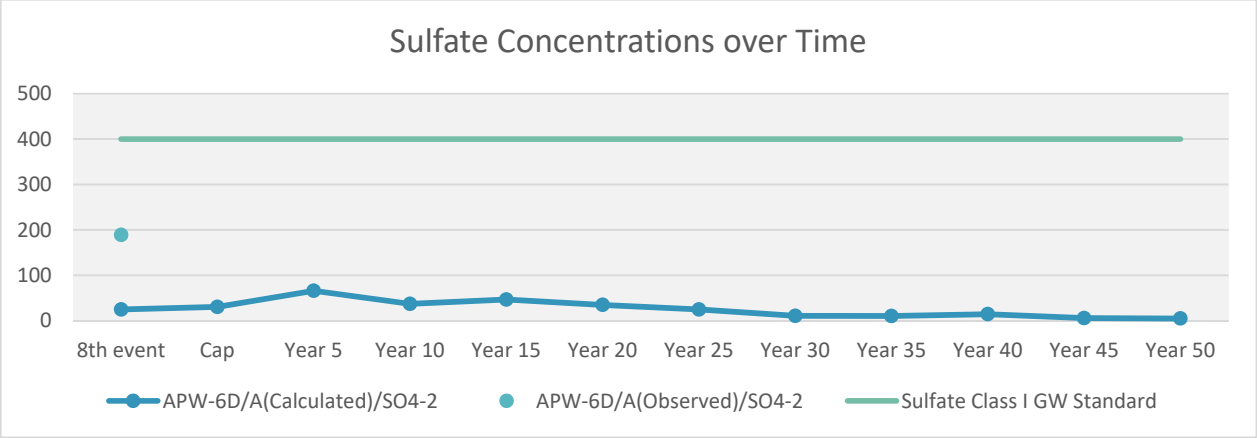


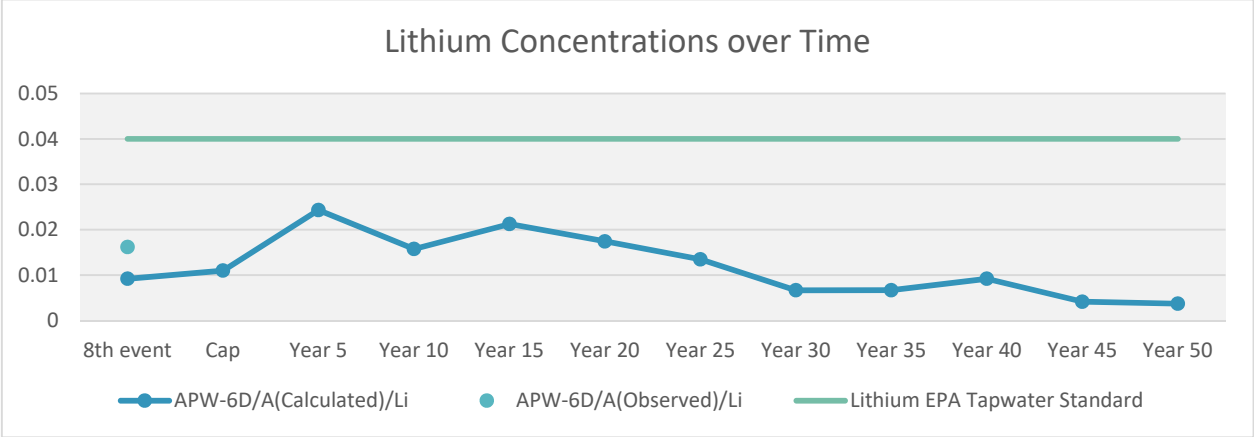


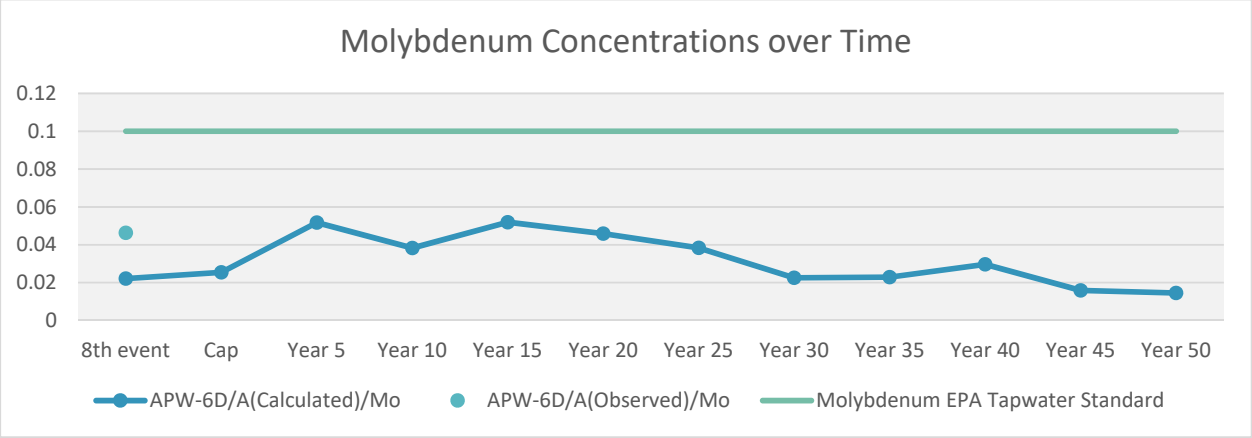
Appendix B - Modeled Concentration Trend Graphs (Perimeter Wells)

APW-6D









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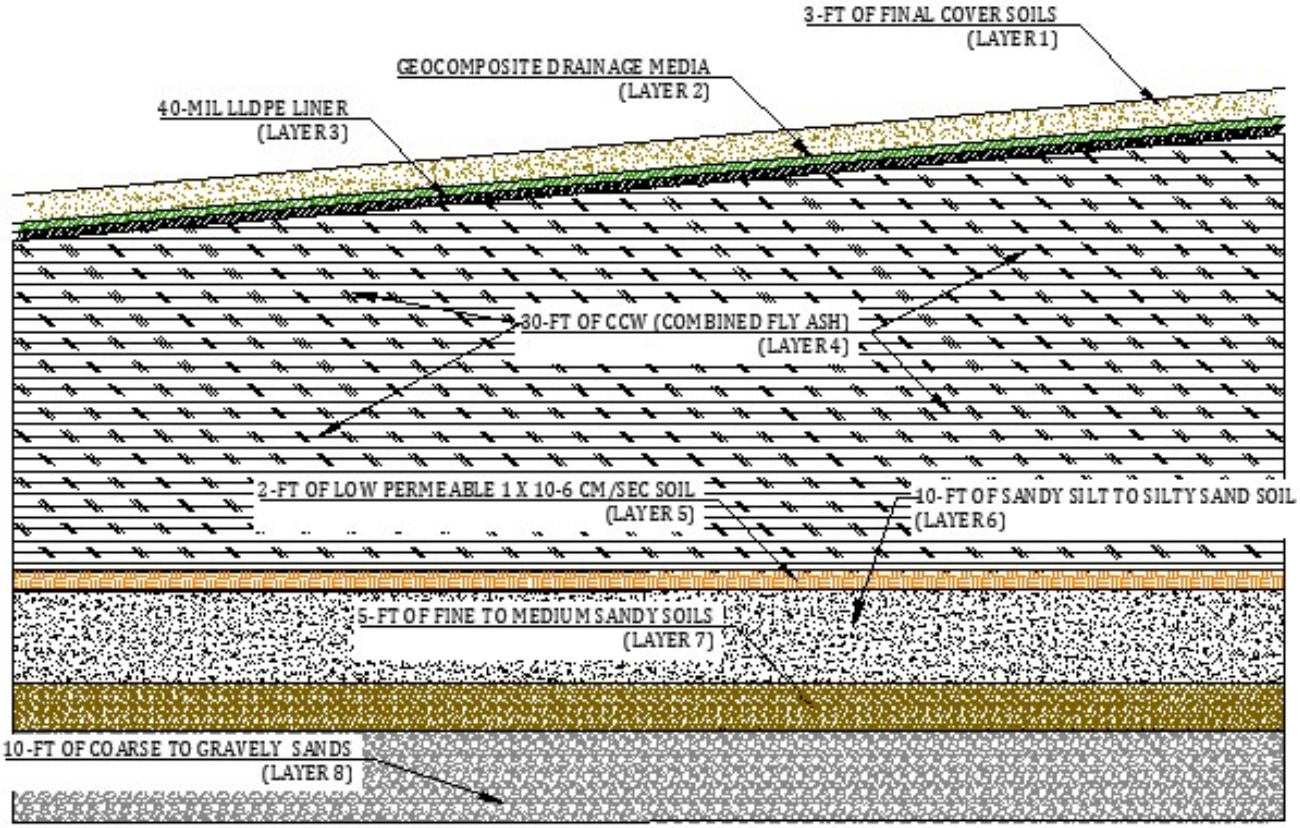
Appendix 8

HELP Modeling

HELP MODEL INPUT INFORMATION

TYPICAL CROSS SECTION OF CLOSED/CAPPED CCW WASTE WITH CORRESPONDING HELP MODEL LAYER #'S



RESULTS FROM 30-YEAR HELP MODEL SIMULATION:

AVERAGE ANNUAL PERCOLATION/LEAKAGE THROUGH LAYER 5 = 4.4 CF OR 33 GAL.

