PART II: Release Information

1. Identify the chemical constituents release to the groundwater. Attach additional documents as necessary.

Chemical Description	Chemical Abstract No.
Boron	***7440-42-8***
Manganese	***7439-96-5***
Total Dissolved Solids	***10052***

2. Describe how the site will be investigated to determine the source or sources of the release. ***The West Ash Pond Complex has been investigated as described in Section 1.2 (Technical Support Documents) in NRT, 2016a.***

3. Describe how groundwater will be monitored to determine the rate and extent of the release. ***The monitoring network to monitor the extent of the release is described in Section 4 (Groundwater Monitoring Plan) in NRT, 2016b.***

4. Has the release been contained on-site at the facility? ***The current horizontal extent of the parameters of concern related to CCR leachate (boron) that exceed Class I groundwater standards is within the Wood River Power Station's property with the exception of a narrow strip along the Mississippi River (Great River Road/Route 143) that is not owned by Dynegy Midwest Generation, LLC.***

5. Describe the groundwater monitoring network and groundwater and soil sampling protocols in place at the facility. ***The groundwater monitoring network and sampling protocols are described in Section 4 (Groundwater Monitoring Plan) in NRT, 2016b.***

6. Provide the schedule for investigation and monitoring. ***The site investigation is complete and groundwater monitoring will continue on a quarterly basis for the required/permitted monitoring period as described in Section 4.2 (Sampling Schedule) in NRT, 2016b.***

7. Describe the laboratory quality assurance program utilized for the investigation. ***Laboratory quality assurance is described in Sections 4.4 (Laboratory Analysis) and 4.5 (Quality Assurance) in NRT, 2016b. The quality assurance/quality control procedures described in the Groundwater Monitoring Plan will be supplemented by the selected Illinois EPA-approved laboratory's QA Manual.***

8. Provide a summary of the results of available soil testing and groundwater monitoring associated with the release at the facility. The summary or results should provide the following information: dates of sampling; types of samples taken (soil or water); locations and depths of samples; sampling and analytical methods; analytical laboratories used; chemical constituents for which analyses were performed; analytical detection limits; and concentrations of chemical constituents in ppm (levels below detection should be identified as "ND"). ***A narrative summary of the results of groundwater monitoring is discussed in Section 3 (Groundwater Quality) in NRT, 2016c. Analytical data summary tables are available in Appendix E (Groundwater Quality Data) in NRT, 2016c. Analytical data for all monitoring events have been previously submitted to Illinois EPA.***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Wood River Power Station	
Facility Name	Signature of Owner/Operator
1 Chessen Ln, Alton, IL 62002	**Dynegy Midwest Generation, LLC**
Location of Facility	Name of Owner/Operator
1190205002	10-19-2016
Illinois EPA Identification Number	Date

Part III: Remedy Selection Information

1. Describe the selected remedy. ***The remedy includes ash dewatering, relocating/reshaping existing CCR within the West Ash Pond Complex to achieve acceptable grades, construction of a geomembrane cover system and establishing a vegetative cover to minimize long-term erosion (AECOM, 2016).***

2. Describe other remedies which were considered and why they were rejected. ***Further mitigation of CCR constituents is not deemed practicable or cost-effective.***

3. Will waste, contaminated soil or contaminated groundwater be removed from the site in the course of this remediation? Yes ☐ No ☒
   If the answer to this question is "yes", where will the contaminated material be taken?

4. Describe how the selected remedy will accomplish the maximum practical restoration of beneficial use of groundwater. ***The dewatering and installation of a geomembrane cover system will control the potential for water infiltration into the closed CCR unit and will allow drainage of surface water off of the cover system. These actions will reduce leachate generation and migration and groundwater quality will improve over time.***

5. Describe how the selected remedy will minimize any threat to public health or the environment. ***The currently defined extent of releases does not threaten public health. As discussed in Section 2.2 in NRT, 2016a, there are currently no impairments to groundwater usage on the Wood River Power Station property or surrounding properties caused by the West Ash Pond Complex. No impairments to groundwater usage resulting from establishment of the proposed GMZ are anticipated. CCR dewatering and the geomembrane cover system will reduce leachate generation and migration from the West Ash Pond Complex and minimize CCR constituents entering the environment.***

6. Describe how the selected remedy will result in compliance with the applicable groundwater standards. ***Closure in place of the Wood River West Ash Pond Complex, as proposed, will result in a reduction of leachate production, decreasing CCR constituent concentrations and contraction of the groundwater plume. A Groundwater Model Report, included in Appendix D of AECOM 2016, suggests that the geosynthetic cover system will control recharge and subsequent leachate generation within the limits of the Site and reduce concentrations of boron below Class I standards. Concentration reductions are expected to begin approximately one year after completion of the cover system.***

7. Provide a schedule for design, construction and operation of the remedy, including dates for the start and completion. ***A schedule for implementing the remedies is included in Section 1.3 in AECOM, 2016.***

8. Describe how the remedy will be operated and maintained. ***The operation and maintenance of the remedy is descried in Section 3 (Post-Closure Care Plan) in (AECOM, 2016).***

9. Have any of the following permits been issued for the remediation?

   a. Construction or Operating permit from the Division of Water Pollution Control. Yes ☐ No ☒

   b. Land treatment permit from the Division of Water Pollution Control. Yes ☐ No ☒
      If the answer to this question is "yes", identify the permit number.

   c. Construction or Operating permit from the Division of Air Pollution Control. Yes ☐ No ☒
      If the answer to this question is "yes", identify the permit number.

10. How will groundwater at the facility be monitored following completion of the remedy to ensure that the groundwater standards have been attained? ***Groundwater monitoring procedures are described in Section 4 (Groundwater Monitoring Plan) in NRT, 2016b.***

Based on my inquiry of those persons directly responsible for gathering the information, I certify that the information submitted is, to the best of my knowledge and belief, true and accurate and confirm that the actions identified herein will be undertaken in accordance with the schedule set forth herein.

Wood River Power Station	
Facility Name	Signature of Owner/Operator
1 Chessen Ln, Alton, IL 62002	**Dynegy Midwest Generation, LLC**
Location of Facility	Name of Owner/Operator
1190205002	10-19-2016
Illinois EPA Identification Number	Date

PART IV: Completion Certification

This certification must accompany documentation which includes soil and groundwater monitoring data demonstrating successful completion of the corrective process described in Parts I-III.

Facility Name _____

Facility Address _____

_____

County _____

Standard Industrial Code (SIC) _____

Date _____

Based on my inquiry of those persons directly responsible for gathering the information, I certify that an adequate corrective action, equivalent to a corrective action process approved by the Agency, has been undertaken and that the following restoration concentrations are being met:

Chemical Name	Chemical Abstract No.	Concentration (mg/L)

Wood River Power Station
Facility Name

1 Chessen Ln, Alton, IL 62002
Location of Facility

1190205002
Illinois EPA Identification Number

Signature of Owner/Operator

Dynegy Midwest Generation, LLC
Name of Owner/Operator

Date

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APPENDICES

1 INTRODUCTION

1.1 Overview

This Groundwater Management Zone Application was prepared by Natural Resource Technology, Inc. (NRT) in support of the Closure Plan for the West Ash Pond Complex (AECOM, 2016) located at the Wood River Power Station (WRPS), which is owned by Dynegy Midwest Generation, LLC (DMG). The West Ash Pond Complex includes West Ash Pond 1, West Ash Pond 2E, and West Ash Pond 2W. This application is submitted pursuant to Illinois Administrative Code Title 35, Part 620: Groundwater Quality (35 IAC Part 620).

DMG requests establishment of a Groundwater Management Zone (GMZ) pursuant to 35 IAC 620.250(a)(2) as a three-dimensional region containing groundwater being managed to mitigate a potential release of Coal Combustion Residuals (CCR) constituents from the West Ash Pond Complex, which is inclusive of the following three surface impoundments as listed below:

- West Ash Pond 1
- West Ash Pond 2E
- West Ash Pond 2W

The boundary of the GMZ is approximated in map view on Figure 1. The boundary generally extends from the northern edge of the ash ponds south to the property line located within Section 19 Township 5 North and Range 9 West. The area of the GMZ includes the entire West Ash Pond Complex.

A legal description and map of the proposed GMZ is provided in Appendix A. The GMZ will extend vertically through all water-bearing strata to the top of bedrock at an estimated elevation of approximately 300 ft MSL.

1.2 Technical Support Documents

Technical documents in support of the Closure Plan for the Wood River West Ash Complex, include, but are not limited to, the following:

- ***AECOM December 31, 2015, 30% Design Data Package for Dynegy Wood River Energy Complex West Ash Pond and East Pond CCR Units.*** A geotechnical program consisting of installation of auger borings, CPT soundings and piezometers to obtain information for compliance with requirements of the federal CCR rule.

- ***Kelron/NRT, August 26, 2009, Assessment of Potential for Groundwater Impact on Identified Water Wells, Dynegy Midwest Generation, Inc., Wood River Power Station, East Alton, Illinois.*** An assessment of the potential for impact to water quality in water wells within 2,500 feet of the WRPS property boundary, identified in the June 3, 2009 Water Well Survey report.

- ***Kelron/NRT, June 3, 2009, Water Well Survey, Dynegy Midwest Generation, Inc., Wood River Power Station, East Alton, Illinois.*** A survey to identify wells located within 2,500 feet of the WRPS property boundary.

- ***NRT, May 3, 2006, Transport Model Investigation for the New East Ash Pond, Dynegy Midwest Generation, Inc., Wood River Power Station, Alton, Illinois.*** Calibration of a groundwater flow and transport model to match conditions observed at the New East Ash Pond and utilization of the model to predict the effects of the New East Ash Pond on groundwater quality in the future.

- ***Kelron, December 17, 2004, Hydrogeologic Investigation for the Proposed New East Ash Pond, Dynegy Midwest Generation, Inc., Wood River Power Station, Illinois.*** An investigation to characterize the hydrogeology and groundwater quality at the location of the New East Ash Pond and former Old East Ash Pond and to collect input data for groundwater flow and transport modelling.

- ***NRT, August 2000, Investigation of Closure Options for the West Ash Impoundment, Dynegy Midwest Generation, Inc., Wood River Power Station, Madison County, Illinois.*** An investigation to characterize hydrogeology and groundwater quality at the West Ash Impoundment and evaluate the effectiveness of closure alternatives for protecting groundwater quality.

- ***Kelron, November 29, 1995, Groundwater Investigation Report, Wood River Ash Pond Expansion, Illinois Power Company.*** An investigation to characterize hydrogeology and groundwater quality near a proposed ash pond expansion near the existing West Ash Pond Complex including analysis of the groundwater monitoring network designed and installed for the ash pond expansion.

- ***Illinois State Water Survey (ISWS), May 1984, Groundwater Monitoring at the Wood River Power Station's Ash Disposal Ponds and Renovated Ash Disposal Area, Illinois Power Company.*** An investigation to design and implement a groundwater monitoring program for determining the impact of ash disposal practices on the local groundwater system. This report includes results from both the West and East Ash Pond Complexes.

Groundwater flow and transport models were also developed to evaluate the effect of various ash pond closure scenarios on groundwater quality and to predict the fate and transport of CCR leachate components (NRT, 2016e). Additional groundwater modeling has been conducted to enable estimation of the time required for hydrostatic equilibrium of groundwater beneath the unit and is being submitted under separate cover (NRT, 2016d).

1.3 Site Location and Background

The West Ash Pond Complex is comprised of West Ash Pond 1, West Ash Pond 2E and West Ash Pond 2W at the WRPS, located in Alton in Madison County, Illinois. WRPS and the West and East Ash Pond Complexes are situated on the east bank of the Mississippi River, about six river miles upstream

from the confluence of the Mississippi and Missouri Rivers. . The Wood River, a perennial stream that discharges into the Mississippi River, lies on eastern edge of the WRPS property.

The West Ash Pond Complex is located within Section 19 Township 5 North and Range 9 West. The cities of Alton, East Alton, and Wood River are within 2 miles of the impoundments. The WRPS is located in an area of heavy industrial activity. Metal refining, vinegar production, cardboard manufacturing, and sewage treatment occur within ½ mile of the plant. The site location is shown on Figure 1. The WRPS property is bordered on the south by the State Route 143 and the Mississippi River, the east by the Wood River, the north by vacant/abandoned industrial property and railroad tracks, and the west by vacant land/ water retention ponds of the Mississippi River levee system operated by the Army Corps of Engineers.

Electrical generation at WRPS was shut down in June 2016, and the plant is closing its ash impoundments. This report includes closure of the West Ash Pond Complex which consists of 3 inactive impoundments (Figure 2):

- West Ash Pond 1 (22 acres, inactive)
- West Ash Pond 2W (19 acres, inactive)
- West Ash Pond 2E (11.5 acres, inactive)

Pond 3 is also shown on the Figure 2 and was used as a polishing pond when the complex was used for ash handling prior to 2006. It is not part of the West Ash Complex. West Ash Pond 2E was constructed with a geomembrane liner system and West Ash Ponds 1 and 2W are unlined. The West Ash Pond Complex will be closed by leaving CCR in place and using a combination of a conventional earth soil cover system and an alternative geomembrane cover system. West Ash Ponds 1 and 2W final cover system soils will be compacted to a permeability less than the subsoils underlying the CCR. This design will control the potential for water infiltration into the closed CCR unit and will allow drainage of surface water off of the cover system (AECOM, 2016).

1.4 Geologic and Hydrogeologic Summaries

1.4.1 Geology

The geology has been extensively evaluated during previous hydrogeologic investigations, groundwater quality assessments, and modeling since the first borings and monitoring wells were installed in 1982. The geology at WRPS consists of the following units (beginning at the ground surface):

- Fill (consisting of clay, sand, and silt mixtures) and coal ash: primarily occurs within the impoundments, impoundment berms and the Wood River and Mississippi River levees

- Upper silty clay unit: Clay and silty clay alluvial deposits of the Mississippi River and Wood River
- Inter-sand unit: a thin (generally 5 feet or less) silty sand/ sand unit above the lower silty clay unit that is continuous across most of the site and may intersect the primary sand unit in the northern portion of the site
- Lower silty clay unit: Clay and silty clay alluvial deposits of the Mississippi River and Wood River
- Primary sand unit: Sand and gravel deposits that are highly variable, well to poorly sorted, with intermittent layers of clay and silt. This unit is the uppermost aquifer unit
- Silt and sandy silt, and silty clay diamicton only observed at depth near the east side of the New (Primary) East Ash Pond (NEAP)

The ash fill lies on top of the silty clay unit, or the inter-sand unit in places where the upper silty clay was either not deposited, or removed during construction of the ash ponds. With the exception of the southeast portion of the NEAP, the ash fill is underlain by silty clay of variable thickness. The primary sand is encountered below the silty clay and is the uppermost aquifer in the area. The primary sand thickness is estimated to be approximately 120 – 140 feet. Bedrock has not been encountered in monitoring wells but regional information indicates that the West Ash Pond Complex is underlain by Mississippian age limestone.

1.4.2 Hydrogeology

Groundwater is present at depth in the primary sand unit and, during periods of high river stage, it is also present in the inter-sand layer. Water levels are elevated within the impoundments relative to groundwater elevations measured both outside and below the impoundment in the primary sand unit.

Groundwater flow directions are variable and significantly influenced by the Mississippi River stage. During base stage or low river levels, groundwater flow occurs in both a southwesterly direction toward the Mississippi River and southeasterly toward the Wood River. During spring flooding and high Mississippi River stages, groundwater flow is northerly, with either an easterly or westerly component. The flooding and high river stages only occur periodically and the dominant flow direction during any given year is toward the rivers.

Field hydraulic conductivity tests performed on the primary sand were presented in the Hydrogeologic Characterization Report (NRT, 2016c). Results indicate high horizontal hydraulic conductivities of 10^{-1} to 10^{-3} cm/sec (NRT, 2000 & Kelron, 2004); the geometric mean of all wells tested is 5.7×10^{-2} cm/sec (Kelron, 2004).

1.5 Groundwater Monitoring Activities

1.5.1 IEPA Monitoring

The current monitoring program performed in compliance with the IEPA-approved Closure Plan (NRT, 2000) includes 12 wells that are sampled semi-annually for dissolved boron and manganese, total sulfate, total dissolved solids (TDS), pH, and groundwater elevation. These monitoring wells include Wells 02, 04, 12, 20, 21, 22, 23, 25, 28, 31, 34, and 36. Additional groundwater elevation measurements are collected at Wells 29, 30, 32R, and 33. Wells 03 and 35R are present on-site but are not monitored. All wells are screened in the primary sand unit near the West Ash Pond Complex.

1.5.2 CCR Monitoring

CCR monitoring which commenced in November 2015 consists of quarterly groundwater elevation measurements and water quality samples collected at background Monitoring Wells 25, 31, 36, and downgradient Wells 02, 04, 32R, and 34. The groundwater is analyzed for Appendix III and Appendix IV parameters including: antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chloride, chromium, cobalt fluoride, lead, lithium, mercury, molybdenum, radium (total 226/228), selenium, sulfate, total dissolved solids, and thallium, and field measurements of pH. Piezometers (P008, P015, P016, P020, P021, P024, P025, and P026) are measured monthly for groundwater elevation.

Exceedances of Class I groundwater quality standards are present in monitoring wells at various locations around the West Ash Pond Complex for boron, manganese, and total dissolved solids. Measurements of pH collected from groundwater wells located immediately north of the West and East Ash Pond Complexes are also frequently below the Class I lower limit (6.5 S.U.) The exceedances of Class I groundwater quality standards for manganese, TDS and pH are attributable to either naturally occurring geochemical variability, or non-CCR sources and are not associated with the West Ash Pond Complex. Boron is the primary indicator parameter for CCR leachate at the West Ash Pond Complex. Class I groundwater quality standard exceedances of boron occur in Wells 2, 12, and 34.

2 GROUNDWATER IMPAIRMENTS AND CONTROL OPTIONS

2.1 Extent of Groundwater Impairments Associated with Ash Impoundments

Concentrations of boron, manganese, TDS, and pH exceeded Class I groundwater quality standards during the January 2010 through November 2015 monitoring period at the following locations (Figure 3):

Monitoring wells exceeding Class I groundwater quality standards [1]					
Well Number	**pH (SU)**	**Total Dissolved Solids (mg/L)**	**Manganese, dissolved (mg/L)**	**Boron dissolved (mg/L)**	**Sulfate, total (mg/L)**
02			X	X	
04			X		
12			X	X	
20	X low				
23	X low				
25		X			
28			X		
31		X			
34			X	X	
36			X		

[1] Exceeded the Class I standards in more than half of the sampling events

Using the Class I standard exceedances of CCR indicator parameter boron, the extent of CCR leachate migration appears limited to the primary sand downgradient of the site. Exceedances in upgradient wells are attributable to another source, and are not indicative of impacts from the West Ash Pond Complex.

A groundwater flow and transport model (NRT, 2016e) was calibrated to match hydraulic head and boron concentrations observed at the WRPS in November 2014 and November 2015, respectively. The calibrated model was then used to evaluate a baseline (no action) scenario and a capping scenario of Ponds 1, 2E, and 2W over a future time frame of 500 years. The capping scenario assumed cap construction with a geosynthetic barrier layer that complies with 40 CFR Part 257, Subpart D (CCR Rule). The results of the modeling indicated:

- The baseline (no action) scenario prediction model indicated boron concentrations at downgradient monitoring wells that currently exceed the Class I standard would slowly increase for a period of about 300 years before reaching an equilibrium concentration above the standard. There was no indication within the 500 year model run that boron concentrations would significantly decrease.

- The capping scenario prediction model indicated boron concentrations in all calibrated monitoring wells are predicted to start decreasing one year following cap construction. Predicted concentration distributions demonstrated reduced contaminant plumes relative to the calibrated transport model. The capping scenario model predicted all calibrated monitoring well concentrations to be below the Class I standard of 2 mg/L for boron within 53.5 years following cap construction. Similarly, the capping scenario model predicted two of the three calibrated monitoring well concentrations downgradient of the Site (wells 02 and 34) would decrease below the Class I standard for boron within 33 years following cap construction.

These model results suggest that the geosynthetic cover system will control recharge and subsequent leachate generation within the limits of the West Ash Pond Complex and sufficiently reduce concentrations of boron below Class I standards within a reasonable timeframe. Concentration reductions should begin approximately one year after completion of the cover system.

2.2 Impairments to Groundwater Usage

There are currently no impairments to groundwater usage on the WRPS property or surrounding properties caused by the West Ash Complex. No impairments to groundwater usage resulting from establishment of the proposed GMZ are anticipated.

According to database records of the ISGS, ISWS, and Illinois Environmental Protection Agency (Illinois EPA), there are 42 water wells within a 2,500 feet radius of the WRPS property boundary. Ten wells are designated as industrial/commercial wells used for dewatering or pressure relief of levees. The operational status of these wells is unknown, although information on the well logs suggests some may have been plugged. Five wells are community water supply wells operated by East Alton and the remaining 27 wells are industrial/commercial wells of unknown operational status. (NRT, 2009)

In addition to the above sources of water well information provided by State agencies, information was obtained from DMG personnel and the Olin Corporation. DMG does not own or operate any water wells on the WRPS property. Olin Corporation owns and operates wells on its property east of the Wood River.

The results of the water well survey, combined with the information contained within the annual groundwater monitoring reports, indicate that there are no water wells, potable or non-potable, that are likely to be impacted by groundwater from the West Ash Pond Complex with the exception of non-potable wells located directly south of the WRPS. All other water wells, located to the northwest, north, northeast, east, and southeast, are either upgradient during most the year (i.e. are not downgradient of the prevailing southerly direction of groundwater flow), and/or are located beyond a groundwater to surface

water discharge zone (i.e., Wood River). The potential for groundwater emanating from the West Ash Pond Complex to affect wells located anywhere but directly south of the WRPS is very low.

Based on existing monitoring well data, there are no known groundwater quality impacts on water wells directly to the south of WRPS along the Mississippi River. These water wells, some of which may no longer exist, are utilized for either dewatering for construction activities or pressure relief for the adjacent levee. . All of these water wells are for non-potable, non-contact use only. Although groundwater in the vicinity of these water wells may be impacted by inorganic parameter concentrations of boron and manganese, there is no known exposure pathway for human ingestion or contact of groundwater at these well locations.

2.3 Closure of the West Ash Pond Complex

The Closure Plan for the West Ash Pond Complex is being submitted under separate cover (AECOM, 2016). In November 2015, in accordance with 40 CFR Part 257, Subpart D, DMG submitted to the Illinois Environmental Protection Agency (IEPA) a notice of intent to close the inactive West Ash Pond 2W. The notice of intent to close the West Ash Pond 2E and West Ash Pond 1 will be submitted by May 17, 2017. Because the ponds are inactive, the CCR Rule deadline for completing closure of these two ponds is November 2020.

The three ponds comprising the West Ash Pond Complex are inactive surface impoundments separated by splitter dikes. West Ash Pond 2E contains a geomembrane liner system and West Ash Ponds 1 and 2W are unlined. The Closure Plan includes the following corrective action elements, with the capped area shown on Figure 4:

- CCR will not be removed from the West Ash Pond Complex but will be redistributed and reshaped to fill in low areas and establish a subgrade; surface water will be removed as necessary
- Portions of the dike around West Ash Pond 1 will be lowered and the excess soils used as capping material in West Ash Ponds 1 and 2W
- West Ash Ponds 1, 2E, and 2W will have an alternative geomembrane cover system that has a permeability less than the subsoils and complies with the CCR Rule
- The design will control the potential for water infiltration into the closed CCR units and will allow drainage of storm water off of the cover system to interior drainage channels routed through culvert pipes to the existing non-CCR West Ash Pond 3.

The proposed corrective action elements will provide hydraulic control of surface water on the cover system and surrounding the West Ash Pond Complex, will lower leachate levels and establish hydrostatic equilibrium within the ponds, and will decrease transport off-site both spatially and temporally.

3 APPLICATION FOR GROUNDWATER MANAGEMENT ZONE

3.1 Environmental Impact of Proposed Groundwater Management Zone

Establishment of this GMZ will have a positive environmental impact. The fate and transport modeling predicted boron concentrations will eventually decrease to levels lower than the Class I standard at all monitoring wells inside of the proposed GMZ boundary within approximately 54 years following completion of closure activities. Under the baseline scenario of no cap on any of the ash ponds in the West Ash Pond Complex, which is a worst-case scenario, the boron concentrations are predicted to reach peaks (equal to or greater than 2 mg/L) in approximately 300 years before starting to decrease. Capping the West Ash Pond Complex will significantly reduce the extent of boron impacts compared to the baseline transport model scenario. The current horizontal extent of the parameters of concern related to CCR leachate (boron) that exceed Class I groundwater standards is near the south and southeast property boundary and within the model-predicted plume extents (NRT, 2016e).

3.2 Proposed Groundwater Management Zone

The proposed GMZ incorporates the area currently exhibiting constituents in groundwater that are attributable to the West Ash Pond Complex, as measured in the on-site groundwater monitoring well network, and also includes the area within the WRPS property boundary that has model-predicted boron concentrations above the Class I groundwater standard. A legal description and map depicting the proposed groundwater management zone is provided in Appendix A. The approximate boundary of the proposed GMZ is depicted in Figure 2. The GMZ will extend vertically through the unlithified deposits to an approximate elevation of 300 ft NGVD within the boundaries of the West Ash Pond Complex. This elevation (300 ft NGVD) is approximately 75 to 110 feet below the top of the primary sand measured in borings for the existing monitoring well network. The GMZ does not extend beyond the WRPS property boundaries; however, it does not include a narrow corridor contiguous with Great River Road (i.e. Highway 143) that is not owned by DMG.

3.3 Compliance with Applicable On-Site Groundwater Quality Standards

In accordance with IAC 620 Section 620.240, the compliance boundary is a lateral distance of 25 feet outward from the outermost edge of the West Ash Pond Complex berms. Following completion of the

corrective action, the groundwater standard at the compliance boundary will be in accordance with IAC 620 Section 450(a)(4) for groundwater quality restoration such that the standard for each released chemical constituent will be the higher of either the Class I groundwater standard or the concentration determined by groundwater monitoring at the compliance boundary.

Compliance with on-site groundwater quality standards, as measured at the proposed monitoring well network, will be achieved when there are no statistically significant increasing trends that are attributed to the West Ash Pond Complex for parameters detected at the compliance boundary after a minimum 30 years of post-closure groundwater monitoring has been completed.

Evaluation of groundwater quality data under USEPA (2015) will be consistent with 40 CFR Part 257.93 and 257.94.

4 PROPOSED GROUNDWATER MONITORING PLAN

Groundwater monitoring will be performed according to the groundwater monitoring plan, incorporated by reference, in the accompanying report:

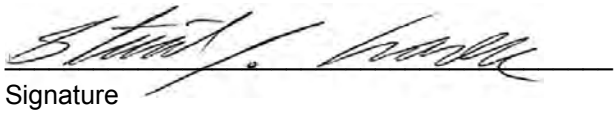
- Groundwater Monitoring Plan, West Ash Pond Complex. Wood River Power Station. East Alton, IL. (NRT, 2016b).

The elements of the groundwater monitoring plan include:

- Groundwater monitoring system with designation of background and compliance monitoring wells along with monitoring well depths and construction.
- Groundwater monitoring parameters.
- Groundwater monitoring frequency and sampling schedule, along with statistical basis for reduction of monitoring frequency.
- Groundwater sample collection protocol with standard operating procedures.
- Laboratory analysis by a state-certified laboratory and listing of methods and reporting limits.
- Quality Assurance Program for field collection of samples and laboratory analysis of samples.
- Groundwater monitoring system maintenance, including schedule of inspections and methods for inspection of monitoring wells.
- Data reporting schedule and content of reports.
- Demonstration of compliance. Statistical methods for evaluating groundwater quality data.
- A notification schedule with actions to be taken in cases of non-compliance.

5 LICENSED PROFESSIONAL ACKNOWLEDGEMENT

The geological work product contained in this document has been prepared under my personal supervision and has been prepared and administered in accordance with the standards of reasonable professional skill and diligence.

Stuart J. Cravens, PG Principal Hydrogeologist Natural Resource Technology 2422 E. Washington Street, Suite 104 Bloomington, Illinois 61704 (217) 390-1503 Registration No. 196000108	Seal:  Expires: 03/31/2017
 Signature	10/19/16 Date

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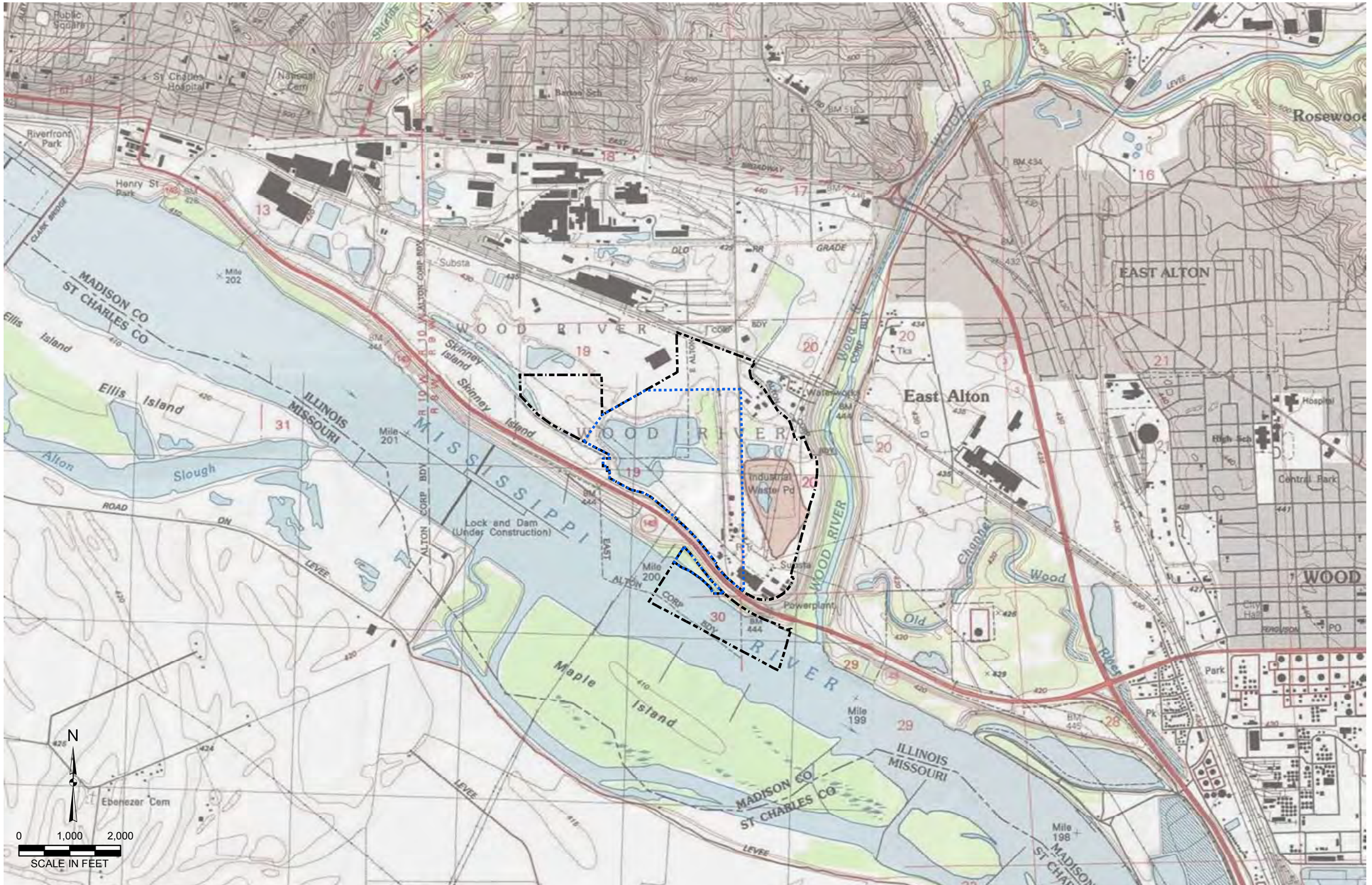
FIGURES



Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed
Source Notes: Property boundary and Groundwater Management Zone boundaries based on IngenAE survey file 2016.09.08 WOOD RIVER GMZ-2.dwg, surveyed on 9/8/16

DRAWN BY/DATE:
SDS 9/9/16
REVIEWED BY/DATE:
NRK 9/9/16
APPROVED BY/DATE:
SJC 9/9/16

SITE LOCATION MAP

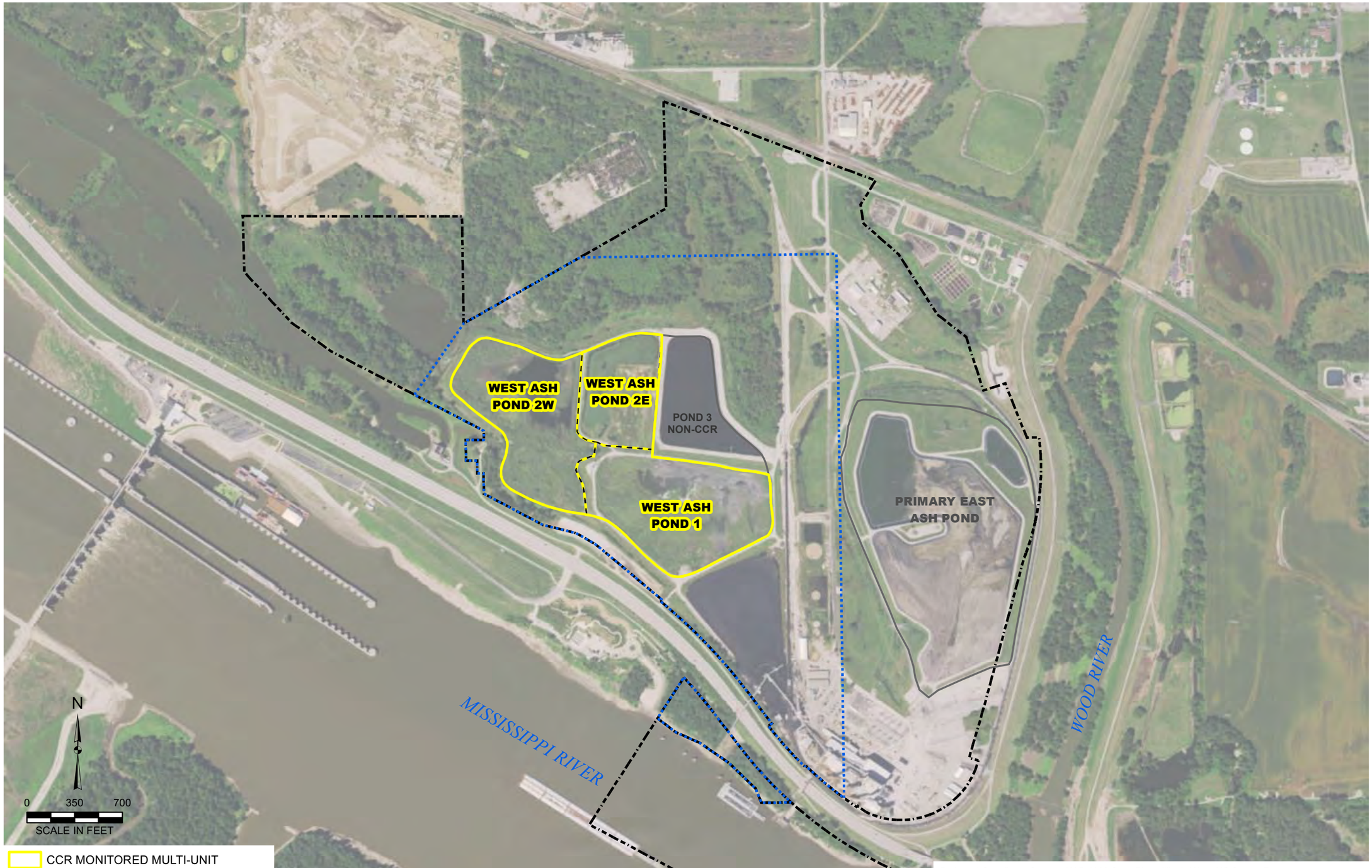
GROUNDWATER MANAGEMENT ZONE APPLICATION
WESTASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

PROJECT NO: 2376

FIGURE NO: 1

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2376\MXD\GMZ Application\Figure 1_Site Location Map.mxd Author: sstolz Date/Time: 9/9/2016, 1:26:38 PM



Projected Coordinate System: NAD 1983 State Plane Illinois West, US Survey Feet.
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Source Notes: Property boundary and Groundwater Management Zone boundaries based on IngenAE survey file 2016.09.08 WOOD RIVER GMZ-2.dwg, surveyed on 9/8/16

DRAWN BY/DATE:
SDS 9/9/16
REVIEWED BY/DATE:
NRK 9/9/16
APPROVED BY/DATE:
SJC 9/9/16

WOOD RIVER WEST ASH PONDS 1, 2E, 2W
GROUNDWATER MANAGEMENT ZONE

GROUNDWATER MANAGEMENT ZONE APPLICATION
WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

PROJECT NO: 2376

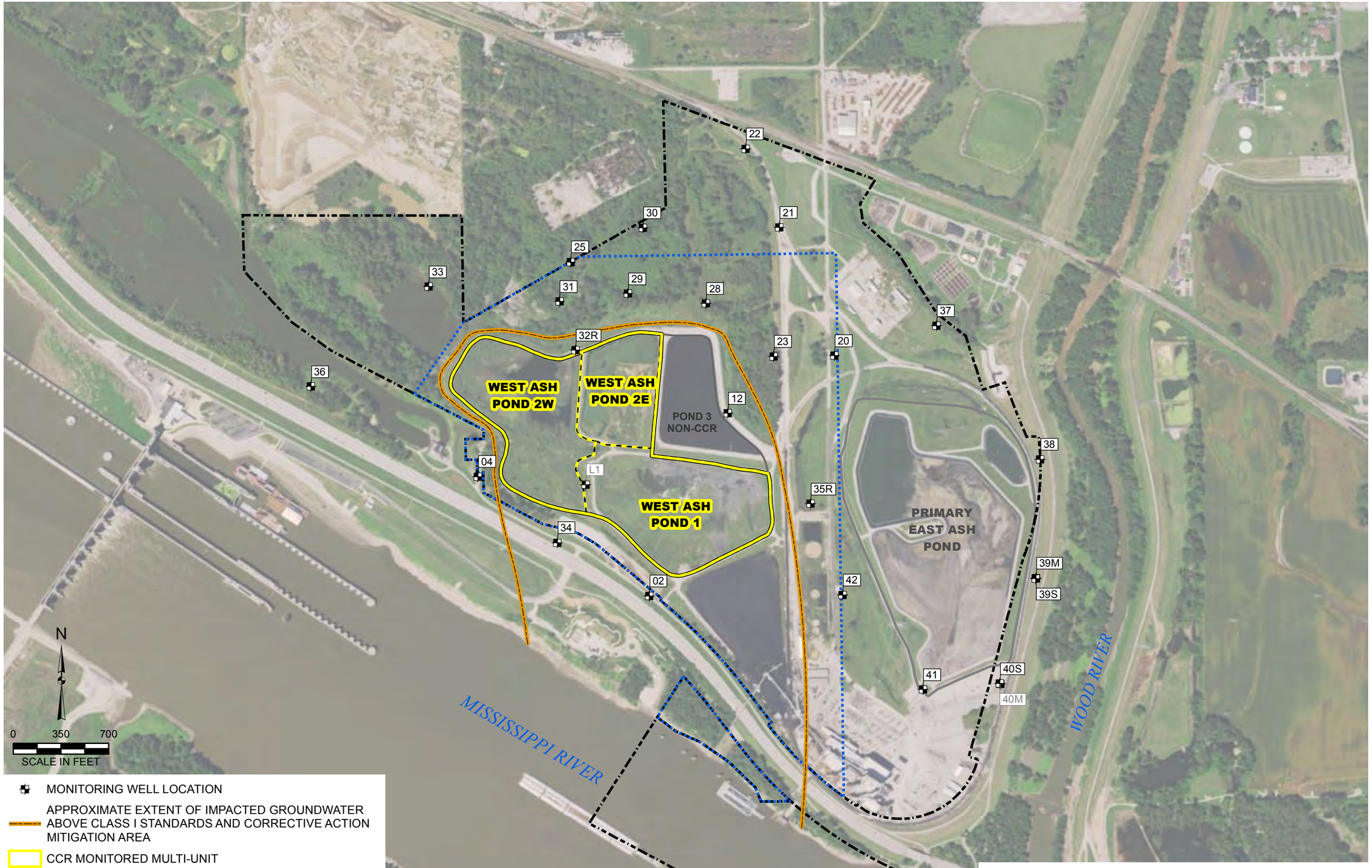
FIGURE NO: 2

NATURAL RESOURCE TECHNOLOGY

MONITORING WELL LOCATION MAP

GROUNDWATER MANAGEMENT ZONE APPLICATION
WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

DRAWN BY/DATE:
SDS 9/9/16
REVIEWED BY/DATE:
NRK 9/9/16
APPROVED BY/DATE:
SJC 9/9/16



- MONITORING WELL LOCATION
- APPROXIMATE EXTENT OF IMPACTED GROUNDWATER ABOVE CLASS I STANDARDS AND CORRECTIVE ACTION MITIGATION AREA
- CCR MONITORED MULTI-UNIT
- CCR UNIT
- GROUNDWATER MANAGEMENT ZONE
- PROPERTY BOUNDARY

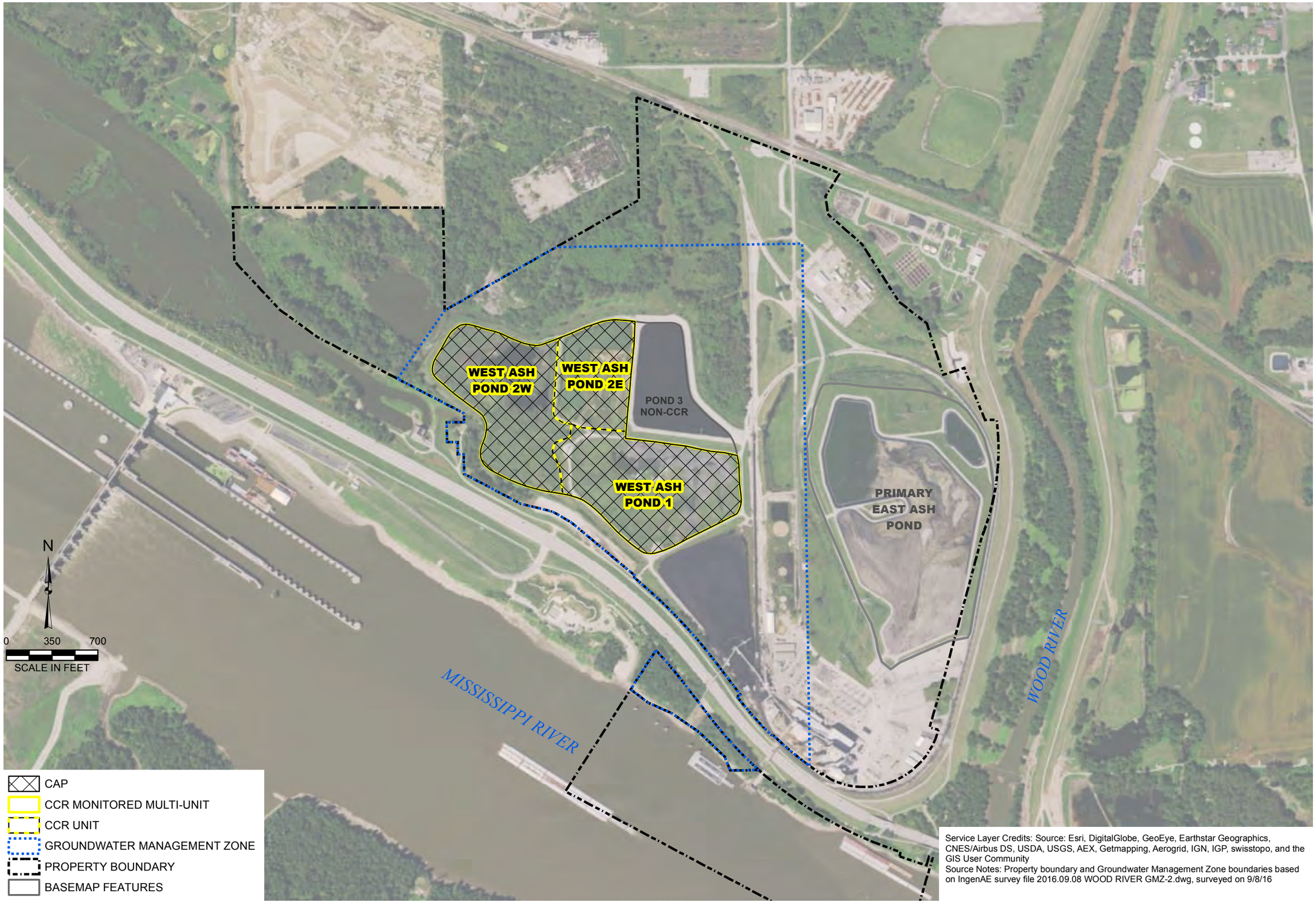
Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Source Notes: Property boundary and Groundwater Management Zone boundaries based on IngenAE survey file 2016.09.08 WOOD RIVER GMZ-2.dwg, surveyed on 9/8/16

PROJECT NO: 2376

FIGURE NO: 3

NATURAL RESOURCE TECHNOLOGY

Y:\Mapping\Projects\23\2376\MXD\GMZ Application\Figure 3_Monitoring Well Location Map.mxd Author: sstolz: Date/Time: 9/9/2016, 1:28:54 PM



Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Source Notes: Property boundary and Groundwater Management Zone boundaries based on IngenAE survey file 2016.09.08 WOOD RIVER GMZ-2.dwg, surveyed on 9/8/16

DRAWN BY/DATE:
SDS 9/9/16
REVIEWED BY/DATE:
NRK 9/9/16
APPROVED BY/DATE:
SJC 9/9/16

SITE CLOSURE PLAN

GROUNDWATER MANAGEMENT ZONE APPLICATION
WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

PROJECT NO: 2376

FIGURE NO: 4

NATURAL RESOURCE TECHNOLOGY

APPENDIX A

GROUNDWATER MANAGEMENT ZONE LEGAL DESCRIPTION

CURVE TABLE						
CURVE	RADIUS	LENGTH	TANGENT	CHORD	BEARING	DELTA
C1	2744.79	220.42	110.27	220.36	S64°37'17"E	4°36'04"
C2	2714.79	241.03	120.59	240.95	S69°27'55"E	5°05'13"
C3	3014.79	1259.32	638.98	1250.19	N59°57'32"W	23°56'00"
C4	3014.79	548.99	275.26	548.23	N42°46'32"W	10°26'01"

LINE TABLE		
LINE	LENGTH	BEARING
L1	233.08	S54°18'02"E
L2	16.00	N23°04'41"E
L3	30.00	N23°04'41"E
L4	20.00	N18°04'28"E
L5	215.74	S71°55'32"E
L6	50.00	S18°04'28"W
L7	17.98	S71°55'31"E
L8	219.35	N89°29'03"E
L9	112.42	S21°48'19"E
L10	272.11	S46°19'52"E
L11	257.28	S55°23'25"E
L12	192.29	S66°13'06"E
L13	169.72	S52°54'22"E
L14	357.27	S32°40'07"W

Land Description of Proposed Groundwater Management Zone (Area 1)

A tract of land being part of fractional section 19, part of the West half of section 20, and part of the Northwest quarter of section 29; township 5 North, range 9 West of the third principal meridian, village of East Alton, Madison County, Illinois, being more particularly described as follows:

Commencing at the Northeast corner of said fractional section 19; thence South 01 degree 20 minutes 46 seconds East, along the East line of said section 19, a distance of 669.11 feet to the southerly right of way of the Illinois terminal railroad, thence South 69 degrees 30 minutes 32 seconds East, along said right of way, a distance of 421.03 feet to the centerline of the Wood River, thence along said centerline the following courses and distances; South 32 degrees 20 minutes 31 seconds West, a distance of 208.37 feet; thence South 08 degrees 40 minutes 59 seconds East, a distance of 138.70 feet; thence South 48 degrees 39 minutes 28 seconds East, a distance of 345.48 feet; thence South 32 degrees 41 minutes 53 seconds East, a distance of 521.26 feet; thence South 51 degrees 59 minutes 33 seconds East, a distance of 269.63 feet; thence leaving said centerline South 17 degrees 55 minutes 20 seconds East, a distance of 413.00 feet; thence North 72 degrees 04 minutes 40 seconds East, a distance of 170.00 feet; thence South 17 degrees 55 minutes 20 seconds East, a distance of 45.00 feet; thence South 21 degrees 56 minutes 20 seconds East, a distance of 382.67 feet to a point on the South line of the Northwest quarter of said section 20; thence along said section line, North 89 degrees 12 minutes 21 seconds East, a distance of 89.50 feet to a point on the West line of property now or formerly owned by Wood River Levee and Drainage District as recorded in deed book 1314, page 74 and the beginning of a non-tangent curve to the right having a radius of 1790.08 feet, and a chord bearing South 07 degrees 10 minutes 55 seconds West; thence Southwesterly along said curve, an arc distance of 909.34 feet; thence South 15 degrees 03 minutes 24 seconds West, a distance of 1101.94 feet; thence South 16 degrees 11 minutes 24 seconds West, a distance of 409.06 feet; thence South 73 degrees 48 minutes 36 seconds East 70.00 feet to the beginning of a non-tangent curve to the right, having a radius of 586.62 feet, and a chord bearing South 65 degrees 25 minutes 48 seconds West, a chord length of 906.74 feet; to the Northerly right of way line of Federal Aid Route 55 (varying width); thence along said Northerly right of way North 54 degrees 17 minutes 50 seconds West, a distance of 70.77 feet; thence South 33 degrees 58 minutes 02 seconds West continuing along said right of way line a distance of 10.00 feet; thence along said right of way being a curve to the right having a radius of 2744.29 feet, a chord bearing North 54 degrees 48 minutes 37 seconds West, a chord distance of 117.15 feet to the Point of Beginning at the tract design herein; then continuing along said right of way line being a curve to the right have a radius of 2744.79 feet, a chord bearing North 49 degrees 44 minutes 57 seconds West, a chord distance of 367.49 feet; thence South 44 degrees 05 minutes 22 seconds West, a distance of 10.00 feet to the beginning of a non-tangent curve to the right, having a radius of 2754.79 feet, and a chord bearing North 41 degrees 44 minutes 05 seconds West; thence northwesterly Along said curve, an arc distance of 401.56 feet; thence North 52 degrees 26 minutes 29 seconds East, a distance of 30.00 feet; thence North 37 degrees 33 minutes 31 seconds West, a distance of 319.90 feet to the beginning of a curve to the left, having a radius of 3959.72 feet, and a chord bearing North 44 degrees 03 minutes 14 seconds West; thence northwesterly along said curve, an arc distance of 897.76 feet; thence North 39 degrees 27 minutes 03 seconds East, a distance of 15.00 feet; thence North 50 degrees 03 minutes 33 seconds West, a distance of 630.39 feet to the beginning of a curve to the left, having a radius of 4029.72 feet, and a chord bearing North 60 degrees 47 minutes 13 seconds West; thence northwesterly along said curve, an arc distance of 174.18 feet; thence North 76 degrees 21 minutes 14 seconds West, a distance of 242.45 feet; thence North 62 degrees 01 minute 31 seconds West, a distance of 489.13 feet to the Southeast corner of property now or formerly owned by Wood River Drainage and Levee District, according to deed in book 3385, page 1729 of the Madison County, Illinois records; thence North 01 degree 17 minutes 15 seconds West, along the easterly line of said Levee District property, a distance of 148.28 feet; thence South 89 degrees 37 minutes 45 seconds West, a distance of 45.00 feet; thence North 01 degree 17 minutes 15 seconds West, a distance of 95.00 feet; thence South 89 degrees 37 minutes 45 seconds West, a distance of 80.65 feet to a point on the West line of the Southeast quarter of said fractional section 19; thence North 00 degrees 51 minutes 00 seconds West, along said West line, a distance of 150.42 feet to a found concrete monument at the center of fractional section 19; thence North 89 degrees 49 minutes 54 seconds East, along the North line of the Southeast quarter of said fractional section 19, a distance of 132.47 feet; thence North 00 degrees 22 minutes 15 seconds West, a distance of 68.02 feet; thence North 62 degrees 29 minutes 15 seconds west, a distance of 573.39 feet; thence North 34 degrees 42 minutes 23 seconds East, a distance of 633.72 feet to a points on the West line of the Northeast quarter of said fractional section 19; thence North 60 degrees 22 minutes 28 seconds East, a distance of 980.90 thence North 89 degrees 12 minutes 20 seconds East a distance of 1881.78 feet; thence South 00 degrees 48 minutes 56 seconds East a distance of 3991.74 feet to the Point of Beginning and continuing along 162.85 Acres.

Land Description of Proposed Groundwater Management Zone (Area 2)

A tract of land being part of the Southeast 1/4 Fractional Section 19, part of the Northeast 1/4 of Section 30, and part of the Northwest 1/4 of Section 29; Township 5 North, Range 9 West of the Third Principal Meridian, Village of East Alton, Madison County, Illinois, being more particularly described as follows:

Commencing at intersection of the Southerly right of way line at Federal Aid Route 55 and the permanent dividing line between Olin Mathieson Chemical Corp. and Illinois Power per deed book 2339, page 141 of the Madison County Illinois Recorders records; thence North 71 degrees 55 minutes 31 seconds West along said right of way line a distance of 28.70 feet; thence South 18 degrees 04 minutes 29 seconds West continuing along said right of way line a distance of 65.00 feet; thence North 71 degrees 55 minutes 31 seconds West continuing along said right of way line a distance of 215.74 feet; thence North 18 degrees 04 minutes 29 seconds East continuing along said right of way line a distance of 35.00 feet; thence North 71 degrees 55 minutes 31 seconds West continuing along said right of way line a distance of 3.94 feet; thence continuing along said right of way line being a curve to the right having a radius of 3014.79 feet a chord bearing North 59 degrees 57 minutes 32 seconds West a chord distance of 1250.19 feet to the Point of Beginning of the tract description herein; thence continuing along said right of way line being a curve to the right having a radius of 3014.79 feet a chord bearing North 42 degrees 46 minutes 32 seconds West a chord distance of 548.23 feet; thence North 37 degrees 33 minutes 31 seconds West continuing along said right of way line a distance of 319.90 feet; thence continuing along said right of way line being a curve to the left having a radius of 3669.72 feet a chord bearing North 40 degrees 13 minutes 45 seconds West a chord distance of 341.95 feet; thence South 32 degrees 40 minutes 07 seconds West a distance of 357.27 feet; thence South 52 degrees 54 minutes 22 seconds East a distance of 169.72 feet; thence South 66 degrees 13 minutes 06 seconds East a distance of 192.29 feet; thence South 55 degrees 23 minutes 25 seconds East a distance of 257.28 feet; thence South 46 degrees 19 minutes 52 seconds East a distance of 272.11 feet; thence South 21 degrees 48 minutes 19 seconds East a distance of 112.42 feet; thence North 89 degrees 29 minutes 03 seconds East a distance of 219.35 feet to the Point of Beginning and continuing along 5.01 Acres.

N

SCALE: 1" = 400'

0 200' 400' 800'

NOTE:

THIS PLAT AND ALL THE INFORMATION SHOWN HEREON WAS BASED ON AN ALTA SURVEY DONE BY THE ORIN GROUP LLC DATED "LAST REVISED 1-20-12" AS FURNISHED BY THE OWNERS (DYNEGY) AND THIS PLAT WAS PRODUCED SOLELY TO DELINEATE THE PROPOSED GROUNDWATER MANAGEMENT ZONE AS SHOWN HEREON.

STATE OF ILLINOIS)
)SS
COUNTY OF MADISON)

I, MICHAEL J. GRAMINSKI, A PROFESSIONAL LAND SURVEYOR, DO HEREBY CERTIFY THAT THIS DRAWING HAS BEEN PREPARED UNDER MY DIRECT SUPERVISION FOR THE CREATION OF A GMZ LIMITS LEGAL DESCRIPTION. ALL DIMENSIONS ARE IN FEET AND DECIMAL PARTS THEREOF.
DATED THIS 8TH DAY OF SEPTEMBER, 2016.

STATE OF ILLINOIS MICHAEL J. GRAMINSKI 35-2901 REGISTERED LAND SURVEYOR

IPLS LICENSE NUMBER 035.002901, EXPIRES 11/30/2016
PROFESSIONAL DESIGN FIRM LICENSE NUMBER 184.004638, EXPIRES 4/30/2017
THIS SURVEY DOES NOT CONFORM TO THE CURRENT ILLINOIS STANDARD FOR A BOUNDARY SURVEY.

IngenAE
514 Earth City Plaza
Earth City, MO 63045
www.ingenae.com

Submissions / Revisions:	Date:
1	
2	
3	
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PREPARED FOR:

DYNEGY

Project Name & Location:

DYNEGY
WOOD RIVER
POWER PLANT
ALTON, ILLINOIS

DO NOT SCALE PLANS
Copying, Printing, Software and other processes required to produce these prints can stretch or shrink the actual paper or layout. Therefore, scaling of this drawing may be inaccurate. Contact IngenAE with any need for additional dimensions or clarifications.

Drawing Name:
GROUNDWATER MANAGEMENT ZONE (GMZ) PARCEL DESCRIPTION EXHIBIT

Date: 9/1/16	Project No.
Type: SITE	Drawing No.
Drawn By: CMB	1
Approved By: EAS	OF 1
Scale: AS NOTED	

Appendix G.
Construction Quality Assurance Plan

Submitted to
Dynegy Midwest Generation, LLC
Wood River Power Station
#1 Chessen Lane
Alton, IL 62002

Submitted by
AECOM
1001 Highlands Plaza Drive West,
Suite 300
St. Louis, MO 63110
October 2016

Construction Quality Assurance (CQA) Plan

For the

Wood River West Ash Complex

at

Dynegy Midwest Generation, LLC
Wood River Power Station
#1 Chessen Lane
Alton, IL 62002

Table of Contents

List of Tables

List of Acronyms

ACI	American Concrete Institute
CQA	Construction Quality Assurance
DMG	Dynegy Midwest Generation, LLC
CQA Plan	Construction Quality Assurance Plan
RCP	Reinforced Concrete Pipe
RFI	Request for Information

Executive Summary

The purpose of the Construction Quality Assurance (CQA) Plan is to provide a means by which observations and tests that assist in evaluating whether the construction has been performed in accordance with the approved plans and has been properly documented. This CQA Plan details the personnel qualifications, material requirements, sampling and testing procedures, testing frequency, testing parameters and sampling locations, surveying, required documentation, items to be certified by a professional engineer, and the procedures to follow in the case of a test failure.

The construction related procedures addressed in the following sections are presented to direct construction personnel for development of the site. The CQA Plan has been organized into the following Sections as listed below:

Section	Title
1.0	Project Description
2.0	QA/QC Program
3.0	Earth Cover and CCR
4.0	Aggregates
5.0	Geomembrane
6.0	Geotextile
7.0	Piping
8.0	Concrete and Grout
9.0	Miscellaneous
10.0	Survey
11.0	Meetings
12.0	Documentation

The following section addresses CQA activities associated with typical components of a Coal Combustion Residuals (CCR) impoundment closure project. These components will include some, but not necessarily all, of the following, based on final project designs:

- Soil Cover Materials
- Fill Materials (including Structural Fill, Crown Fill, CCR placement and grading)
- Aggregates
- Geomembrane
- Geotextile
- Piping
- Cast-in-Place Concrete and Grout
- Miscellaneous Items
- Surveys
- Meetings
- Documentation

1. Project Description

Dynegy Midwest Generation, LLC (DMG) proposes to carry out the following activities at the Wood River West Ash Complex located at the Wood River Power Station:

- Remove ponded surface water from the Wood River West Ash Complex.
- Construct a non-contact stormwater management system to convey stormwater from the cover system to the interior collection ditches located along the perimeter of the impoundments.
- Regrade the CCR surface in the Wood River West Ash Complex to establish the design subgrade elevations needed for the final cover system.
- Compact the final cover system subgrade to design parameters to create a stable base for final cover construction.
- Construct the final composite cover system using an alternative geomembrane cover system.
- Grade and contour the stormwater management system.
- Establish vegetation on the erosion layer by seeding the final cover system utilizing native grasses.

2. CQA Program

2.1 Quality Assurance

Construction Quality Assurance starts at the beginning of the project during preparation of the engineering plans and specifications. At this stage, the CQA Plan outlines means and actions to be employed by DMG through the CQA Consultant to evaluate and measure compliance with the design, supplier, and installation of equipment and materials in accordance with this CQA Plan as well as with the design plans and specifications.

2.2 Quality Control

Quality Control (QC) includes actions taken by the designer, contractor, supplier, and installer to document that their methods, materials, and workmanship are accurate and correct, meet regulatory requirements, and are in accordance with the approved plans and specifications. QC is provided by each party for its own work, product, or service.

2.3 Roles and Responsibilities

2.3.1 Owner and Operator

The Wood River Power Station is owned and operated by DMG. DMG will be responsible for overall management of construction activities including contracting and administration.

2.3.2 Contractor

The Contractor for this project will be selected by DMG. The Contractor shall be responsible for construction activities associated with this project, including meeting the requirements for project quality as defined in the construction plans and specifications for his or her work as well as that of his or her subcontractors.

2.3.3 CQA Consultant

The CQA Consultant is responsible for making observations and performing field tests to provide written documentation that the CCR unit's final cover system is constructed in accordance with the applicable plans, specifications, and CQA Plan. The CQA Consultant will be a third party engineering firm retained by DMG.

The following section provides a description of the typical CQA Consultant team including each member's roles and responsibilities.

2.3.3.1 CQA Officer

The CQA Officer is responsible for certifying to DMG and the Illinois Environmental Protection Agency (IEPA) that, to the best of his or her knowledge based on the data provided, the construction activities observed, and the testing performed, the final cover system has been constructed in accordance with the plans, drawings, and the approved CQA Plan. The CQA Officer shall be an Illinois-licensed Professional Engineer for the project and certifies the construction record or certification report. The CQA Officer will review and approve construction reports. Construction reports will be prepared until construction is complete and will include: descriptions of the weather, locations where construction occurred during the previous week, materials used, results of testing, inspection reports, and procedures used to perform the inspections. The CQA Officer will certify reports, when applicable.

The CQA Officer must supervise and be responsible for inspections, testing and other activities required to be implemented as part of the CQA Program. The CQA Officer will need to visit the site on a routine and periodic basis, especially during times of critical work. The CQA Officer is

responsible for directing and supervising the on-site inspections and will provide supervision and assume responsibility for performing inspections of the following activities, when applicable:

- Grading and compaction of the subgrade materials;
- Dewatering activities (if applicable);
- Installation of geomembranes (if applicable);
- Placement of the cover soil;
- Placement of the topsoil (vegetative soil); and,
- Construction of stormwater features such as ponds, ditches, lagoons and berms.

2.3.3.2 CQA Officer-in-Absentia

If the CQA Officer is unable to be present to perform duties as required, the CQA Officer shall provide, in writing, reasons for his or her absence, a designation of a person who shall exercise professional judgement in carrying out the duties of a CQA officer as the designated CQA Officer-in-Absentia (CQAOA), and a signed statement that the CQA Officer assumes full personal responsibility for all inspections performed and reports prepared by the designated CQAOA during the absence of the CQA Officer.