PEAK DAILY PERCOLATION/LEAKAGE THROUGH LAYER 5 = 0.36 CF OR 2.7 GAL.

30-YR HELP MODEL SIMULATION OUTPUT

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\GTDATA4.D4
TEMPERATURE DATA FILE:      C:\GTDATA7.D7
SOLAR RADIATION DATA FILE:  C:\GTDATA13.D13
EVAPOTRANSPIRATION DATA:    c:\GTDATA11.D11
SOIL AND DESIGN DATA FILE:  C:\GT30DGN.D10
OUTPUT DATA FILE:           c:\GTREV1.OUT


TIME:   8:22     DATE:   6/12/2019


******************************************************************************

     TITLE:  Grand Tower 30 Year Capped

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER   7
          THICKNESS                  =     36.00   INCHES
          POROSITY                   =      0.4730 VOL/VOL
          FIELD CAPACITY             =      0.2220 VOL/VOL
```

```
  WILTING POINT               =      0.1040 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.2644 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.520000001000E-03 CM/SEC
NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
         FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                        LAYER  2
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER  20
  THICKNESS                   =      0.25   INCHES
  POROSITY                    =      0.8500 VOL/VOL
  FIELD CAPACITY              =      0.0100 VOL/VOL
  WILTING POINT               =      0.0050 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =   10.0000000000     CM/SEC
  SLOPE                       =      5.00   PERCENT
  DRAINAGE LENGTH             =    300.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
  THICKNESS                   =      0.05   INCHES
  POROSITY                    =      0.0000 VOL/VOL
  FIELD CAPACITY              =      0.0000 VOL/VOL
  WILTING POINT               =      0.0000 VOL/VOL
  INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
  EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
  FML PINHOLE DENSITY         =      1.00   HOLES/ACRE
  FML INSTALLATION DEFECTS    =      1.00   HOLES/ACRE
  FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER  30
  THICKNESS                   =    360.00   INCHES
  POROSITY                    =      0.5410 VOL/VOL
  FIELD CAPACITY              =      0.1870 VOL/VOL
```

```
WILTING POINT               =      0.0470 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.1870 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.499999987000E-04 CM/SEC


                       LAYER  5
                       --------

             TYPE 3 - BARRIER SOIL LINER
             MATERIAL TEXTURE NUMBER  28
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4520 VOL/VOL
FIELD CAPACITY              =      0.4110 VOL/VOL
WILTING POINT               =      0.3110 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4520 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.120000004000E-05 CM/SEC


                       LAYER  6
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
             MATERIAL TEXTURE NUMBER   9
THICKNESS                   =    120.00   INCHES
POROSITY                    =      0.5010 VOL/VOL
FIELD CAPACITY              =      0.2840 VOL/VOL
WILTING POINT               =      0.1350 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.2840 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.190000006000E-03 CM/SEC