Additional duties of the CQAOA include:

- Observe and document construction-related activities.
- Monitor delivery, handling, and on-site storage of construction materials.
- Evaluate conformance of borrow source materials.
- Observe material placement and testing.
- Coordinate material sampling and shipping for laboratory testing.

2.3.3.3 CQA Subcontractors

The CQA Consultant will subcontract with a construction materials testing and inspection firm for laboratory testing as needed. Anticipated laboratory testing may include, but not be limited to:

- Compressive strength testing of concrete cylinders,
- Pre-qualification of geomembranes,
- Pre-qualification testing of soils, and
- Conformance testing of soils and aggregate materials.

2.3.4 Stop Work Authority

The Contractor is responsible for overall site safety, however, the CQA Consultant will advise DMG and the Contractor when the Contractor should “stop work” in situations of safety, recognizable stability issues, deviations from design, and/or significant cost or schedule impacts. In situations where personnel safety is a concern, the CQA Consultant will advise the Contractor to stop work immediately and notify DMG as soon as possible of that action.

2.4 Project Meetings

To achieve a high degree of quality during installation, clear, open channels of communication are essential. The following meetings should be held when appropriate.

2.4.1 Pre-Construction Meetings

Following the completion of the contract documents and selection of a CQA Consultant for the project, a Pre-Construction Meeting may be held. At a minimum, the meeting should be attended by the Project Manager, the CQA Consultant, the geomembrane installer, the Contractor, and other involved parties. Two Pre-Construction Meetings may be held, one prior to dewatering (if required) and one prior to geomembrane placement.

2.4.2 Daily Meetings

A daily meeting will be held, as necessary, between the CQAOA, the geomembrane installer, the Contractor, and other involved parties. Those attending will discuss, plan, coordinate the work, and CQA activities to be completed that day.

2.4.3 Progress Meetings

Progress meetings will be held weekly, or as determined by the CQA Officer. Attendees should include the CQAOA, the geomembrane installer, the Contractor, and other involved parties. Those attending will discuss current progress, planned activities for the next week, submittals, and new business or revisions to the work. The CQAOA will log problems, decisions, or questions arising at this meeting.

2.4.4 Problem or Work Deficiency Meeting

A special meeting may be held when and if a problem or deficiency, which would impact the construction schedule or other project requirements, is present or likely to occur. At a minimum, the meeting should be attended by the affected contractors, the Project Manager, and the CQA Consultant. The purpose of the meeting is to define and resolve the problem or work deficiency.

2.4.5 Safety Meetings

The Contractor will hold safety meetings in accordance with the Contractor's Site Health and Safety Plan. The Contractor's Site Health and Safety Plan must be submitted to DMG for approval prior to commencing construction activities. Meetings will be held at the start of construction and then periodically as conditions change or as determined by the CQA Officer.

2.5 Documentation

An effective CQA plan depends largely on recognition of construction activities that should be monitored, and on assigning monitoring responsibilities. This is most effectively accomplished and verified through quality assurance activities. The CQA Consultant will document that quality assurance requirements have been addressed and satisfied.

The CQA Consultant will prepare periodic signed reports which summarize construction activities and the results of observations and tests including descriptive remarks, data sheets, and logs to verify that quality assurance monitoring activities have been carried out.

2.5.1 Reports

Progress reports will be prepared at regular time intervals to document the status of the work by the CQA Consultant. Certifications will be prepared at the completion of major construction activities. At the completion of the work, final documentation will be prepared and will include a professional engineer's seal along with supporting field and laboratory test results.

2.5.1.1 Daily Summary Report

Standard reporting procedures must include preparation of a daily report which, at a minimum, will consist of:

- An identifying sheet number for cross referencing and document control
- Date, project name/number, location, and other identification
- A summary report including memoranda of meetings and/or relevant discussions with DMG, CQA Consultant, and/or site contractors, observation logs, test data sheets, decisions reached, activities planned and their schedule
- Other forms of daily recordkeeping to be used as appropriate including construction problem and solution data sheets and photographic reporting data sheets

The daily summary report will also include the following information as needed:

- Weather conditions
- A reduced-scale site plan showing proposed work areas and test locations
- Descriptions and locations of on-going construction
- Descriptions and specific locations of areas, or units, of work being tested and/or observed and documented
- Locations where tests and samples were taken or reference to specific observation logs and/or test data sheets where such information can be found
- A summary of field/laboratory test results or reference to specific observation logs and/or test data sheets
- Calibrations or recalibration of test equipment and actions taken as a result of recalibration, or reference to specific observation logs and/or test data sheets
- Off-site materials received, including quality verification documentation
- Decisions made regarding acceptance of units of work, and/or corrective actions to be taken in instances of substandard quality
- The CQAOA's signature

This information must be regularly submitted to and reviewed by the CQA Officer.

2.5.1.2 Observation Logs and Test Data Sheets

Observations of construction and QA-related activities will be recorded on project-specific logs and data sheets by the CQA Consultant. At a minimum, the logs and data sheets will include the following information:

- An identifying sheet numbered for cross referencing and document control
- Date, project name, location, and other identification
- Description or title of activity monitored
- Location of activity and locations of samples collected
- Locations of field tests performed and their results
- Results of laboratory tests received
- Results of monitoring activity in comparison to specifications
- The CQAOA's signature

This information will be submitted with the Daily Summary Report during construction projects.

2.5.1.3 Construction Certification Report

At the completion of the work, a signed Construction Certification Report will be submitted by the CQA Consultant prepared in accordance with the project requirements

The Construction Certification Report will be prepared and signed and sealed by a professional engineer skilled in the appropriate discipline(s) and registered in the state in which the work was performed.

At a minimum, the Construction Certification Report will include:

1. A narrative section that identifies the engineered components that were constructed that includes the following:
    - A summary of the design and construction specifications and a comparison with the components that were constructed during the construction event
    - A summary of how construction was impacted by weather and equipment limitations and other difficulties encountered
2. All alterations and other changes that relate to the installation of any of the components to be certified and presented as follows:
    - A listing of applicable alteration requests/changes that were previously concurred with
    - All alteration requests/changes and supporting documentation which are proposed for concurrence
    - A list of any other changes made by DMG or operator which do not require regulatory concurrence but which affect construction or the record drawings

The alteration request will be equivalent or more protective than the applicable regulation or authorizing document.

3. Results of tests in accordance with the project specifications.
4. Results of surveys in accordance with the project specifications. Unless otherwise specified, the survey data will be reported in a table(s) displaying the northing and easting for each designated survey point established to be no more than one hundred feet apart based on the grid system coincident with the design drawings. Additional points will be established at grade breaks and other critical locations.
5. Record drawings of the constructed facility components showing the following:
    - The location of survey control points.
    - Plan views with topographic representation of engineered components depicted along with critical elevations such as pipe inverts, sump elevations, ditch flow lines, tops and toes of berms, locations of repairs, etc.
    - The location and as-built detail drawings of components to be certified.
    - If the Certification Report is submitted for the composite final cover system, cross sections showing the top elevations of the existing waste, top elevation of the composite cover system, and the elevations of the surface water management system. The cross sections will be taken at the same locations and using the same scale as in the approved permit to install. Otherwise, the cross sections will be taken at an interval no greater than every three hundred feet of length and width.
    - If the Certification Report is submitted for establishment of facility survey marks, the following information summarizing the activities performed to construct and establish the facility survey marks:

- An identification and description of the known control point(s) used to establish the horizontal and vertical coordinate(s) of the facility survey marks.
- The horizontal and vertical coordinates of the known control point(s) and facility survey marks.
- A summary of surveying activities performed in determining the coordinates of the facility survey marks.
- A copy of the 7.5 minute series quadrangle sheet(s) used in establishing the survey marks with the known control point(s) and the location of the facility survey marks clearly identified.
- A detailed drawing(s) illustrating the design of the facility survey marks, as constructed.

6. Qualifications of testing personnel that provided construction oversight and conducted the testing on the engineered components for which the Certification Report is submitted including a description of the experience, training, responsibilities in decision making, and other relevant qualifications.
7. A notarized statement that, to the best of the knowledge of CQA Consultant or operator, the Certification Report is true, accurate, and contains information required by this rule and by the CQA plan.

2.5.1.4 Progress Reports

Progress reports at time intervals established at the Pre-Construction meeting will be completed and submitted to DMG by the CQA Consultant. At a minimum, this report will include the following information:

- A unique identifying sheet number for cross-referencing and document control
- The date, project name, location, and other information
- A summary of work activities during progress reporting period
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period
- The signature of the CQA Officer

Copies of progress reports will be distributed as decided at the Progress Meetings and as determined necessary by the CQA Officer.

2.5.1.5 Photographic Reporting Data Sheets

Photographic reporting data sheets, where used, will be cross-referenced with observation logs and test data sheets and/or construction problem and solution reports. These photographs will serve as a pictorial record of work progress, problems, and mitigation activities. The basic file will contain color prints; negatives will be stored in a separate file in chronological order. These records will be presented to the DMG upon completion of the project.

Design and/or specification changes may be required during construction. In such cases, the CQA Officer will evaluate the cause of the non-conformance and recommend appropriate changes in procedures or specifications to DMG. After DMG's evaluation for the appropriateness of the change, a contract evaluation is performed to confirm the change is not included in the scope of the contract/project. Finally, DMG will determine if the change order is financially justifiable for the approval. Once approved, DMG will submit these changes for approval, if necessary, to the IEPA.

When this type of evaluation is made, the results will be documented with a description of the changes by the CQA Consultant and cross-referenced to specific observation logs and test data sheets.

These reports must include the following information:

- An identifying sheet number for cross-referencing and document control
- A detailed description of the situation or deficiency
- The location and probable cause of the situation or deficiency
- How and when the situation or deficiency was found or located
- Documentation of the corrective action taken to address the situation or deficiency
- Final results of any responses
- Any measures taken to prevent a similar situation from occurring in the future
- The signature of the CQA Officer indicating concurrence

Design and/or specifications changes will be made only with the written agreement of DMG and the CQA Officer, and will take the form of an addendum to the specifications.

2.5.2 Documentation Management

The Contractor will submit project documentation to the CQA Consultant on a weekly basis or an alternate frequency established by the project requirements.

Complete project CQA documentation must be collected and maintained on-site by the CQA Consultant in a safe repository. This includes (but is not limited to):

- A complete set of construction drawings and specifications
- The CQA Plan
- Project checklists, test procedures, and standards
- Project test procedures, daily logs, pertinent regulatory documents, and other necessary documents.

2.5.3 Storage of Records and Records Retention

All data sheet originals related to the CQA and Certification process, test results, daily logs, memorandums, etc., will be stored by the CQA Consultant in a safe repository on-site during the construction project.

Upon completion of the construction project, records will either be retained at the facility or alternately stored at the CQA Consultants office and be readily accessible by the facility if requested. Records will be maintained for a minimum period of five years from the project completion.

2.6 Failed Test Procedures and Alterations

A "failed test" occurs when a test performed on an engineered component yields a result that does not meet the specifications outlined in the applicable construction drawings or specifications. Testing performed on an engineered component which does not meet the specifications is not considered a failed test if the engineered component is undergoing construction or installation at the time of testing and the testing is performed for the purpose of gauging the effectiveness or completeness of construction. An “alteration” or “field change” is a change in construction materials, specifications, or CQA procedures from the project requirements that is necessary to perform the work or meet project requirements.

2.6.1 Failed Test Prior To Certification Report Submittal

If, prior to submission of the Construction Certification Report for the engineered component, the CQA Consultant determines that there is a "failed test," the CQA Consultant will perform the following:

- Retest or otherwise assess the engineered component or portion of the facility to determine if construction is in compliance with the construction plans and specifications or other project requirements and include the final results in the Certification Report.
- Implement measures to attain compliance with the construction plans and specifications or other project requirements. An area with a verified failure must be reconstructed. Reconstructed areas must be retested at a frequency acceptable to the CQA Consultant and at a frequency and location(s) sufficient to demonstrate that compliance has been achieved.

2.6.2 Alteration Prior to Submittal of Certification Report

If, prior to submission of the Construction Certification Report the CQA Officer determines that an alteration or field change is necessary to the construction drawings or specifications, the CQAOA will do the following:

- Include the applicable testing results and an assessment and justification for the necessary change(s) in an appropriate section of the Certification Report where the change is clearly identified.
- Provide a demonstration in the Certification Report that the change(s) are at least equivalent to the project requirements, the construction plans and specifications, and are at least as protective to human health and the environment.
- Submit the Certification Report as required by the CQA Officer.

2.6.3 Detection of the Change after Submittal of the Certification Report

If, after submission of the Construction Certification Report the CQA Officer determines that the Certification Report is in error due to improper documentation of an alteration or field change of the construction drawings or specifications, the CQA Officer will do the following:

- Notify DMG of the change within twenty-four hours after discovery, by phone and within seven days after discovery in writing.
- Within fourteen days of submitting the written notification required above, do either the following:

    a. Implement the failed test procedures outlined above (Section 2.6.1) and amend and resubmit the Construction Certification Report to explain the circumstances and how compliance was achieved.

    b. Submit the Alteration information outlined above (Section 2.6.2).

3. Prequalification Testing

3.1 Prequalification Testing of Materials

The following section discusses the QA/QC requirements for prequalification conformance testing of the engineered components for the closure construction.

3.2 Prequalification Conformance Testing

Prequalification testing is necessary to establish that the materials used for the engineered components conform to the minimum specifications contained in this document for each component. Prequalification testing is generally required for any engineered component comprised in whole or in part of aggregate, soils, or geosynthetics. Conformance testing is performed on representative materials obtained from the location of origin and results submitted prior to arrival of the material on site unless otherwise directed by the CQA Officer.

Prequalification conformance testing is material characteristics testing. Material characteristics' testing is contained in Tables 1 through 7 as applicable. Soil and aggregate laboratory and field testing methods and minimum testing requirements are provided in Tables 1 and 2. Minimum testing requirements and frequencies for geotextiles are provided in Table 3, pipes in Table 4, concrete and grout in Table 5, cover soil in Table 6 and geomembrane in Tables 7A and 7B. Calibration requirements for testing equipment are provided in Table 8.

3.3 Engineered Components Requiring Prequalification Conformance Testing

Engineered components that require some measure of prequalification are noted in the individual specifications under submittals. These materials are summarized as follows:

- Fill
- Soil Cover and Vegetation Layer
- Aggregates
- Geomembrane
- Geotextile
- HDPE Pipe

3.4 Submittals

Submit the results of required prequalification testing including interface friction testing, to the CQA Consultant for review and verification that the reported test results meet with project specifications at least 14 days prior to use of the material at the job site unless otherwise directed by the CQA Consultant.

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4. Earth Cover and CCR Materials

4.1 Subgrade Excavation and Compaction of In-Situ Materials

Subgrade refers to the material on which the final cover system will be constructed. The subgrade may consist of CCR material or cover soil that has been placed over the CCR material to act as a temporary cover. The subgrade will be graded and shaped per the construction drawings to meet the design grades. The subgrade will be compacted in order to provide a stable base on which the final cover can be constructed.

If the existing subgrade is not sufficient to meet the minimum grades of the final cover system design, crown fill may be required to raise the existing grades. Crown fill may consist of additional CCR material either generated by the plant or relocated from another impoundment or soil materials from a borrow source. The crown fill shall be placed in lifts and compacted to meet the minimum standards as described in Table 1 of the CQA Plan. Crown fill shall be placed to raise sections of the impoundments to specified elevations as shown in the construction drawings. The CCR material will not contain organic materials, debris, frozen materials, vegetation, roots or other materials that could protrude into the soil cover. Unsuitable material located below the subgrade elevations shall be over-excavated or dewatered, as necessary, to a competent, stable surface at a lower elevation and replaced with suitable fill. In addition, significant protrusions shall be removed and replaced with suitable fill as appropriate such that the final subgrade surface is relatively smooth.

After preparation, adequacy of the subgrade materials to support the design loads will be verified through a proofroll by the Contractor that is observed and documented by the CQAOA or CQA Officer. Proofrolling should be performed with a pneumatic tire minimum tandem axle, filled dump truck vehicle. Proofrolling shall be performed with a minimum of two overlapping passes. If excessive pumping or rutting occurs during proof-rolling, the area will be reworked or undercut to more suitable material. Depending on the suitability of the crown fill material, the CCR may require dewatering and modification according to the construction techniques used to develop a suitable CCR surface. The CQA Officer or CQAOA shall document the subgrade construction was completed in conformance with the construction documents prior to the placement of the final cover soils.

4.1.1 Construction

Suitable fill will be placed in horizontal loose-lifts. The Contractor shall adjust the moisture content of the fill material as needed to meet the specified moisture/density requirements.

4.1.2 Construction Testing

The CQA Consultant is responsible for pre-qualification testing of proposed sources of fill material. In-place moisture/density testing of suitable fill will be conducted by the CQAOA or CQA Subcontractor in accordance with the requirements listed in Table 1.

4.2 Cover Soil and Vegetation

Final cover protective soil will be used to establish final elevations within the limits of the impoundment, serve as a stormwater infiltration barrier, and provide erosion protection for the underlying material. The layer will also provide adequate soil for the establishment of vegetation on the final cover. The upper 6-inches of the cover layer are referred to as the vegetative cover soil and the lower 18-inches are called the protective cover soil. The 6-inch cover will be planted with vegetation consisting of grass species native to Illinois to prevent erosion of the final cover system.

The CQA Consultant is responsible for pre-qualification testing of proposed sources of fill material. In-place moisture/density testing of suitable fill will be conducted by the CQAOA or CQA Subcontractor in accordance with the requirements listed in Table 1. Soils for placement for the final cover from borrow sources as contained in the construction plans and/or as directed by DMG will be used. The Contractor will remove excess or unsatisfactory material to designated on-site stockpiles as directed by the CQAOA.

Borrow source samples for soil qualification shall be evaluated for every 20,000 cubic yards of protective cover material or when visual observations indicate that a change has occurred in the borrow soils. The following testing shall be performed:

- Atterberg Limits, ASTM D4318; and
- Unified Soil Classification, ASTM D2487.

The CQA Officer shall determine if the soils meet the specification for protective cover based on the results of the laboratory testing.

Unsuitable material may include, but not be limited to: roots, rocks larger than 3-inches, debris, frozen soils, organic matter, topsoil, granular materials, and other deleterious materials.

Material for the 18-inch protective cover soil will have the following characteristics:

- Consist of well graded natural earth that is not excessively dry or saturated;
- Free of cobbles, stones, rock, gravel, or boulders greater than three (3) inches. No rocks greater than 1-inch, sharp edged rocks or other hard objects which could damage the geomembrane liner material will be allowed on the top layer of the cover at the time of protective cover system installation;
- Free of organic materials, debris, waste, frozen materials, vegetation, roots, and other deleterious materials,
  - Unsuitable materials shall be removed from the borrow source prior to transport;
- Meets one of the following USCS soil classifications: SC, CL, CH, GC, ML, CL-CH, or CL-ML;

Material for the vegetative cover soil will have the following characteristics:

- Consists of well-graded natural earth materials that are not excessively dry or saturated unless otherwise specified by the construction specifications
- Has sufficient fertility or can be amended to support vegetation in the top 6-inches of material

4.2.1 Construction

Place the final cover protective layer to the lines and grades shown on the construction drawings. Place the protective cover layer only after the geosynthetics layers have been accepted in writing by the CQAOA. The protective cover soil will be deposited and spread in two (2) 9-inch lifts (total of 18-inches) using low ground pressure equipment. Complete the final cover soil protective soil layer such that it is well draining and exhibits a smooth uniform surface free from ruts, depressions, and debris.

The top vegetative cover soil layer will be deposited in a uniform 6-inch lift using low ground pressure equipment. The final cover protective soil will exhibit a smooth uniform surface free from ruts, depressions, and debris. Seeding of the final cover may begin after the area to be covered has been properly prepared and fertilized. Uniformly distribute seed to meet the application rate provided in the project specifications. Perform seeding only during periods of acceptable weather conditions. Protect seeded areas with temporary erosion control matting (ECM) as shown in the construction drawings, or as necessary to prevent loss of seed and fertilizer. Complete ECM field installation in accordance with the manufacturer's recommended installation procedures and the construction specifications. Confirm that matting overlaps are shingled in the direction of flow.

4.2.2 Placement Observations and Documentation

Protective cover soil lift thickness and source verification will be visually observed and confirmed by the CQAOA for compliance with the engineering design. Cover construction certification data shall include visual observations, and thickness confirmation for completed protective cover soil, and documentation of deviations from the plan. For every 20,000 cubic yards of cover soil or when visual observations indicate that a change has occurred in the borrow soils, the CQAOA will obtain soil samples and perform the testing outlined in Section 3.2. Cover soil rejected by CQAOA shall be reworked or removed and replaced.

The CQAOA will verify the seed, application method, and application rates meet the construction specifications, and that seed has been uniformly distributed over the final cover. Testing requirements are included in Table 1. Total thickness will be verified by as-built survey on a 100-ft maximum grid.

5. Aggregates

Aggregates include materials used for the construction of the bedding/backfill of underdrains, slope and channel protection (rip rap), and stormwater control structures.

5.1 Material, Construction, and Design Specifications

Material and construction specifications for aggregates are set forth in Table 2.

5.2 Pre-Construction Manufacturer/Conformance Testing

Aggregate materials for use shall be obtained from approved off-site borrow sources and shall satisfy the requirements in the contract documents throughout delivery and use of the materials. The Contractor shall submit to the CQA Consultant certified laboratory test reports for each proposed aggregate source or supplier stating that the material meets or exceeds the quality and durability requirements for aggregates as set forth in Table 2.

5.3 Construction

Channels will be excavated to the lines and grades as shown on the construction drawings. Aggregate materials shall be placed using equipment and methods that protect underlying pipe materials, geotextiles and outlets of letdown structures. Aggregates for bedding and backfill of pipes and structures should be placed to the thickness and elevations shown on the plans and tamped in place to achieve compaction. Aggregates for underdrains shall be placed to the thickness and elevations shown on the plans and tamped in place to achieve compaction.

Rip rap shall be placed in a manner that will produce a reasonable well-graded mass of stone with smaller stone fragments filling the space between the larger ones, so as to result in the minimum practicable percentage of voids. The final section of stone filling shall be in conformance with the lines, grades, and thicknesses as shown on the Construction Drawings. Rip rap shall not be placed or dropped from a height greater than 24”.

5.4 Construction Testing

Observation of aggregate placement by the CQAOA will document that the correct materials are utilized and thicknesses of the layers are attained to meet the design intent. For aggregate used in bedding and backfill of structures, the aggregate will be field observed to document that it meets the project requirements.

6. Geomembrane

6.1 General

6.1.1 Summary

The following section discusses the specific requirements for the testing and installation of this material. Geomembrane will serve as a low permeability barrier from overlying liquids. It must be placed on a stable subgrade and may be used in conjunction with other materials to act as a composite liner or barrier system. Geomembrane typically has extensive requirements for the manufacturer, installer, and the CQAOA.

6.1.2 References

GRI-GM13 - Geosynthetic Research Institute: "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes"

GRI-GM14 - Geosynthetic Research Institute: "Selecting Variable Intervals for Taking Geomembrane Destructive Seam Samples Using the Method of Attributes"

GRI-GM17 - Geosynthetic Research Institute: “Test Methods, Test Properties and Testing Frequency for Linear Low Density Polyethylene (LLDPE) Smooth and Textured Geomembranes”

GRI-GM19 - Geosynthetic Research Institute: “Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes”

6.1.3 Description and Design Requirements

The geomembrane (a.k.a. Flexible Membrane Liner or FML) is designed to function as a liquid barrier for infiltrating storm water to minimize the amount of contact water generated from surface water. FML is a stable material and retains its strength and hydraulic conductivity properties even after being subjected to strain from differential settling or being exposed to leachate. HDPE and LLDPE are ideally suited for disposal facility liner and final cover systems. For this project, LLDPE will be used in the final cover system.

6.1.4 Submittals

Submit the results of the manufacturer's quality control testing in accordance with the test requirements outlined in Table 7A as applicable to the CQA Consultant for review and verification that the reported test results meet with project specifications at least 14 days prior to delivery of the liner material to the job site.

Submit the results of required prequalification testing as required in Section 4, including interface friction testing, to the CQA Consultant for review and verification that the reported test results meet with project specifications at least 14 days prior to delivery of the geomembrane material to the job site.

Upon delivery at the site, submit roll identification and quality control certificates issued by the manufacturer to the on-site CQAOA. Rolls without proper identification will be rejected.

Submit the results of the quality control testing performed during the deployment of the geomembrane. This will include at a minimum:

- Trial welds
- Panel placement logs
- Panel seaming logs
- Non-destructive test results

- Destructive test results
- Repair logs

6.1.5 Quality Assurance

Prior to delivery of the rolls of geomembrane, the CQA Consultant will verify that representative samples are removed and forwarded to a qualified testing laboratory for testing to verify conformance with the test methods and values presented in Table 7B as applicable.

6.1.6 Delivery Storage and Handling

Handle the geomembrane materials with due care and utilize handling equipment on-site that poses minimal risk of damage to the material.

6.2 Products

6.2.1 Material Requirements

FML Barrier Liner for the Final Cover: Utilize 40-mil textured LLDPE geomembrane for the final cover system containing no fillers or extenders. The minimum acceptable physical, mechanical, and hydraulic properties of the LLDPE-manufactured sheet are outlined in GRI-GM17 and in Table 7B.

It is the responsibility of the Contractor to verify that the most current version of GRI-GM17 is adhered to.

6.2.2 Source Quality Control

Quality Control testing for the geomembrane will be performed by the manufacturer on the representative samples of the proposed material to demonstrate and verify the materials meet minimum requirements outlined in GRI-GM17.

6.3 Execution

6.3.1 Construction and Installation

A daily Prepared Subgrade Acceptance form is to be signed and submitted by the installer to the CQA Consultant.

Install the geomembrane above a stable subgrade after receipt of approval of the subgrade from the CQA Consultant.

Complete geomembrane field installation in accordance with the approved panel placement drawing, manufacturer's recommended installation procedures and the construction specifications as outlined in this Section and to the lines and grades shown on the construction drawings.

Ensure the method and equipment used to unroll the panels has the following characteristics:

- Does not cause scratches or crimps in the geomembrane and does not damage the supporting soil
- Minimizes wrinkles and has adequate temporary anchors (e.g., sand bags, tires) to prevent wind damage

For fusion seaming, a rub sheet may be required directly below each overlap of geomembrane to be seamed in order to prevent any moisture build-up between the sheets.

For extrusion seaming, geomembrane is to be cleaned using a disc grinder or equivalent prior to seaming.

Record construction details for deployed geomembrane on individual forms acceptable to the Resident Engineer. This includes at a minimum:

- Panel placement logs
- Panel seaming logs
- Repair logs
- Non-destructive and destructive test result logs

Prepare panel layout drawings (field sketches) of the deployed and tested geomembrane for review by the Resident Engineer.

Complete the installation such that the geomembrane is smooth, without wrinkles, tears, or holes, and covers the total surface of the disposal facility liner and/or cap system. Do not leave tools, debris, or surplus materials on the surface.

6.3.1.1 Trial Welds

Verify seaming conditions and techniques are adequate by performing daily trial welds on representative pieces of geomembrane in accordance with the following procedures for combinations of seamer and seaming equipment:

- Perform trial welds once in the morning and once in the afternoon, when operator/machine combinations change, and when an apparatus is turned off and restarted
- Perform additional trial welds when the liner temperature changes by 36°F or more since the previous trial weld was performed

A passing trial seam must be made at the frequency noted above for each seaming device and technician prior to performing production seaming.

6.3.1.2 Seam Geometry

Seam in accordance with the following specifications:

- Orient seams parallel to the line of maximum slope, i.e., oriented along, not across, the slope
- Minimize the number of seams in corners and odd-shaped geometric locations
- Where horizontal seams are necessary and acceptable to the CQAOA, stagger seams a minimum distance of 10-feet between adjacent seams
- Do not allow horizontal seams to be within 5-feet of the toe of slopes or areas of potential stress concentration unless otherwise approved by the CQAOA.

6.3.1.3 Ambient Temperatures and Weather Considerations

Do not deploy geomembrane during any precipitation, fog, snow, in areas of ponded water, or in the presence of excessive winds.

Measure sheet temperature prior to seaming by placing a thermometer on the surface of the sheet.

Do not perform seaming where measured surface temperatures are below 32°F or above 104°F for extrusion welding and 140°F for fusion welding. Deviations from these temperature criteria may only occur when authorized by DMG and with the concurrence of the CQAOA.

6.3.2 Field Quality Control

During deployment and seaming of the geomembrane, perform the following quality control tests and record the results for review and concurrence by the CQAOA:

- Trial welds
- Non-destructive test results
- Destructive test results
- Repair logs

Perform non-destructive testing on 100 percent of field seams over their full length using a vacuum test unit (for extrusion seams only), air pressure test, or other acceptable method in accordance with industry accepted standards and in accordance with manufacturer's recommendations.

Complete non-destructive testing of the seams as the seaming work progresses and any required repairs in accordance with industry standards and in accordance with manufacturer's recommendations.

Ensure field testing equipment is calibrated in accordance with Table 8.

6.3.2.1 Air Channel Testing

Unless otherwise specified, air pressure testing of the seamed channel will include inflating the test channel, closing the valve, and observing initial pressure after approximate air temperature and pressure have stabilized. The initial pressure will be set appropriately as indicated in Table 7B, and the test will last for 5 minutes after reading the initial test pressure. If pressure loss exceeds the allowable specification in the Table 7C or if the pressure does not stabilize, locate the faulty area and repair as needed. Flap welding is not an acceptable repair for a failing air channel test. For passing tests, at the end of the 5-minute period, cut the far end of the seam and note the resultant pressure drop.

6.3.2.2 Vacuum Box Testing

Unless otherwise specified, vacuum testing will be required on extrusion welded seams. To vacuum test, turn on the vacuum pump to reduce the vacuum box to approximately 5 psi. They will apply liquid soap and water solution to the area to be tested, place the vacuum box over the area to be tested and apply sufficient downward pressure to "seat" the seal strip against the liner. Once a tight seal is created, observe the seam through the window for a period of not less than 10 seconds. If no bubbles appear after 10 seconds, proceed to the next segment of seam to be tested. Mark and repair areas failing the test with a cap strip or other acceptable method.

6.3.3 Field Quality Assurance

The CQAOA will confirm the roll identification corresponds to quality control certificates issued by the manufacturer.

The CQAOA will document observations during installation including damage, seaming logs, repair logs, test results, and conformance to specifications. Other items that will be noted include:

- The method and equipment used to unroll the panels does not cause scratches or crimps in the geomembrane and does not damage the supporting soil
- The method used to place the panels for minimization of wrinkles and temporary loading utilized to prevent wind damage

All field testing will be performed in the manner and at the frequency identified in Table 7C.

6.3.3.1 Destructive Testing

Unless an alternative frequency is indicated, the CQAOA will choose locations for cutting samples by the Contractor for destructive seam tests at a frequency no less than one per every 500-feet of seam completed by a particular seamer/apparatus combination.

Cut the samples as the seaming progresses in order to have passing test results before the geomembrane is covered by the overlying materials. The CQAOA will:

- Assign a number to each sample, and mark it accordingly
- Observe sample cutting
- Record the sample location on the layout drawing
- Record the reason for taking the sample at this location, if not taken due to statistical routine
- Observe and record test results

The sample will be divided into three specimens: one for field testing by the Contractor, one for independent laboratory peel and shear testing, and one to DMG for archive storage.

Test the field specimen with a properly calibrated tensiometer for peel and shear and verify it meets the minimum requirements presented in Table 7C. If any field test sample fails to meet the minimum requirements, the CQA consultant will determine locations for additional destruct samples for testing a minimum of 10-feet on either side of the failed test location continually bounding the failing test(s) until two bounding, passing tests are recorded. Repair the interval between the passing test locations with a cap strip and test via vacuum box.