                       LAYER  7
                       --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
             MATERIAL TEXTURE NUMBER   6
THICKNESS                   =     60.00   INCHES
POROSITY                    =      0.4530 VOL/VOL
FIELD CAPACITY              =      0.1900 VOL/VOL
WILTING POINT               =      0.0850 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.1900 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.720000011000E-03 CM/SEC
```

LAYER 8

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 3

THICKNESS	=	120.00	INCHES
POROSITY	=	0.4570	VOL/VOL
FIELD CAPACITY	=	0.0830	VOL/VOL
WILTING POINT	=	0.0330	VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.0830	VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.310000009000E-02	CM/SEC

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT SOIL DATA BASE USING SOIL TEXTURE # 7 WITH A FAIR STAND OF GRASS, A SURFACE SLOPE OF 5.% AND A SLOPE LENGTH OF 300. FEET.

SCS RUNOFF CURVE NUMBER	=	75.20	
FRACTION OF AREA ALLOWING RUNOFF	=	100.0	PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	14.000	ACRES
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
INITIAL WATER IN EVAPORATIVE ZONE	=	5.366	INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE	=	9.460	INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE	=	2.080	INCHES
INITIAL SNOW WATER	=	0.000	INCHES
INITIAL WATER IN LAYER MATERIALS	=	143.129	INCHES
TOTAL INITIAL WATER	=	143.129	INCHES
TOTAL SUBSURFACE INFLOW	=	0.00	INCHES/YEAR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM EAST ST. LOUIS ILLINOIS

STATION LATITUDE	=	38.80	DEGREES
MAXIMUM LEAF AREA INDEX	=	2.00	
START OF GROWING SEASON (JULIAN DATE)	=	97	
END OF GROWING SEASON (JULIAN DATE)	=	300	
EVAPORATIVE ZONE DEPTH	=	20.0	INCHES
AVERAGE ANNUAL WIND SPEED	=	10.40	MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY	=	73.00	%

AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 67.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 71.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 74.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR ST. LOUIS MISSOURI

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.72	2.14	3.28	3.55	3.54	3.73
3.63	2.55	2.70	2.32	2.53	2.22

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EAST ST. LOUIS ILLINOIS

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
29.80	34.60	43.80	56.20	65.20	74.10
77.70	75.70	69.00	57.60	44.90	35.00

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR EAST ST. LOUIS ILLINOIS
AND STATION LATITUDE = 38.80 DEGREES

****

MONTHLY TOTALS (IN INCHES) FOR YEAR 1

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.98	1.06	3.57	2.17	2.13	5.39
	2.13	2.72	2.99	3.19	0.66	3.66
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION	1.055	1.610	2.372	3.017	2.472	5.809
	2.539	2.722	2.911	1.503	1.304	0.827
LATERAL DRAINAGE COLLECTED	0.9755	0.3783	0.1522	0.6072	0.2707	0.0575
FROM LAYER 2	0.0004	0.0005	0.0002	0.0000	0.0003	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.003	0.001	0.001	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.002	0.000	0.000	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 1

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.65	1557632.750	100.00
RUNOFF	0.000	0.000	0.00
EVAPOTRANSPIRATION	28.139	1430015.620	91.81
DRAINAGE COLLECTED FROM LAYER 2	2.4429	124145.766	7.97

PERC./LEAKAGE THROUGH LAYER 3	0.000046	2.336	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0007		
PERC./LEAKAGE THROUGH LAYER 5	0.000046	2.336	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000049	2.493	0.00
CHANGE IN WATER STORAGE	0.068	3469.371	0.22
SOIL WATER AT START OF YEAR	145.373	7387877.000	
SOIL WATER AT END OF YEAR	145.442	7391346.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.481	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 2

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.74	1.99	4.17	5.70	6.14	7.59
	2.25	1.03	0.73	4.89	1.23	1.13
RUNOFF	0.242	0.553	2.206	0.020	0.009	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.693	0.410	1.792	4.447	5.114	7.011
	2.787	1.030	0.685	1.468	1.490	0.789
LATERAL DRAINAGE COLLECTED	1.0418	0.2671	2.1530	1.7811	2.1121	1.1207
FROM LAYER 2	0.5990	0.1767	0.0000	0.0120	0.6602	0.4247
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.001	0.007	0.006	0.007	0.004
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.002	0.001
STD. DEVIATION OF DAILY	0.002	0.000	0.009	0.004	0.008	0.002
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.001	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 2

	INCHES	CU. FEET	PERCENT
PRECIPITATION	39.59	2011963.750	100.00
RUNOFF	3.030	153989.937	7.65
EVAPOTRANSPIRATION	27.715	1408466.620	70.00
DRAINAGE COLLECTED FROM LAYER 2	10.3483	525898.250	26.14
PERC./LEAKAGE THROUGH LAYER 3	0.000171	8.710	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0030		
PERC./LEAKAGE THROUGH LAYER 5	0.000171	8.708	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000159	8.082	0.00

CHANGE IN WATER STORAGE	-1.503	-76399.047	-3.80
SOIL WATER AT START OF YEAR	145.442	7391346.000	
SOIL WATER AT END OF YEAR	143.938	7314947.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.013	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 3

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.76	4.82	2.54	2.94	0.95	3.56
	6.47	2.31	3.16	1.52	3.39	1.02
RUNOFF	0.213	0.000	0.000	0.000	0.000	0.014
	0.002	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.600	1.462	2.353	3.436	1.943	3.289
	6.582	2.469	1.615	1.765	1.193	0.285
LATERAL DRAINAGE COLLECTED	0.3260	3.4406	1.3909	0.5013	0.3546	0.1008
FROM LAYER 2	0.0000	0.0002	0.0000	0.0009	0.0083	0.7655
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.013	0.005	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.009	0.003	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 3

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.44	1801061.120	100.00
RUNOFF	0.229	11655.770	0.65
EVAPOTRANSPIRATION	26.991	1371690.500	76.16
DRAINAGE COLLECTED FROM LAYER 2	6.8891	350104.781	19.44
PERC./LEAKAGE THROUGH LAYER 3	0.000113	5.718	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0021		
PERC./LEAKAGE THROUGH LAYER 5	0.000112	5.716	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000098	4.960	0.00
CHANGE IN WATER STORAGE	1.330	67604.687	3.75
SOIL WATER AT START OF YEAR	143.938	7314947.000	
SOIL WATER AT END OF YEAR	145.010	7369415.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.258	13136.189	0.73

ANNUAL WATER BUDGET BALANCE 0.0000 0.377 0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 4

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.15	1.39	3.40	4.39	3.71	4.19
	3.22	2.89	2.12	2.08	3.16	2.52
RUNOFF	0.109	0.173	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.076
EVAPOTRANSPIRATION	0.311	0.983	1.982	4.373	4.820	3.770
	3.830	2.931	2.218	1.534	1.222	0.658
LATERAL DRAINAGE COLLECTED	0.3143	1.0271	1.6560	0.7651	0.4544	0.1429
FROM LAYER 2	0.0001	0.0004	0.0000	0.0000	0.0000	0.1548
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.004	0.006	0.003	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
STD. DEVIATION OF DAILY	0.000	0.004	0.004	0.001	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 4

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.22	1739060.120	100.00
RUNOFF	0.359	18219.406	1.05
EVAPOTRANSPIRATION	28.632	1455077.120	83.67
DRAINAGE COLLECTED FROM LAYER 2	4.5153	229466.031	13.19
PERC./LEAKAGE THROUGH LAYER 3	0.000079	4.013	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0013		
PERC./LEAKAGE THROUGH LAYER 5	0.000079	4.015	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000099	5.020	0.00
CHANGE IN WATER STORAGE	0.714	36292.219	2.09
SOIL WATER AT START OF YEAR	145.010	7369415.500	
SOIL WATER AT END OF YEAR	145.572	7397950.500	
SNOW WATER AT START OF YEAR	0.258	13136.189	0.76
SNOW WATER AT END OF YEAR	0.411	20893.338	1.20
ANNUAL WATER BUDGET BALANCE	0.0000	0.224	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 5

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.51	0.74	2.69	4.65	4.12	5.22
	2.97	2.35	3.21	0.95	4.85	1.34
RUNOFF	0.125	0.006	0.000	0.000	0.000	0.009
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.190	0.633	2.718	3.849	4.874	4.884
	4.473	0.995	4.026	1.369	1.169	1.044
LATERAL DRAINAGE COLLECTED	0.2276	0.9024	0.7348	0.4146	0.6346	0.4711
FROM LAYER 2	0.2051	0.0433	0.0000	0.0000	0.0071	0.8080
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.003	0.003	0.001	0.002	0.002
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.000	0.003	0.001	0.001	0.002	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

ANNUAL TOTALS FOR YEAR 5

	INCHES	CU. FEET	PERCENT
PRECIPITATION	33.60	1707551.750	100.00
RUNOFF	0.140	7126.098	0.42
EVAPOTRANSPIRATION	30.225	1536034.250	89.96
DRAINAGE COLLECTED FROM LAYER 2	4.4486	226078.469	13.24
PERC./LEAKAGE THROUGH LAYER 3	0.000081	4.134	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0013		
PERC./LEAKAGE THROUGH LAYER 5	0.000081	4.129	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000049	2.509	0.00
CHANGE IN WATER STORAGE	-1.214	-61689.074	-3.61
SOIL WATER AT START OF YEAR	145.572	7397950.500	
SOIL WATER AT END OF YEAR	144.769	7357155.000	
SNOW WATER AT START OF YEAR	0.411	20893.338	1.22
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.505	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 6

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.21	2.01	2.11	2.40	2.04	5.57
	1.77	5.60	3.77	2.81	4.86	0.54

RUNOFF	0.031	0.121	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.043	0.000
EVAPOTRANSPIRATION	0.510	1.210	2.549	3.216	3.198	4.878
	2.454	5.249	2.214	1.410	1.466	0.954
LATERAL DRAINAGE COLLECTED	1.1364	1.0134	0.7813	0.2430	0.0426	0.0057
FROM LAYER 2	0.0001	0.0057	0.0002	0.0083	2.0738	1.5246
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.004	0.003	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.007	0.005
STD. DEVIATION OF DAILY	0.003	0.003	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.006	0.003
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 6

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.69	1813766.120	100.00
RUNOFF	0.195	9925.547	0.55
EVAPOTRANSPIRATION	29.308	1489419.250	82.12

DRAINAGE COLLECTED FROM LAYER 2	6.8351	347359.844	19.15
PERC./LEAKAGE THROUGH LAYER 3	0.000114	5.789	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0020		
PERC./LEAKAGE THROUGH LAYER 5	0.000114	5.791	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000124	6.296	0.00
CHANGE IN WATER STORAGE	-0.648	-32945.840	-1.82
SOIL WATER AT START OF YEAR	144.769	7357155.000	
SOIL WATER AT END OF YEAR	144.121	7324209.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.965	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 7

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.61	2.58	4.19	1.66	4.83	4.40
	2.62	0.40	0.24	1.25	2.62	2.07
RUNOFF	0.045	1.136	0.000	0.000	0.080	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.602	0.484	2.416	3.257	3.208	6.222
	3.090	0.515	0.242	0.529	0.957	0.979
LATERAL DRAINAGE COLLECTED	0.4837	0.1575	0.7925	1.7992	0.3320	0.1698
FROM LAYER 2	0.1309	0.0006	0.0001	0.0001	0.0001	0.0092
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.003	0.006	0.001	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.003	0.004	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 7

	INCHES	CU. FEET	PERCENT
PRECIPITATION	28.47	1446845.370	100.00
RUNOFF	1.261	64083.531	4.43
EVAPOTRANSPIRATION	22.502	1143571.500	79.04
DRAINAGE COLLECTED FROM LAYER 2	3.8757	196964.000	13.61
PERC./LEAKAGE THROUGH LAYER 3	0.000069	3.501	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0011		
PERC./LEAKAGE THROUGH LAYER 5	0.000069	3.507	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		

PERC./LEAKAGE THROUGH LAYER 8	0.000073	3.687	0.00
CHANGE IN WATER STORAGE	0.831	42222.566	2.92
SOIL WATER AT START OF YEAR	144.121	7324209.000	
SOIL WATER AT END OF YEAR	144.951	7366431.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.020	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 8

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.60	4.18	2.94	5.82	2.64	2.74
	7.57	2.56	1.84	1.53	2.31	1.98
RUNOFF	0.000	0.027	0.000	0.015	0.000	0.000
	0.124	0.000	0.000	0.000	0.000	0.078
EVAPOTRANSPIRATION	1.109	1.438	2.639	4.640	2.884	3.725
	5.201	3.291	2.413	1.253	1.063	0.507
LATERAL DRAINAGE COLLECTED	1.3900	1.0842	1.3736	1.7488	1.0246	0.2438
FROM LAYER 2	0.0448	0.7137	0.2103	0.0115	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.005	0.004	0.005	0.006	0.004	0.001
TOP OF LAYER 3	0.000	0.002	0.001	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.004	0.003	0.002	0.008	0.002	0.000
HEAD ON TOP OF LAYER 3	0.000	0.002	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 8

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.71	1916422.370	100.00
RUNOFF	0.245	12455.164	0.65
EVAPOTRANSPIRATION	30.162	1532846.250	79.98
DRAINAGE COLLECTED FROM LAYER 2	7.8453	398696.312	20.80
PERC./LEAKAGE THROUGH LAYER 3	0.000132	6.714	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0023		
PERC./LEAKAGE THROUGH LAYER 5	0.000132	6.714	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000128	6.485	0.00
CHANGE IN WATER STORAGE	-0.543	-27582.041	-1.44
SOIL WATER AT START OF YEAR	144.951	7366431.500	
SOIL WATER AT END OF YEAR	144.409	7338849.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00

SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.175	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 9

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.17	1.87	2.36	4.90	2.47	4.46
	3.89	2.51	2.28	2.23	3.92	1.89
RUNOFF	1.118	1.036	1.134	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.032	0.000
EVAPOTRANSPIRATION	0.177	0.340	1.378	3.518	3.907	3.847
	4.465	2.913	1.339	1.400	0.900	0.503
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	1.0024	0.7605	1.3784	0.4349
FROM LAYER 2	0.1416	0.0006	0.0000	0.0000	0.0004	1.7423
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.003	0.003	0.005	0.002
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.006
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.002	0.003	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 9

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.95	1776159.000	100.00
RUNOFF	3.320	168724.281	9.50
EVAPOTRANSPIRATION	24.688	1254642.250	70.64
DRAINAGE COLLECTED FROM LAYER 2	5.4612	277536.562	15.63
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.656	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0016		
PERC./LEAKAGE THROUGH LAYER 5	0.000091	4.648	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000101	5.108	0.00
CHANGE IN WATER STORAGE	1.481	75250.742	4.24
SOIL WATER AT START OF YEAR	144.409	7338849.500	
SOIL WATER AT END OF YEAR	145.411	7389806.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.478	24294.266	1.37
ANNUAL WATER BUDGET BALANCE	0.0000	0.022	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 10

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.93	1.12	2.97	3.94	3.29	1.98
	5.28	0.89	2.36	2.85	1.96	3.66
RUNOFF	0.862	0.000	0.000	0.000	0.000	0.000
	0.006	0.000	0.000	0.000	0.000	0.048
EVAPOTRANSPIRATION	0.165	1.320	2.434	4.085	3.477	2.857
	4.343	1.829	2.192	1.621	0.960	0.765
LATERAL DRAINAGE COLLECTED	0.4727	2.0718	0.6051	0.4951	0.5932	0.1833
FROM LAYER 2	0.0000	0.0000	0.0000	0.0001	0.0000	0.9020
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.008	0.002	0.002	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.006	0.001	0.002	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 10

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.23	1637928.750	100.00
RUNOFF	0.916	46550.125	2.84
EVAPOTRANSPIRATION	26.049	1323818.000	80.82
DRAINAGE COLLECTED FROM LAYER 2	5.3231	270519.937	16.52
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.661	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0016		
PERC./LEAKAGE THROUGH LAYER 5	0.000092	4.653	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000078	3.983	0.00
CHANGE IN WATER STORAGE	-0.058	-2963.785	-0.18
SOIL WATER AT START OF YEAR	145.411	7389806.000	
SOIL WATER AT END OF YEAR	145.514	7394998.500	
SNOW WATER AT START OF YEAR	0.478	24294.266	1.48
SNOW WATER AT END OF YEAR	0.318	16138.057	0.99
ANNUAL WATER BUDGET BALANCE	0.0000	0.482	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 11

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.27	2.35	1.84	2.13	4.80	4.83

	1.27	3.10	2.48	2.50	1.70	4.27
RUNOFF	0.178	0.676	0.000	0.000	0.000	0.201
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.384	0.511	3.117	1.967	3.973	5.348
	2.629	2.711	1.349	1.696	1.498	0.859
LATERAL DRAINAGE COLLECTED	0.4674	0.4343	2.3114	0.4655	0.1566	0.0003
FROM LAYER 2	0.0005	0.0003	0.0013	0.0000	0.0103	0.8712
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.002	0.008	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.001	0.004	0.006	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.004
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 11

	INCHES	CU. FEET	PERCENT
PRECIPITATION	32.54	1653682.620	100.00
RUNOFF	1.055	53612.176	3.24

EVAPOTRANSPIRATION	26.043	1323481.620	80.03
DRAINAGE COLLECTED FROM LAYER 2	4.7190	239819.469	14.50
PERC./LEAKAGE THROUGH LAYER 3	0.000079	4.033	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0014		
PERC./LEAKAGE THROUGH LAYER 5	0.000079	4.034	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.307	0.00
CHANGE IN WATER STORAGE	0.723	36765.367	2.22
SOIL WATER AT START OF YEAR	145.514	7394998.500	
SOIL WATER AT END OF YEAR	145.533	7395994.500	
SNOW WATER AT START OF YEAR	0.318	16138.057	0.98
SNOW WATER AT END OF YEAR	1.021	51907.746	3.14
ANNUAL WATER BUDGET BALANCE	0.0000	-0.346	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 12

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.53	1.47	1.97	1.10	7.85	1.55
	3.35	2.49	1.92	2.13	1.91	1.38
RUNOFF	0.196	0.387	0.000	0.000	0.009	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.629	0.317	2.638	2.073	5.891	3.673
	3.301	2.352	1.483	1.428	1.420	0.984
LATERAL DRAINAGE COLLECTED	0.6609	0.1823	1.5629	0.3866	0.1219	0.4897
FROM LAYER 2	0.2310	0.0204	0.0001	0.0000	0.0100	0.2858

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.005	0.001	0.000	0.002
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.001
STD. DEVIATION OF DAILY	0.001	0.000	0.004	0.001	0.000	0.001
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 12

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.65	1405173.370	100.00
RUNOFF	0.591	30049.133	2.14
EVAPOTRANSPIRATION	26.190	1330969.370	94.72
DRAINAGE COLLECTED FROM LAYER 2	3.9517	200824.312	14.29
PERC./LEAKAGE THROUGH LAYER 3	0.000073	3.703	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0011		
PERC./LEAKAGE THROUGH LAYER 5	0.000073	3.716	0.00

AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.299	0.00
CHANGE IN WATER STORAGE	-3.083	-156674.719	-11.15
SOIL WATER AT START OF YEAR	145.533	7395994.500	
SOIL WATER AT END OF YEAR	143.458	7290518.000	
SNOW WATER AT START OF YEAR	1.021	51907.746	3.69
SNOW WATER AT END OF YEAR	0.014	709.195	0.05
ANNUAL WATER BUDGET BALANCE	0.0000	0.999	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 13

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.59	0.56	1.38	3.97	2.81	1.96
	1.67	5.05	4.35	2.72	0.06	2.30
RUNOFF	0.000	0.003	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.944	0.043	2.152	3.370	3.549	3.025
	1.460	4.422	3.912	1.764	1.186	0.737
LATERAL DRAINAGE COLLECTED	0.1088	0.0000	0.0011	0.0005	0.0499	0.0106
FROM LAYER 2	0.0001	0.0000	0.0044	0.1739	0.0010	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 13

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.42	1393484.370	100.00
RUNOFF	0.003	143.992	0.01
EVAPOTRANSPIRATION	26.563	1349925.870	96.87
DRAINAGE COLLECTED FROM LAYER 2	0.3503	17804.482	1.28
PERC./LEAKAGE THROUGH LAYER 3	0.000008	0.421	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0001		
PERC./LEAKAGE THROUGH LAYER 5	0.000008	0.423	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	0.504	25610.408	1.84
SOIL WATER AT START OF YEAR	143.458	7290518.000	
SOIL WATER AT END OF YEAR	143.976	7316837.500	

SNOW WATER AT START OF YEAR	0.014	709.195	0.05
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.406	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 14

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.06	2.03	3.57	2.50	1.67	4.08
	1.12	1.63	4.21	1.11	3.68	2.09
RUNOFF	0.000	0.297	0.000	0.000	0.000	0.002
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.300	0.392	2.888	2.336	2.481	4.740
	1.433	1.618	2.531	1.946	1.177	0.924
LATERAL DRAINAGE COLLECTED	0.0002	0.0000	1.7931	0.6379	0.2089	0.0065
FROM LAYER 2	0.0000	0.0000	0.0011	0.0000	0.0000	0.7433
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.006	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.003
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.001	0.000	0.000

HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 14

	INCHES	CU. FEET	PERCENT
PRECIPITATION	27.75	1410255.250	100.00
RUNOFF	0.299	15171.110	1.08
EVAPOTRANSPIRATION	22.766	1156968.750	82.04
DRAINAGE COLLECTED FROM LAYER 2	3.3910	172332.500	12.22
PERC./LEAKAGE THROUGH LAYER 3	0.000058	2.930	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0010		
PERC./LEAKAGE THROUGH LAYER 5	0.000058	2.924	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000088	4.453	0.00
CHANGE IN WATER STORAGE	1.294	65777.805	4.66
SOIL WATER AT START OF YEAR	143.976	7316837.500	
SOIL WATER AT END OF YEAR	145.236	7380895.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.034	1720.071	0.12
ANNUAL WATER BUDGET BALANCE	0.0000	0.584	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 15

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.66	1.86	3.69	2.36	1.63	9.51
	0.68	3.44	3.50	0.35	0.24	2.62
RUNOFF	0.234	0.451	0.000	0.000	0.000	0.488
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.397	0.561	2.706	3.927	2.116	6.804
	0.680	2.502	3.362	1.423	0.164	0.527
LATERAL DRAINAGE COLLECTED	0.5616	0.1950	1.6504	1.1481	0.3153	2.1999
FROM LAYER 2	0.5723	0.1663	0.0004	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.002	0.001	0.006	0.004	0.001	0.008
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.004	0.002	0.000	0.009
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 15

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.54	1602863.250	100.00
RUNOFF	1.174	59638.680	3.72
EVAPOTRANSPIRATION	25.170	1279117.120	79.80
DRAINAGE COLLECTED FROM LAYER 2	6.8094	346052.562	21.59