If the result is passing, then the CQA Consultant will transport an additional specimen for laboratory testing. Peel and shear destructive seam sample testing will be performed with a calibrated tensiometer. At least five specimens will be tested. If a sample fails laboratory testing, then additional samples will be collected in the field similar to the field testing procedures.

Repair holes in the geomembrane resulting from destructive seam sampling immediately.

6.3.3.2 Alternative Destructive Testing Sampling Frequency

As the project continues and data is accumulated, the sampling interval may be varied according to the procedure set forth in GRI GM14. Following this procedure will result in three possible situations:

- Good seaming with fewer rejected test results than the preset historic average can result in a sequential increase in the spacing interval, i.e., one per greater than 500-feet.
- Poor seaming with more rejected test results than the preset historic average can result in a sequential decrease in the spacing interval, i.e., one per less than 500-feet.
- Average seaming with approximately the same test results as the preset historic average will result in the spacing interval remaining the same, i.e., one per 500-feet.

Alternative frequency testing will be implemented at the discretion of the CQA Officer.

7. Geotextiles

Geotextiles will be used as a permeable separation fabric in the construction letdown structures, drainage ditches and underdrains, and will be placed under rip rap protection of slopes and channels per the construction drawings.

7.1 Material, Construction, and Design Specifications

The geotextile is designed to separate dissimilar subsurface elements without retarding drainage through the materials. A summary of geotextile material requirements is provided in Table 3.

7.2 Pre-Construction Manufacturer/Conformance Testing

The Contractor shall submit the manufacturers' names and the materials intended for use as non-woven geotextiles. Certified test reports conforming to the requirements of standards and testing methods specified herein shall be submitted to the CQA Consultant for approval prior to delivery of geotextile. Upon delivery at the site, the Contractor will submit roll identification and quality control certificates issued by the manufacturer to the on-site CQA Consultant representative. Rolls without proper identification will be rejected. Geotextile materials will be handled in accordance with manufacturer’s recommendations utilizing handling equipment on-site that poses minimal risk of damage to the material.

7.3 Construction

Geotextile field installation will be performed in accordance with the manufacturer’s recommended installation procedures and the construction specifications. Complete the installation such that the geotextile is smooth, without wrinkles, tears, or holes. Installation will be performed in such a manner as to minimize damage and will comply with the following:

- On slopes, the geotextiles will be securely anchored and then rolled down the slope in such a manner as to continually keep the geotextile panel in tension.
- In the presence of wind, geotextiles will be weighted with sandbags or the equivalent. Sandbags will be installed during the placement and will remain until replaced with the appropriate overlying material.
- Sandbags will be filled with the fine-grained material and must be handled with care to prevent rupture.
- Geotextiles will be cut using an approved geotextile cutter only (i.e., an upward cutting hook blade). If in place, special care must be taken to protect other materials from damage which could be caused by the cutting of the geotextiles.
- Seams will be overlapped a minimum of 18-inches.

The aggregate shall be placed in the same direction as the fabric is seamed. Extreme care is required by the Contractor so that the equipment operator does not cause damage to the geotextile. At no time will construction equipment be permitted to track directly on the fabric. Geotextile shall not be exposed to sunlight (UV) for more than 30 days. Damage to the geotextile fabrics shall be repaired by the Contractor (using acceptable methods) at no additional expense to DMG.

8. Piping

8.1 Piping Systems and Stormwater Structures

All piping and stormwater structures used as part of the stormwater management system will be to the sizes and installed in locations as shown on the contract drawings.

8.1.1 Material, Construction, and Design Specifications

A summary of piping material and construction requirements is provided in the contract documents.

8.1.2 Pre-Construction Conformance Testing

Contractor must submit shop drawings and material samples for each type of pipe and each structure intended for installation for review and approval. The CQAOA will verify that the materials meet or exceed the minimum property values.

8.1.3 Construction

Care will be taken during transportation of the pipe such that it will not be cut, kinked, or otherwise damaged. Pipes will be handled and stored in general accordance with the manufacturer's recommendation. The handling of joined pipe will be in such a manner that the pipe is not damaged by dragging it over sharp and cutting objects. Slings for handling the pipe will not be positioned at joints. Sections of the pipes with deep cuts and gouges will be removed and the ends of the pipe rejoined using manufacturer-approved methods and equipment. Pipes and stormwater structures shall be installed to the elevations, lines, and grades shown in the contract documents. Pipes shall be bedded and backfilled as shown in the contract drawings.

The CQAOA will verify through delivery tickets and material bill of ladings that the material delivered to the site meets the project requirements.

As required by the construction specifications, the joints of non-perforated HDPE pipes will be tested using the pressure test procedures given in ASTM C924.

8.1.4 Construction Inspection

Pipe installation will be in accordance with the manufacturer's recommended installation procedures and the construction specifications. The CQAOA will monitor and document the following:

- The perforations or slots of the pipe conform to the requirements of the specifications.
- That pipe and fittings are joined by the methods indicated by the manufacturer or in the specifications.
- That pipes are properly bedded and covered per the specifications.
- That marker/warning tape is installed in the trench above the pipe to mark its location.
- Testing requirements for pipe and fittings are provided in Table 4.

During installation of the HDPE pipe, perform the following quality control tests and record the results for review and concurrence by the CQA Contractor:

- Non-destructive pressure test performance results
- Pipe repair logs

- The CQAOA will document observations during installation including damage, repair logs, test results, and conformance to specifications. The method and equipment used to fuse pipe joints and conduct pressure testing will also be noted.

The CQAOA will document the results of pressure testing. Additionally, should a failed test occur, the CQA Contractor will document the nature of leaks discovered and the details of their repair.

9. Concrete and Grout

9.1 Material, Construction, and Design Specifications

A summary of concrete and grout material and construction requirements is provided in Table 5.

9.2 Pre-Construction Conformance Testing

The Contractor shall submit a mix design for each type of concrete and grout and from each supplier. The Contractor shall submit a minimum of three 28-day compressive strength test results for each mix design.

9.3 Construction

9.3.1 Cast-in-Place Concrete

Mixing, transporting, and placement of concrete shall be in accordance with the American Concrete Institute (ACI) standard 301-96. In accordance with Section 1.4.3 of ACI 301-96, the Contractor shall keep a copy of ACI SP-15(95), Field Reference Manual: Standard Specifications for Structural Concrete on-site. SP-15 is a compilation of references on measuring, mixing, transporting, and placing concrete; concrete pumping methods; hot and cold weather concreting; and concrete formwork.

Cast-in-place concrete shall be cured in accordance with ACI 308. Surfaces not covered by forms shall be protected with membrane curing compound, dampened burlap, polyethylene film, cotton mats, or wetted sand. Unless membrane curing compound is used, curing materials shall be kept wet and remain in place for seven days.

9.3.2 Grout

Submit a grout mix design to the CQA Officer for review and approval.

9.4 Construction Observation and Testing

9.4.1 Cast-in-Place Concrete

Reinforcing shall be installed in accordance with the Contractor's shop drawings. Reinforcing shall not be covered or completely enclosed by formwork until the CQAOA has been given an opportunity to observe the reinforcing and installation of other embedded items. The Contractor shall provide the CQAOA with a minimum of 24 hours advance notice of concrete placement.

Construction testing of cast-in-place concrete will be performed by the CQAOA. Field testing will include tests for temperature, slump, and air content. Field testing will also include the preparation of test specimens for laboratory testing of compressive strength. Each test specimen will consist of a set of 4 cylinders to be tested in accordance with the following schedule:

- 1 Cylinder – 7 day compressive strength
- 2 Cylinders – 28 day compressive strength
- 1 Cylinder - Spare

Field and laboratory testing requirements are provided in Table 5.

9.4.2 Grout

Field and laboratory testing requirements for the grout are provided in Table 5.

10. Miscellaneous Items

The following section discusses the specific QA/QC requirements for miscellaneous items installed as part of the project.

10.1 Construction Observation and Testing

Contractor shall submit for review the following information as appropriate:

- Shop drawings
- Product data
- Manufacturer's certificates
- Design data and calculations
- Manufacturer's instructions

Installation of miscellaneous items will be observed and documented by the CQAOA to verify conformance with the construction documents and shop drawings.

11. Surveys

11.1 Surveying

CQA surveying will be performed by a third party surveyor retained by DMG. The purpose of the surveys is to verify that actual thickness and grades of the construction components are in accordance with the construction drawings. Surveying of lines and grades will be conducted during construction of the soil layers. Surveying will be performed to provide documentation for record plans, verify quantities of soils and assist the Contractor in complying with the required grades. Review of the surveys conducted at the site will be part of the CQA program. The permanent benchmarks at the facility will be used for survey control. Surveying will be performed under the supervision of a qualified, professional Land Surveyor licensed in the State of Illinois.

Based on the control points provided by DMG, the Contractor is to provide temporary and permanent benchmarks, monuments, and increments needed to control work. If during the work, control points set by DMG are disturbed by the Contractor, the Contractor shall replace them at no cost to DMG.

11.1.1 Survey Requirements

The following surfaces are required to be surveyed in order to certify the cover for the impoundment closure:

- Top of Subgrade
- Top of Protective Cover Soil Layer
- Top of Vegetative Layer
- Stormwater Controls

11.1.2 Record Surveys or As-Built Surveys

Record Surveys or As-Built Surveys shall obtain field measurements of vertical (where required) or horizontal dimensions. Each drawing shall clearly show by symbols, notations, or delineations, those constructed facilities located by the field survey. Survey data shall be reviewed and approved by a Professional Licensed Surveyor or a Professional Engineer. The Contractor shall complete as-built surveys in order to document the following:

- Quantities of materials placed.
- As-built line and grade of structures, piping, fills, and embankments.

11.2 Accuracy Requirements & Measurement Specifications

Every determination of distance shall be made either directly or indirectly in such a manner that the linear error in the distance between two points (not necessarily adjacent points) shall not exceed the reported distance divided by ten thousand (allowable linear error = reported distance divided by ten thousand) and every angular measurement shall be made in such a manner that the allowable (directional) error, in radians, shall not exceed the allowable linear error divided by the reported distance (allowable [directional] error = allowable linear error divided by reported distance). When the reported distance is less than two hundred feet, the linear error shall not exceed 0.02 feet.

11.3 Acceptable Construction Tolerances

Acceptable construction tolerances from plan dimensions, elevations, and grades shall be as shown on the drawings and as listed in Table 6.

11.4 Surveys by Owner

DMG may conduct additional surveys to monitor or document the work.

11.5 Survey Deliverables

The Contractor shall provide As-Built Drawings in both electronic and hard-copy format. As-Built Drawings are surveys that document as-constructed conditions and/or confirm that a project has been constructed consistent with the provisions of the construction/contract documents. As-built surveys are typically finalized after construction is completed. However, these As-Built Surveys may be also commonly used during intermediate points in construction to confirm the construction project is achieving interim objectives and milestones. The following items shall be required when as-built surveys are delivered to the CQA Consultant:

- The As-Built survey drawings shall be accompanied by a three-dimensional surface model of the survey.
- When performing as-built surveys, the surveyor shall obtain field measurements of vertical or horizontal dimensions of permanent structures or constructed improvements so that the constructed facility can be delineated in such a way that the location of the construction may be compared with the construction plans.
- The as-built maps shall clearly show those constructed improvements by symbols, notations, or delineations, located by the survey.
- The as-built survey shall clearly depict the limits of constructed features such as fill, liner and drainage system, etc. When depicting pipelines, the as-built survey shall indicate the size and material of construction as well as invert (gravity) or top of pipe (non-gravity) elevations.
- The vertical and horizontal accuracy of the measurements shall be made such that it may be determined whether the improvements were constructed consistent with planned locations.
- The Contractor shall be required to conduct and submit verification for items shown in Table 6. Surveys shall be prepared in sufficient detail to document the 18-inch thick protective soil cover layer and 6-inch thick erosion/vegetative layer. As such, data shall be depicted in tabular form, in cross-sections and/or in maps such that the CQA Officer can compare the data with the specific design requirement. In addition to the above information, the source file (such as an Excel file) containing the tabular information should also be provided.

12. Meetings

The following meetings will be held during the course of the construction phase:

- Kick-Off Meeting – A project kick-off meeting will be held at the project site on a schedule established by DMG. The kick-off meeting is to be attended by the Contractor and key subcontractor representatives, the CQA Officer, CQAOA, and other DMG representatives as determined by DMG. This meeting will be held to discuss construction responsibilities, safety, scheduling, design, QA/QC procedures, change orders, and Contractor submittals.
- Pre-Construction Meetings - Following the completion of the contract documents and selection of a CQA Consultant for the project, a Pre-Construction Meeting may be held. At a minimum, the meeting should be attended by the Project Manager, the CQA Consultant, the geomembrane installer, the Contractor, and other involved parties. Two Pre-Construction Meetings may be held, one prior to dewatering (if required) and one prior to geomembrane placement.
- Construction Progress Meetings – Construction progress meetings will be held at the project site on a schedule established by DMG. A consistent day, time, and location will be established. The construction progress meetings are to be attended by the Contractor and key subcontractor representatives, the CQAOA, and other DMG representatives as determined by DMG. These meetings will be held to discuss construction progress, delays, design issues, QA/QC procedures, change orders, and Contractor submittals.
- Safety Meetings – The Contractor will hold safety meetings in accordance with its Site Health and Safety Plan including daily tailgate meetings. The Contractor's Site Health and Safety Plan must be submitted to DMG prior to commencing construction activities. It is anticipated that these meetings will be held at the start of construction and then periodically as conditions change.

13. Documentation

13.1 Submittals

Submittals include shop drawings, material data, and samples. Product data submittals, samples, and shop drawings are required to verify that the correct products will be installed on the project. The shop drawing submittal is a drawing or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator typically for pre-fabricated components or construction procedures. The material data submittal usually consists of the manufacturer's product information. The sample submittal is a physical portion of a specified product, often required when several products are acceptable, to confirm the quality and aesthetic level of the material. The size or unit of sample material is usually specified.

For borrow sources to be used as cover material, the Contractor shall provide the location and a survey of the borrow source. Contractor shall provide access a minimum of two weeks prior to the scheduled start of cover material placement for the CQA Contractor to obtain samples for borrow source testing. If the borrow source fails to meet project specifications, the Contractor must provide another borrow source.

13.1.1 Submittal Procedures

The Contractor shall initially submit to the CQA Officer a minimum of 4 copies of submittals. One copy of the submittal will be returned to the Contractor. A letter of transmittal shall accompany each submittal. At the beginning of each letter of transmittal, a reference heading will be provided indicating the following:

- Owner's Name
- Project Name
- Contract No.
- Transmittal No.
- Specification or Drawing Reference

Shop Drawings shall be submitted a minimum of seven days prior to the intended use of the material or equipment for construction and with ample allowance for the time required to deliver the material or equipment after data covering such is reviewed. The Contractor shall assume the risk for materials or equipment which are fabricated or delivered prior to the approval of the Shop Drawings.

It is the Contractor's responsibility to review submittals made by his or her suppliers and subcontractors before transmitting them to the CQA Officer. The Contractor's review is intended to allow for the proper coordination of the Work, to determine that each submittal is in accordance with the Contractor's desires, and that there is sufficient information provided for the CQA Officer to determine compliance with the contract documents. Incomplete or inadequate submittals will be returned for revision without review.

13.1.2 Submittal Review and Approval

After the CQA Officer completes the review, Shop Drawings will be marked with one of the following notations:

- Conforms As Is
- Conforms As Noted
- Revise and Resubmit
- Does Not Conform / Resubmit
- See Attached Comments

If a submittal is acceptable, it will be marked "Conforms As Is" or "Conforms As Noted". Upon return of a submittal marked "Conforms As Is" or "Conforms As Noted", the Contractor may order, ship or fabricate the materials included on the submittal, provided they are in accordance with the corrections indicated. If a Shop Drawing marked "Conforms As Noted" has extensive corrections or corrections affecting other drawings or Work, the CQA Officer may require that the Contractor make the corrections indicated thereon and resubmit the Shop Drawings for record purposes. Such drawings will have the notation, "Conforms As Noted / Resubmit." If a submittal is unacceptable, 2 copies will be returned to the Contractor with the following notation: "Does Not Conform / Resubmit".