PERC./LEAKAGE THROUGH LAYER 3	0.000114	5.806	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0020		
PERC./LEAKAGE THROUGH LAYER 5	0.000114	5.812	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.781	0.00
CHANGE IN WATER STORAGE	-1.613	-81951.406	-5.11
SOIL WATER AT START OF YEAR	145.236	7380895.500	
SOIL WATER AT END OF YEAR	143.657	7300664.000	
SNOW WATER AT START OF YEAR	0.034	1720.071	0.11
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.518	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 16

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC

PRECIPITATION	1.60	2.52	3.94	4.93	1.26	2.83
	6.92	1.69	3.82	2.86	0.61	1.13
RUNOFF	0.000	1.231	0.713	0.000	0.000	0.000
	0.157	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.694	0.247	2.513	3.339	3.434	2.911
	5.051	3.383	3.014	1.467	0.955	0.900
LATERAL DRAINAGE COLLECTED	0.0916	0.1468	1.8954	0.6256	1.0007	0.3191
FROM LAYER 2	0.0908	0.0000	0.0000	0.0000	0.0000	0.0042
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.001	0.006	0.002	0.003	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.001	0.002	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 16

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.11	1733470.250	100.00

RUNOFF	2.100	106738.023	6.16
EVAPOTRANSPIRATION	27.907	1418256.500	81.82
DRAINAGE COLLECTED FROM LAYER 2	4.1743	212135.422	12.24
PERC./LEAKAGE THROUGH LAYER 3	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0012		
PERC./LEAKAGE THROUGH LAYER 5	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000036	1.821	0.00
CHANGE IN WATER STORAGE	-0.072	-3662.458	-0.21
SOIL WATER AT START OF YEAR	143.657	7300664.000	
SOIL WATER AT END OF YEAR	143.585	7297001.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.929	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 17

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.17	2.44	3.18	3.45	1.75	2.16
	1.07	1.10	0.60	1.50	0.43	2.76
RUNOFF	0.000	1.105	0.741	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.729	0.644	2.734	3.639	2.570	2.703
	1.014	0.911	0.812	1.535	0.173	0.790

LATERAL DRAINAGE COLLECTED	0.0151	0.0890	1.5767	0.5105	0.1668	0.0245
FROM LAYER 2	0.0000	0.0000	0.0000	0.0001	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.005	0.002	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.001	0.004	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 17

	INCHES	CU. FEET	PERCENT
PRECIPITATION	22.61	1149040.370	100.00
RUNOFF	1.846	93797.977	8.16
EVAPOTRANSPIRATION	18.253	927606.625	80.73
DRAINAGE COLLECTED FROM LAYER 2	2.3828	121091.648	10.54
PERC./LEAKAGE THROUGH LAYER 3	0.000042	2.124	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0007		

PERC./LEAKAGE THROUGH LAYER 5	0.000042	2.124	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000038	1.913	0.00
CHANGE IN WATER STORAGE	0.129	6542.278	0.57
SOIL WATER AT START OF YEAR	143.585	7297001.500	
SOIL WATER AT END OF YEAR	143.293	7282143.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.421	21400.707	1.86
ANNUAL WATER BUDGET BALANCE	0.0000	-0.106	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 18

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.40	2.85	3.11	4.06	4.06	9.18
	1.84	2.80	3.42	1.56	4.17	4.40
RUNOFF	0.015	0.001	1.789	0.000	0.000	0.065
	0.000	0.000	0.000	0.000	0.034	0.004
EVAPOTRANSPIRATION	0.474	0.404	2.208	3.802	4.301	7.659
	4.264	2.909	2.644	1.170	1.201	0.694
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	0.6897	0.7707	0.2341	0.0545
FROM LAYER 2	0.6051	0.2461	0.0337	0.0000	0.0012	3.5051
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.002	0.003	0.001	0.000
TOP OF LAYER 3	0.002	0.001	0.000	0.000	0.000	0.012
STD. DEVIATION OF DAILY	0.000	0.000	0.003	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.011
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 18

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.85	2126817.000	100.00
RUNOFF	1.908	96974.906	4.56
EVAPOTRANSPIRATION	31.731	1612559.370	75.82
DRAINAGE COLLECTED FROM LAYER 2	6.1404	312054.281	14.67
PERC./LEAKAGE THROUGH LAYER 3	0.000100	5.084	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0018		
PERC./LEAKAGE THROUGH LAYER 5	0.000099	5.055	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000155	7.867	0.00
CHANGE IN WATER STORAGE	2.070	105221.242	4.95
SOIL WATER AT START OF YEAR	143.293	7282143.000	

SOIL WATER AT END OF YEAR	145.784	7408765.000	
SNOW WATER AT START OF YEAR	0.421	21400.707	1.01
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.563	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 19

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.69	1.92	3.72	4.18	2.29	5.62
	3.63	2.36	4.06	0.74	0.40	2.87
RUNOFF	0.219	0.138	0.027	0.000	0.000	0.136
	0.000	0.000	0.030	0.000	0.000	0.006
EVAPOTRANSPIRATION	0.619	0.731	1.943	4.685	2.756	5.948
	4.240	2.517	1.267	1.598	1.179	0.732
LATERAL DRAINAGE COLLECTED	1.4948	0.5340	1.0660	2.0457	0.4490	0.1595
FROM LAYER 2	0.0003	0.0000	0.0000	0.0347	0.1269	0.0003
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.005	0.002	0.004	0.007	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.003	0.002	0.004	0.004	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 19

	INCHES	CU. FEET	PERCENT
PRECIPITATION	33.48	1701453.370	100.00
RUNOFF	0.557	28311.867	1.66
EVAPOTRANSPIRATION	28.214	1433820.250	84.27
DRAINAGE COLLECTED FROM LAYER 2	5.9113	300410.062	17.66
PERC./LEAKAGE THROUGH LAYER 3	0.000100	5.104	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000101	5.133	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000074	3.780	0.00
CHANGE IN WATER STORAGE	-1.202	-61093.184	-3.59
SOIL WATER AT START OF YEAR	145.784	7408765.000	
SOIL WATER AT END OF YEAR	144.582	7347672.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.648	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 20

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.25	1.22	1.19	1.45	3.65	3.42
	5.50	3.01	6.23	5.38	1.21	3.14
RUNOFF	0.338	0.000	0.003	0.000	0.000	0.000
	0.000	0.000	0.000	0.032	0.000	0.000
EVAPOTRANSPIRATION	0.265	1.334	1.644	2.012	3.911	4.368
	5.476	3.020	2.592	1.899	1.165	1.292
LATERAL DRAINAGE COLLECTED	0.2781	1.2462	0.4270	0.2826	0.1367	0.0299
FROM LAYER 2	0.0131	0.0003	0.0002	0.6101	3.5629	0.9736
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.005	0.001	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.002	0.013	0.003
STD. DEVIATION OF DAILY	0.000	0.003	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.015	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 20

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.65	1913373.120	100.00
RUNOFF	0.373	18977.084	0.99
EVAPOTRANSPIRATION	28.979	1472718.000	76.97
DRAINAGE COLLECTED FROM LAYER 2	7.5608	384238.187	20.08
PERC./LEAKAGE THROUGH LAYER 3	0.000124	6.293	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0022		
PERC./LEAKAGE THROUGH LAYER 5	0.000123	6.275	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000124	6.323	0.00
CHANGE IN WATER STORAGE	0.737	37433.379	1.96
SOIL WATER AT START OF YEAR	144.582	7347672.000	
SOIL WATER AT END OF YEAR	145.319	7385105.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.087	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 21

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.37	0.96	3.65	2.76	2.54	6.66
	4.14	3.21	1.29	0.34	3.64	3.07
RUNOFF	0.000	0.435	0.352	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	1.039	0.344	2.762	2.954	2.815	7.094
	4.336	3.418	0.774	0.825	1.068	0.947
LATERAL DRAINAGE COLLECTED	1.1448	0.4111	2.8904	0.7240	0.2286	0.0595
FROM LAYER 2	0.1130	0.0007	0.0001	0.0000	0.0001	0.6575
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.002	0.010	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
STD. DEVIATION OF DAILY	0.002	0.001	0.007	0.001	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 21

	INCHES	CU. FEET	PERCENT

PRECIPITATION	35.63	1810716.870	100.00
RUNOFF	0.787	40007.133	2.21
EVAPOTRANSPIRATION	28.376	1442079.500	79.64
DRAINAGE COLLECTED FROM LAYER 2	6.2297	316595.531	17.48
PERC./LEAKAGE THROUGH LAYER 3	0.000105	5.311	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0018		
PERC./LEAKAGE THROUGH LAYER 5	0.000105	5.320	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000074	3.760	0.00
CHANGE IN WATER STORAGE	0.237	12030.357	0.66
SOIL WATER AT START OF YEAR	145.319	7385105.500	
SOIL WATER AT END OF YEAR	145.556	7397135.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.523	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 22

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.41	3.52	2.70	3.69	2.58	5.97
	4.36	1.73	2.50	3.52	2.55	0.83
RUNOFF	0.000	1.052	0.000	0.000	0.000	0.003
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.931	0.316	2.562	3.530	3.951	5.869

	4.418	2.056	2.246	1.604	1.280	0.879
LATERAL DRAINAGE COLLECTED	1.0254	0.3868	1.4666	0.8485	0.4154	0.1898
FROM LAYER 2	0.0086	0.0005	0.0000	0.0000	0.0002	0.4571
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.004	0.001	0.005	0.003	0.001	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.002
STD. DEVIATION OF DAILY	0.001	0.001	0.004	0.002	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 22

	INCHES	CU. FEET	PERCENT
PRECIPITATION	34.36	1746175.250	100.00
RUNOFF	1.055	53605.242	3.07
EVAPOTRANSPIRATION	29.642	1506410.250	86.27
DRAINAGE COLLECTED FROM LAYER 2	4.7991	243890.094	13.97
PERC./LEAKAGE THROUGH LAYER 3	0.000085	4.310	0.00

AVG. HEAD ON TOP OF LAYER 3	0.0014		
PERC./LEAKAGE THROUGH LAYER 5	0.000085	4.313	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000092	4.670	0.00
CHANGE IN WATER STORAGE	-1.136	-57734.871	-3.31
SOIL WATER AT START OF YEAR	145.556	7397135.500	
SOIL WATER AT END OF YEAR	144.261	7331320.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.159	8080.812	0.46
ANNUAL WATER BUDGET BALANCE	0.0000	-0.126	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 23

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.44	3.01	3.45	3.14	4.02	2.44
	4.32	1.37	3.20	2.36	1.60	1.06
RUNOFF	0.114	0.000	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.408	1.178	2.984	3.918	4.505	3.106
	4.312	1.349	2.251	1.903	1.252	1.026
LATERAL DRAINAGE COLLECTED	0.3531	0.5676	1.8765	0.9505	0.3612	0.1061
FROM LAYER 2	0.0004	0.0001	0.0000	0.0006	0.0000	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.002	0.006	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.004	0.005	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 23

	INCHES	CU. FEET	PERCENT
PRECIPITATION	31.41	1596256.500	100.00
RUNOFF	0.114	5798.639	0.36
EVAPOTRANSPIRATION	28.194	1432811.870	89.76
DRAINAGE COLLECTED FROM LAYER 2	4.2162	214265.531	13.42
PERC./LEAKAGE THROUGH LAYER 3	0.000072	3.679	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0012		
PERC./LEAKAGE THROUGH LAYER 5	0.000072	3.684	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000085	4.344	0.00
CHANGE IN WATER STORAGE	-1.114	-56624.086	-3.55

SOIL WATER AT START OF YEAR	144.261	7331320.000	
SOIL WATER AT END OF YEAR	143.305	7282777.000	
SNOW WATER AT START OF YEAR	0.159	8080.812	0.51
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.231	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 24

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.35	3.18	5.19	5.51	3.62	3.99
	4.01	0.70	4.60	4.51	1.11	1.29
RUNOFF	0.000	0.502	0.000	0.000	0.011	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.522	0.466	2.658	4.238	4.725	3.888
	4.390	0.711	2.463	1.809	1.280	0.726
LATERAL DRAINAGE COLLECTED	0.0001	0.0000	2.6746	1.6390	1.5227	0.3253
FROM LAYER 2	0.0954	0.0001	0.0002	0.0116	2.0194	0.5449
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0000	0.0001	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.009	0.006	0.005	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.007	0.002
STD. DEVIATION OF DAILY	0.000	0.000	0.007	0.004	0.003	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.004	0.001
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 24

	INCHES	CU. FEET	PERCENT
PRECIPITATION	38.06	1934209.250	100.00
RUNOFF	0.513	26072.764	1.35
EVAPOTRANSPIRATION	27.877	1416716.250	73.25
DRAINAGE COLLECTED FROM LAYER 2	8.8332	448900.719	23.21
PERC./LEAKAGE THROUGH LAYER 3	0.000143	7.281	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0026		
PERC./LEAKAGE THROUGH LAYER 5	0.000143	7.278	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000145	7.386	0.00
CHANGE IN WATER STORAGE	0.837	42513.363	2.20
SOIL WATER AT START OF YEAR	143.305	7282777.000	
SOIL WATER AT END OF YEAR	144.142	7325290.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-1.225	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 25

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.54	0.34	4.50	4.51	4.08	5.92
	1.88	4.34	5.24	2.68	0.87	1.60
RUNOFF	0.000	0.000	0.000	0.000	0.000	0.017
	0.000	0.000	0.000	0.000	0.000	0.081
EVAPOTRANSPIRATION	0.972	0.276	2.451	4.062	3.311	7.625
	1.949	4.028	3.167	1.571	1.367	0.802
LATERAL DRAINAGE COLLECTED	0.1615	0.4925	0.2899	2.5201	0.8096	0.3411
FROM LAYER 2	0.1034	0.0002	0.0001	0.0888	0.4940	0.4502
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.002	0.001	0.009	0.003	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.002	0.002
STD. DEVIATION OF DAILY	0.001	0.001	0.001	0.003	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.001	0.001	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000

HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 25

	INCHES	CU. FEET	PERCENT
PRECIPITATION	37.50	1905750.250	100.00
RUNOFF	0.098	4999.769	0.26
EVAPOTRANSPIRATION	31.581	1604960.000	84.22
DRAINAGE COLLECTED FROM LAYER 2	5.7514	292284.719	15.34
PERC./LEAKAGE THROUGH LAYER 3	0.000101	5.111	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000101	5.111	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000101	5.149	0.00
CHANGE IN WATER STORAGE	0.069	3500.867	0.18
SOIL WATER AT START OF YEAR	144.142	7325290.000	
SOIL WATER AT END OF YEAR	144.141	7325227.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.070	3563.679	0.19
ANNUAL WATER BUDGET BALANCE	0.0000	-0.268	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 26

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	3.85	2.01	2.39	2.09	3.90	1.95
	4.43	3.23	1.89	3.23	2.88	3.19
RUNOFF	1.224	1.712	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.297	1.335	2.706	2.327	4.394	2.549
	4.092	2.079	2.049	1.994	1.611	1.061
LATERAL DRAINAGE COLLECTED	0.1584	1.2960	0.6780	0.2155	0.0177	0.0047
FROM LAYER 2	0.0000	0.0028	0.0000	0.0044	0.4425	2.1200
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.005	0.002	0.001	0.000	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.002	0.007
STD. DEVIATION OF DAILY	0.000	0.005	0.001	0.000	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.001	0.005
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 26

	INCHES	CU. FEET	PERCENT
PRECIPITATION	35.04	1780732.870	100.00
RUNOFF	2.935	149170.516	8.38
EVAPOTRANSPIRATION	26.494	1346435.120	75.61
DRAINAGE COLLECTED FROM LAYER 2	4.9400	251048.500	14.10
PERC./LEAKAGE THROUGH LAYER 3	0.000083	4.231	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0015		
PERC./LEAKAGE THROUGH LAYER 5	0.000083	4.220	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.800	0.00
CHANGE IN WATER STORAGE	0.670	34073.645	1.91
SOIL WATER AT START OF YEAR	144.141	7325227.500	
SOIL WATER AT END OF YEAR	144.881	7362864.500	
SNOW WATER AT START OF YEAR	0.070	3563.679	0.20
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.753	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 27

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.39	1.33	2.46	1.95	3.55	2.96
	1.91	3.68	0.49	1.44	1.75	0.58
RUNOFF	0.000	0.027	0.000	0.000	0.000	0.000
	0.000	0.000	0.000	0.000	0.000	0.000

EVAPOTRANSPIRATION	1.425	0.472	1.941	2.746	4.017	3.533
	2.114	2.950	1.228	1.380	1.082	0.897
LATERAL DRAINAGE COLLECTED	0.9212	0.2467	0.0787	0.9503	0.3590	0.1018
FROM LAYER 2	0.0018	0.0007	0.0000	0.0006	0.0001	0.0001
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.003	0.001	0.000	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.001	0.000	0.000	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 27

	INCHES	CU. FEET	PERCENT
PRECIPITATION	23.49	1193761.750	100.00
RUNOFF	0.027	1390.530	0.12
EVAPOTRANSPIRATION	23.785	1208743.370	101.25
DRAINAGE COLLECTED FROM LAYER 2	2.6612	135243.359	11.33

PERC./LEAKAGE THROUGH LAYER 3	0.000050	2.518	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0008		
PERC./LEAKAGE THROUGH LAYER 5	0.000050	2.530	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000000	0.000	0.00
CHANGE IN WATER STORAGE	-2.983	-151616.312	-12.70
SOIL WATER AT START OF YEAR	144.881	7362864.500	
SOIL WATER AT END OF YEAR	141.898	7211248.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.885	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 28

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	2.78	3.09	3.88	4.57	4.52	4.01
	5.81	6.25	2.70	0.97	2.45	0.42
RUNOFF	0.000	0.574	0.722	0.379	0.000	0.000
	0.024	0.052	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.674	0.675	0.970	3.345	5.219	4.678
	5.356	4.791	4.052	1.317	1.025	0.578
LATERAL DRAINAGE COLLECTED	0.0000	0.0067	2.0917	2.8878	0.4687	0.2560
FROM LAYER 2	0.0725	0.0000	0.0001	0.0021	0.0048	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.007	0.010	0.002	0.001
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.004	0.012	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 28

	INCHES	CU. FEET	PERCENT
PRECIPITATION	41.45	2106488.750	100.00
RUNOFF	1.751	88978.602	4.22
EVAPOTRANSPIRATION	32.680	1660797.000	78.84
DRAINAGE COLLECTED FROM LAYER 2	5.7903	294265.125	13.97
PERC./LEAKAGE THROUGH LAYER 3	0.000092	4.689	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0017		
PERC./LEAKAGE THROUGH LAYER 5	0.000092	4.689	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000114	5.769	0.00

CHANGE IN WATER STORAGE	1.229	62442.469	2.96
SOIL WATER AT START OF YEAR	141.898	7211248.500	
SOIL WATER AT END OF YEAR	143.127	7273691.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	-0.153	0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 29

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	1.32	4.01	3.51	2.71	4.02	3.12
	4.04	2.02	0.87	1.52	3.11	0.54
RUNOFF	0.018	2.028	0.390	0.000	0.016	0.000
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.576	0.225	2.379	2.830	4.074	4.657
	3.538	2.518	0.833	1.048	0.836	0.666
LATERAL DRAINAGE COLLECTED	0.0000	0.0000	1.9095	0.9163	0.2334	0.0775
FROM LAYER 2	0.0008	0.0022	0.0000	0.0001	0.0002	0.0959
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.000	0.000	0.007	0.003	0.001	0.000
TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.005	0.002	0.000	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 29

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.79	1564748.250	100.00
RUNOFF	2.452	124599.914	7.96
EVAPOTRANSPIRATION	24.179	1228796.870	78.53
DRAINAGE COLLECTED FROM LAYER 2	3.2359	164448.281	10.51
PERC./LEAKAGE THROUGH LAYER 3	0.000055	2.797	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0009		
PERC./LEAKAGE THROUGH LAYER 5	0.000055	2.793	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000042	2.132	0.00
CHANGE IN WATER STORAGE	0.923	46900.867	3.00
SOIL WATER AT START OF YEAR	143.127	7273691.000	
SOIL WATER AT END OF YEAR	144.049	7320591.500	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00

ANNUAL WATER BUDGET BALANCE 0.0000 0.146 0.00

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MONTHLY TOTALS (IN INCHES) FOR YEAR 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION	0.49	1.98	2.50	1.59	6.25	5.30
	1.16	3.20	2.30	0.76	1.44	2.53
RUNOFF	0.000	0.449	0.076	0.000	0.001	0.034
	0.000	0.000	0.000	0.000	0.000	0.000
EVAPOTRANSPIRATION	0.127	0.456	2.548	2.035	4.409	7.505
	1.447	3.033	2.466	0.688	0.748	0.748
LATERAL DRAINAGE COLLECTED	0.2415	0.0285	0.8995	0.8515	0.2771	0.2410
FROM LAYER 2	0.2073	0.0000	0.0005	0.0001	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 3	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 5	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
LAYER 8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)

AVERAGE DAILY HEAD ON	0.001	0.000	0.003	0.003	0.001	0.001
TOP OF LAYER 3	0.001	0.000	0.000	0.000	0.000	0.000
STD. DEVIATION OF DAILY	0.000	0.000	0.003	0.001	0.001	0.000
HEAD ON TOP OF LAYER 3	0.000	0.000	0.000	0.000	0.000	0.000
AVERAGE DAILY HEAD ON	0.000	0.000	0.000	0.000	0.000	0.000
TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

STD. DEVIATION OF DAILY	0.000	0.000	0.000	0.000	0.000	0.000
HEAD ON TOP OF LAYER 5	0.000	0.000	0.000	0.000	0.000	0.000

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ANNUAL TOTALS FOR YEAR 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	29.50	1499190.120	100.00
RUNOFF	0.560	28449.311	1.90
EVAPOTRANSPIRATION	26.210	1331989.620	88.85
DRAINAGE COLLECTED FROM LAYER 2	2.7471	139605.672	9.31
PERC./LEAKAGE THROUGH LAYER 3	0.000051	2.593	0.00
AVG. HEAD ON TOP OF LAYER 3	0.0008		
PERC./LEAKAGE THROUGH LAYER 5	0.000051	2.596	0.00
AVG. HEAD ON TOP OF LAYER 5	0.0000		
PERC./LEAKAGE THROUGH LAYER 8	0.000041	2.076	0.00
CHANGE IN WATER STORAGE	-0.017	-856.874	-0.06
SOIL WATER AT START OF YEAR	144.049	7320591.500	
SOIL WATER AT END OF YEAR	144.033	7319735.000	
SNOW WATER AT START OF YEAR	0.000	0.000	0.00
SNOW WATER AT END OF YEAR	0.000	0.000	0.00
ANNUAL WATER BUDGET BALANCE	0.0000	0.274	0.00

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AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.56	2.15	3.09	3.37	3.44	4.42
	3.38	2.66	2.75	2.18	2.16	2.06
STD. DEVIATIONS	0.95	1.09	0.92	1.36	1.56	2.04
	1.87	1.38	1.45	1.28	1.38	1.14
RUNOFF						
TOTALS	0.176	0.471	0.272	0.014	0.004	0.032
	0.010	0.002	0.001	0.001	0.004	0.010
STD. DEVIATIONS	0.321	0.552	0.557	0.069	0.015	0.097
	0.036	0.009	0.005	0.006	0.011	0.025
EVAPOTRANSPIRATION						
TOTALS	0.594	0.694	2.371	3.366	3.743	4.799
	3.509	2.574	2.145	1.464	1.113	0.803
STD. DEVIATIONS	0.324	0.449	0.477	0.806	0.986	1.615
	1.485	1.165	1.014	0.351	0.327	0.204
LATERAL DRAINAGE COLLECTED FROM LAYER 2						
TOTALS	0.4684	0.5535	1.2824	0.9498	0.4910	0.2643
	0.1080	0.0461	0.0084	0.0320	0.3141	0.5680
STD. DEVIATIONS	0.4601	0.7428	0.7700	0.7024	0.4824	0.4296
	0.1788	0.1399	0.0386	0.1147	0.8095	0.7924
PERCOLATION/LEAKAGE THROUGH LAYER 3						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
PERCOLATION/LEAKAGE THROUGH LAYER 5						
TOTALS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
STD. DEVIATIONS	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

```
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  PERCOLATION/LEAKAGE THROUGH LAYER  8
  -------------------------------------
    TOTALS                0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS       0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  3
  -------------------------------------
    AVERAGES              0.0016   0.0021   0.0044   0.0034   0.0017   0.0009
                          0.0004   0.0002   0.0000   0.0001   0.0011   0.0019

    STD. DEVIATIONS       0.0016   0.0028   0.0026   0.0025   0.0017   0.0015
                          0.0006   0.0005   0.0001   0.0004   0.0029   0.0027

  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  -------------------------------------
    AVERAGES              0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

    STD. DEVIATIONS       0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                          0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                     INCHES            CU. FEET       PERCENT
                                 -------------------   -------------   ---------
 PRECIPITATION                    33.21    (   4.731)    1687867.6     100.00

 RUNOFF                            0.996   (  0.9827)      50640.57      3.000

 EVAPOTRANSPIRATION               27.175   (  3.0366)    1381024.87     81.821

 LATERAL DRAINAGE COLLECTED        5.08598 (  2.10634)    258469.328   15.31336
   FROM LAYER  2

 PERCOLATION/LEAKAGE THROUGH       0.00009 (  0.00003)         4.398     0.00026
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  LAYER  3

 AVERAGE HEAD ON TOP             0.001 (    0.001)
   OF LAYER  3

 PERCOLATION/LEAKAGE THROUGH     0.00009 (  0.00003)         4.398     0.00026
   LAYER  5

 AVERAGE HEAD ON TOP             0.000 (    0.000)
   OF LAYER  5

 PERCOLATION/LEAKAGE THROUGH     0.00009 (  0.00004)         4.342     0.00026
   LAYER  8

 CHANGE IN WATER STORAGE        -0.045   (  1.2514)      -2271.40     -0.135

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              PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ---------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              3.44        174820.797

      RUNOFF                                     1.542        78341.5625

      DRAINAGE COLLECTED FROM LAYER  2           0.57912      29430.85940

      PERCOLATION/LEAKAGE THROUGH LAYER  3       0.000007         0.37043

      AVERAGE HEAD ON TOP OF LAYER  3            0.061

      MAXIMUM HEAD ON TOP OF LAYER  3            0.123

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)                0.0 FEET

      PERCOLATION/LEAKAGE THROUGH LAYER  5       0.000007         0.36136

      AVERAGE HEAD ON TOP OF LAYER  5            0.000

      PERCOLATION/LEAKAGE THROUGH LAYER  8       0.000033         1.67392

      SNOW WATER                                 2.13        108084.5230


      MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.3844

      MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.1040

       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

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FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	8.1781	0.2272
2	0.0025	0.0100
3	0.0000	0.0000
4	67.3200	0.1870
5	10.8480	0.4520
6	34.0800	0.2840
7	11.4000	0.1900
8	9.9600	0.0830
SNOW WATER	0.000	

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Appendix 9

Response to June 6, 2019 IEPA Comments

Environmental Resources Management

1701 Golf Road
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(314) 733-4490
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July 26, 2019

William E. Buscher, P.G.
Manager, Hydrogeology and Compliance Unit
Groundwater Section – Bureau of Water
Illinois Environmental Protection Agency
1021 North Grand Avenue East
Springfield, Illinois 62794-9276

RE: Response to June 6, 2019 IEPA Comments
Application to Establish a Groundwater Management Zone
Grand Tower, Jackson County, Illinois W0770400003

Dear Bill:

On behalf of Grand Tower Energy Center, LLC (GTEC), Environmental Resources Management (ERM) has prepared this response to comments provided to ERM in the June 6, 2019 letter from the Illinois Environmental Protection Agency (IEPA). The IEPA letter was developed in response to the March 2019 Application to Establish a Groundwater Management Zone (GMZ) and other project-related documents that were submitted to the IEPA to support closure of the inactive coal combustion waste (CCW) ash basin located on the GTEC facility property in Grand Tower, Illinois. The GTEC facility is currently owned by Main Line Generation LLC, a subsidiary of Rockland Capital, and was purchased from Ameren in February 2014. The facility has not received CCW since about 2001, and is considered an inactive ash basin. GTEC is intending to close this inactive ash basin in 2019, using criteria defined in the Code of Federal Regulation (CFR) Part 257 regulations as the guide.

IEPA comments, and ERM's response to those comments, are presented below.

Comment 1
Application to Establish a Groundwater Management Zone
Book 3, Appendix 7

The document states that the chosen corrective action plan, after alternatives analysis and modeling, is on-site basin construction capped with a linear low density polyethylene (LLDPE) liner which is designed to reduce or eliminate the infiltration of water into the CCW materials. Of major concern is that the model on which the chosen plan is based, while it does show boron concentrations will significantly decrease thirty years post-closure, does not indicate when Illinois numerical groundwater standards will be met. Further information is required indicating when Illinois numerical groundwater standards will be met.

ERM Response: ERM modeled the concentrations of COCs in groundwater after completion of closure activities, to the point where COC concentrations at the point of compliance wells in the GMZ were below the applicable groundwater quality standards. The results of this modeling are presented in the July 25, 2019 Technical Memorandum – Groundwater Flow/Contaminant Fate and Transport Model Update, which is included with this letter. In summary, water quality at the point of compliance wells in the GMZ is below the applicable standards as shown below:

- Boron – 30 years for GMZ, 45 years for all wells in GMZ;
- Sulfate – 15 years for all wells in GMZ;
- Lithium - 25 years for GMZ, 35 years for all wells in GMZ; and
- Molybdenum - 45 years for GMZ, 50 years for all wells in GMZ.

Comment 2
Application to Establish a Groundwater Management Zone
Book 3, Appendix 7

Boron, sulfate are modeled predictively with the chosen cap scenario, but other constituents in the GMZ are not, specifically, TDS, molybdenum, and lithium. In order to fully evaluate the success of the chosen cap, the predictive results of a model showing these constituents must be presented. Further information is required indicating when Illinois numerical groundwater standards and the Part 257.95(h) groundwater protection standards will be met.

ERM Response: TDS is not required per discussion with IEPA.

Comment 3
Application to Establish a Groundwater Management Zone
Book 3, Appendix 8

The HELP model used does not appear to represent the 36 inches of soil above the LLDPE liner proposed, but rather 24 inches. However, there is not a clear explanation of the layers modeled in the HELP model and what they represent. Further explanation of the layers modeled is needed to properly assess the HELP model presented.

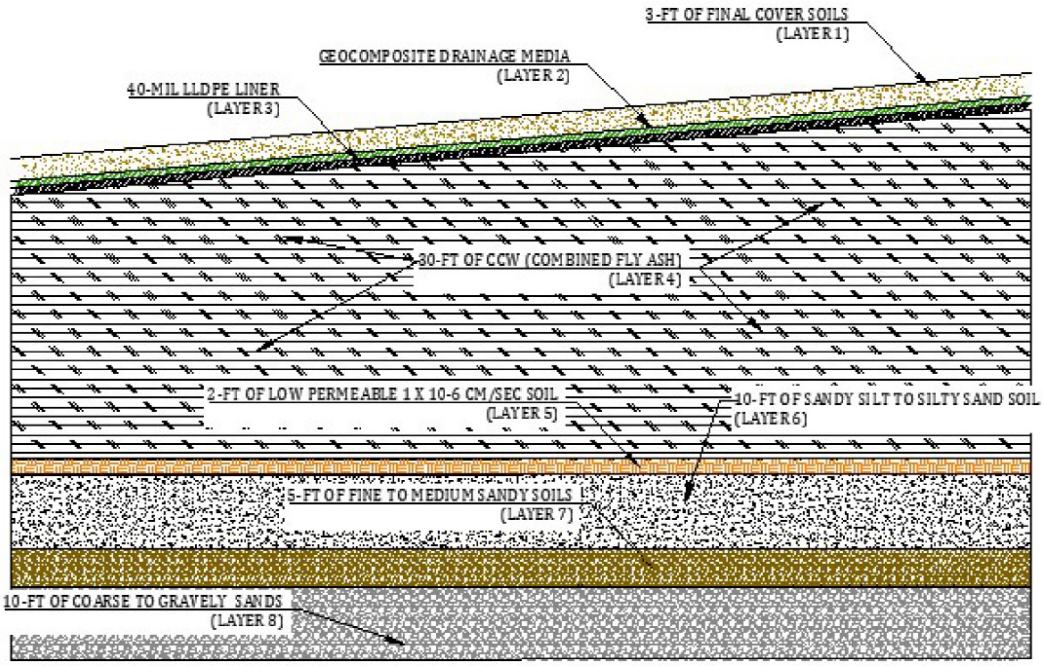
ERM Response: ERM developed proposed closure plans (Appendix 3 of the submitted GMZ Application) incorporating subsurface data collected from the site. Using these plans, ERM utilized the Hydraulic Evaluation of Landfill Performance (HELP) Model to develop a 30-year simulation of rainfall infiltration into and through the CCW materials based on current conditions

(Scenario 1) and following closure using the selected remedy (Scenario 2). This simulation was updated to include three feet of final cover soils above the proposed liner. Based on results of the simulations, rainfall infiltration through CCW materials and into the upper Henry Formation will reduce from an annual average total infiltration of 490,000 gallons per year (existing conditions) to 33 gallons per year (post closure). Therefore, the installation of the proposed cap system will provide effective source area control. The revised model run for 36-inches of cover is presented in Attachment A of the Technical Memorandum.

The layers through which infiltration was assessed are presented below.

HELP MODEL INPUT INFORMATION

TYPICAL CROSS SECTION OF CLOSED/CAPPED CCW WASTE WITH CORRESPONDING HELP MODEL LAYER #'S



RESULTS FROM 30-YEAR HELP MODEL SIMULATION:

AVERAGE ANNUAL PERCOLATION/LEAKAGE THROUGH LAYER 5 = 4.4 CF OR 33 GAL.

PEAK DAILY PERCOLATION/LEAKAGE THROUGH LAYER 5 = 0.36 CF OR 2.7 GAL.

Comment 4
Application to Establish a Groundwater Management Zone

For the GMZ application as a whole, the 3-dimensional extent of the area to be included in the GMZ is not defined in the application. In addition the proposed GMZ included the Please submit an update showing the horizontal and vertical extents of the boundary of the requested GMZ extent.

ERM Response: The proposed area for the GMZ is shown on Figure 1 (attached). The vertical limits of the GMZ are defined by the base of the Henry Formation sands, which at Monitoring Well 6D was encountered at depths greater than 150 feet. For reference, limestone bedrock was encountered at 97 feet at Monitoring Well APW-10D, which is located on GTEC property south of the defined limits of the GMZ.

Comment 5
Proposed Remedy – Continued Monitoring

Monitoring wells APW-1 through APW-10 will be required to be monitored quarterly for a minimum period of five years commencing on the approval of the GMZ. Groundwater monitoring results will be reported to the Illinois EPA annually. Iron and manganese must be added to the constituent list to be monitored.

ERM Response: Acknowledged.

ERM appreciates the opportunity to provide this information to the IEPA. Should you have any questions, please contact me at (217) 529-0914.

Sincerely,

Brett D. Carney, P.G.
Project Manager
Environmental Resources Management
68 Villa Grove
Springfield, IL 62712