Upon return of a submittal marked "Revise and Resubmit", Contractor shall make the corrections indicated and repeat the initial procedure. The "Does Not Conform / Resubmit" notation is used to indicate material or equipment that is not acceptable. Upon return of a submittal so marked, the Contractor shall repeat the initial procedure utilizing acceptable material or equipment. Related work performed or equipment installed without a “Conforms As Is" or “Conforms As Noted” Shop Drawing will be at the sole responsibility of the Contractor.

The CQA Officer will review and process submittals promptly. A reasonable time should be allowed for initial review, for the Shop Drawings to be revised and resubmitted as necessary, and for subsequent review, approval, and return to the Contractor.

13.2 Project Schedules

The Contractor will be required to build a detailed project schedule to be approved by DMG prior to the preconstruction meeting. The schedule shall, at a minimum, have the following attributes:

- Schedule narrative describing the logic for the work planned;
- Clearly defined starting point;
- Clearly defined completion date;
- Project milestones;
- Certification milestones;
- Mobilization and demobilization activities;
- Critical paths identified;
- Tasks that represent the performance of the work, including tangible deliverables or products;
- Specifies the resources required to perform the work (This shall include labor, equipment, and materials); and
- Can be easily measured during the performance of the detailed activity relating to the work.

All details in the project schedule will be logically tied to other activities. As a general guideline for generating schedules, the duration of an activity should be limited to 14 calendar days. In no case should an individual work activity be scheduled for a duration longer than 45 calendar days without approval from DMG. If a portion of the project is to be accomplished during a plant outage, those scheduled activities should be incorporated into a separate hourly schedule. The work should be broken down into sufficient enough detail to allow the maximum use of start-to-finish relationships. In addition, start-to-start, finish-to-finish, or start-to-finish relationships shall be used at a minimum. In no case will negative lag values be allowed for relationships. Exceptions to the above criteria must have DMG construction management’s approval.

Individual activities in the project schedule requiring identifiable labor to complete the project will be resource loaded with necessary engineering labor hours, project support labor hours, and/or craft labor hours consistent with the Contractor’s estimate, scope of work, and work assignments. Craft hour resource loading will include direct hours necessary to complete the specified scope of work, including foremen hours. Resource loading of necessary overhead or indirect hours will be determined by advanced consultation with and approval from DMG. The Contractor

will provide written assurances that the man-hours included in the schedule reasonably represent the estimate for the work scope identified. In addition, the Contractor will resource load major equipment necessary for completion of the individual work activities where the approximate daily rental or ownership value exceeds $500 per day or provide an equipment utilization plan with actual usage indicated. Changes made to the project schedule's resource loading after the schedule has been submitted will be highlighted in the weekly and monthly reports along with a written explanation.

Progress for scheduled tasks will be tracked using physical percent complete. Physical percent complete will be calculated based on actual progress as measured by work effort or by installed quantities. When requested by DMG, the Contractor will provide information and back up support to validate methods used to develop physical percent complete. In no case will physical percent complete be based solely on remaining duration compared to original durations or actual expenditures compared to budgeted expenditures. Significant reductions in physical percent complete will be reported in the weekly report along with an explanation.

13.3 Requests For Information

The purpose of this procedure is to define and detail the Request For Information (RFI) process. RFIs must be processed expeditiously in order to avoid the possibility of delay to the project. An RFI is a form established for the Contractor's use to request information and/or clarification related to the plans, specifications, or contract requirements. RFIs are also submitted to request approval for minor deviations from contract requirements that do not involve time or cost adjustment and to obtain directions on how to proceed when there are conflicting contract requirements. Please note that the RFI shall not be used as a substitute for items specifically requiring a submittal from the Contractor. RFIs shall not be used to change the design or price. If a change in the design or price is needed (i.e., based on an RFI response), then a change order must be issued.

13.3.1 RFI Procedures

The following procedures will be followed for filing, reviewing, and responding to RFIs:

- The Contractor completes, sequentially numbers, and submits the RFI form to the CQA Officer.
- The CQA Officer or CQAOA enters the RFI in a tracking log.
- The CQA Officer will review and respond to the RFI.
- If the RFI will lead to a Change Order, the CQA Officer will submit to DMG for review.
- DMG approval of each Change Order is required.
- If the RFI does not lead to a Change Order, the CQA Officer will sign and return the RFI to the Contractor.

The RFI form should be agreed upon prior to the start of construction. RFIs may be submitted electronically if the CQA Consultant and DMG agree.

13.4 Project Documentation

Project documentation shall be collected and maintained on-site by the CQA Officer. The Contractor and CQA Officer shall submit project documentation to DMG on a weekly basis. Copies will be maintained by the Contractor and the CQA Officer for back-up.

13.4.1 CQA Consultant Documentation

Construction Documentation Forms that will be developed prior to construction and used for CQA and will include the following:

- CQAOA’s Daily Report
- Submittal Log

- Requests for Information (RFI) Log
- Concrete Placement Log
- Concrete Testing Log
- Trial Weld Log
- Panel Placement Log
- Panel Seaming Log
- Destructive Testing Log
- Non-Destructive Testing Log
- Repair Log

These forms represent examples; however, they may be modified as deemed appropriate based on the requirements of the CQA Consultant or DMG.

At the end of each week of construction of the final cover system until construction is complete, a summary report must be either prepared by the CQA Officer or under the supervision of the CQA Officer. The report must include descriptions of the weather, locations where construction occurred during the previous week, materials used, results of testing, inspection reports, and procedures used to perform the inspections. The CQA Officer must certify the report. DMG shall retain weekly summary reports and must make those reports available at reasonable times for inspection by the Agency.

13.4.2 Contractor Documentation

The Contractor will submit a daily force report identifying the Contractor's and subcontractors' total manpower headcount performing the work with a breakdown of craft, by shift, along with a list of major equipment being employed on-site. The daily force report will also include a description of the work performed that day. The daily force report will identify separately scheduled tasks actually started or completed for the day, as well as daily weather conditions (temp, wind, precipitation) and schedule impacts or delays encountered due to weather. The report will include details of safety or environmental events. If there are no events, the report shall state that. The daily force report is due by 8:30 am for the previous day worked.

The Contractor will provide a weekly schedule update and status report. Weekly schedule updates will include actual starts, actual finishes, remaining durations, physical percent complete, and other status items required by DMG to be included in the log feature of each activity. The weekly schedule status report shall be prepared immediately following the schedule update and shall show changes made to the prior schedule file as a result of the weekly schedule update. The weekly schedule status report shall discuss the following items:

- The current critical path,
- all logical revisions that affect the critical path,
- all decreases in physical percent complete,
- all increases to the remaining durations,
- all revisions to original durations,
- all added schedule activities,
- actual man hours expended to date and for the prior week,

- actual equipment used, and
- actual quantity of material used.

Each weekly update must be accompanied by a detailed status report indicating the overall status of the work, problem areas, recovery plans, unresolved issues, change orders and their effect on the work progress, and manpower availability. Each weekly update must be accompanied by a material received report and a material status report. The weekly status report and schedule update is due by close of business Monday for the previous week worked.

The Contractor shall report on a weekly basis the information necessary for DMG to establish and maintain DMG's earned value management system performance indicators and indexes. This report shall be submitted no later than Wednesday for the prior work week. This would include period and cumulative planned hours, earned hours, and actual hours. Earned hours are defined as budgeted hours multiplied by the physical percent complete per each budget resource hour loaded in the individual scheduled activity. Actual hours can be reported at a level higher than individual schedule activities, but not less than by the resource detail provided (i.e., by craft or discipline, by subcontractor, by area) and will be the subject of source validation by DMG. The form of the Contractor’s earned value management system reporting shall generally be in its native electronic form that can best be utilized by the DMG.

Each month, the Contractor shall provide a more in-depth and detailed status report indicating the overall status of the work, major or significant changes made to the schedule, problem areas, recovery plans, unresolved issues, change orders and their effect on the work progress, and manpower availability. The monthly status report must include the following: Project Tracking System reports detailing planned, earned, and actual man hours and a monthly cost report including current budget, actual commitments, expenditures, and estimate-at-completions for construction activities. The monthly report will have a financial report included that shows actual cost vs. forecasted cost and details for variances.

Tables

TABLE 1 - SOIL REQUIREMENTS

Component	Required Test or Observation	Test Method	Minimum Frequency	Acceptance Criteria	Responsible Party
Closure Cover Soil 18-inch Layer	Moisture Content	ASTM D 2216	1 / 20,000 CY	Soil classified as CL, CH, CL-ML, SC, GC OR GM , free from organic material, waste material, angular stones greater than 2 inches, and rounded stones greater than 3 inches,	CQA Consultant to retrieve samples and perform testing
	Soil Classification	ASTM D 2487	1 / 20,000 CY		
	Atterberg Limits	ASTM D 4318	1 / 20,000 CY		
	Visual Observation	NA	As required	Substantially free of debris, large rocks, plant material, or other deleterious material.	CQA Consultant to retrieve samples and perform testing
	In-place Moisture Content	ASTM D 6938	1 test acre per lift	Moisture content -2 to +2 % optimum	CQA Consultant
	In-Place Visual Observation	NA	As required	Final surface firm, smooth and uniform	CQA Consultant
Closure Cover Soil 6-inch Vegetative Layer	In-Place Visual Observation	NA	As required	Final surface firm, smooth and uniform	CQA Consultant
	In Place Lift Depth Check	NA	As required	Thickness verified by as-built survey at 100-ft maximum grid interval	

Latest version of the applicable testing standards will be used when conducting tests.

TABLE 2 - AGGREGATE REQUIREMENTS

Component	Required Test or Observation	Test Method	Minimum Frequency	Acceptance Criteria	Responsible Party
No. 5 Stone for Finger Drains	Sieve Analysis	AASHTO T27	1 per supplier or source.	No. 5	Contractor/Supplier
C-33 Sand for Finger Drains	Sieve Analysis	ASTM C33	1 per supplier or source.	ASTM C33	Contractor/Supplier
Rip Rap	Percent Wear	AASHTO T96	1 per supplier or source	60% maximum	Contractor / Supplier
	Percent Soundness	AASHTO T104	1 per supplier or source	85% minimum	Contractor / Supplier
	Visual Inspection	N/A	All Rip Rap placed	Per the General Notes in the Construction Plans	CQA Consultant
Aggregate for filter gravel at underdrains	Sieve Analysis	AASHTO T27	1 per supplier or source.	Per the General Notes in the Construction Plans	Contractor / Supplier

Latest version of the applicable testing standards will be used when conducting tests.

TABLE 3 – REQUIRED PROPERTIES FOR NON-WOVEN GEOTEXTILES

Material Property	Value[(1)]	Units	Test Method	Frequency
10 oz/sy Nonwoven Geotextile				
Mass/Area (min. avg.)	10	oz/sy	ASTM D 5261	250,000 SF
Permittivity	0.94	sec^{-1}	ASTM D 4491	250,000 SF
Grab Tensile	260	lb	ASTM D 4632	250,000 SF
Grab Elongation	50	percent	ASTM D 4632	250,000 SF
CBR Puncture Resistance	725	lb	ASTM D 6241	250,000 SF
Trapezoidal Tear	100	lb	ASTM D 4533	250,000 SF
Apparent Opening Size	100	U.S. Sieve	ASTM D 4751	250,000 SF
8 oz/sy Nonwoven Geotextile				
Mass/Area (min. avg.)	8	oz/sy	ASTM D 5261	250,000 SF
Permittivity	1.26	sec^{-1}	ASTM D 4491	250,000 SF
Grab Tensile	220	lb	ASTM D 4632	250,000 SF
Grab Elongation	50	percent	ASTM D 4632	250,000 SF
CBR Puncture Resistance	575	lb	ASTM D 6241	250,000 SF
Trapezoidal Tear	90	lb	ASTM D 4533	250,000 SF
Apparent Opening Size	80	U.S. Sieve	ASTM D 4751	250,000 SF
6 oz/sy Nonwoven Geotextile				
Mass/Area (min. avg.)	6	oz/sy	ASTM D 5261	250,000 SF
Permittivity	1.50	sec^{-1}	ASTM D 4491	250,000 SF
Grab Tensile	160	lb	ASTM D 4632	250,000 SF
Grab Elongation	50	percent	ASTM D 4632	250,000 SF
CBR Puncture Resistance	435	lb	ASTM D 6241	250,000 SF
Trapezoidal Tear	65	lb	ASTM D 4533	250,000 SF
Apparent Opening Size	70	U.S. Sieve	ASTM D 4751	250,000 SF
Overlap of Seams	Minimum 18-inch	N/A	N/A	All Seams

(1) Minimum average roll values

TABLE 4 - MINIMUM TESTING REQUIREMENTS FOR PIPE

Component	Required Test or Observation	Test Method	Minimum Frequency	Acceptance Criteria	Responsible Party
HDPE Underdrain and Finger Drain Piping	Visual observation of pipe joining and installation	N/A	Each section of pipe	Per manufacturer's recommendations	CQA Consultant
Non-Perforated HDPE Piping	Pressure test of pipe joinings	ASTM C924	As specified in construction specifications	Per manufacturer's recommendations	CQA Consultant

Latest version of the applicable testing standards will be used when conducting tests

TABLE 5 – MINIMUM TESTING REQUIREMENTS FOR CONCRETE AND GROUT

Component	Required Test or Observation	Test Method	Minimum Frequency	Acceptance Criteria	Responsible Party
Concrete Mix Design	Submit for review	N/A	1 per mix	N/A	Contractor / Supplier
	Compressive Strength	ASTM C 39	3 per mix design	4,000 psi at 28 days	Contractor / Supplier
Cast-in-Place Concrete	Temperature	ASTM C 1064	1 / 10 CY	≤ 95°	CQA Consultant
	Slump	ASTM C 143	1 / 20 CY	4 inches ± 1 inch	CQA Consultant
	Air Entrainment	ASTM C 231	1 / 20 CY	6 % ± 1%	CQA Consultant
	Test Cylinders	ASTM C 31	1 set (4) / 50 CY	N/A	CQA Consultant
	Compressive Strength	ASTM C 39	1 at 7 days 2 at 28 days 1 spare	Average of 2 tests ≥ 4,000 psi at 28 days and each test is ≥ 3,800 psi	CQA Consultant
Concrete reinforcing	Visual observation	N/A	All structures	Per Contractor's approved shop drawings	CQA Consultant
Grout Mix Design	Submit for review	N/A	1 per mix	N/A	Contractor / Supplier
	Compressive Strength	ASTM C 942	3 per mix design	1000 psi at 28 days	Contractor / Supplier

Latest version of the applicable testing standards will be used when conducting tests

TABLE 6 – CONSTRUCTION TOLERANCES FOR COVER THICKNESS VERIFICATION

Component	Acceptance Criteria	Responsible Party
Top of Fill	+ 0.10 Feet Vertical	Contractor
	± 1.0 Feet Horizontal	Contractor
Top of Cover Soil Layer	+ 0.10 Feet Vertical	Contractor
	± 1.0 Feet Horizontal	Contractor
Top of Vegetative Soil Layer	+ 0.10 Feet Vertical	Contractor
	± 1.0 Feet Horizontal	Contractor

Latest version of the applicable testing standards will be used when conducting tests

TABLE 7A – REQUIRED PROPERTIES FOR 40-MIL TEXTURED LLDPE GEOMEMBRANE – MANUFACTURING QUALITY CONTROL

Material Property	Value[1]	Units	Test Method	Frequency
Resin – Melt Flow Index	≤1.0	g/10 min.	ASTM D1238	50,000 SF
Thickness[1]	40	mil	ASTM D 5994	Per roll
Asperity Height[2] [5] (min. avg.)	10	mil	GRI GM12	50,000 SF
Specific Gravity (min.)	0.939	gm/cm^3	ASTM D 792 or ASTM D 1505	50,000 SF
Tensile Properties (each direction)			ASTM D6693 Type IV	
1. Tensile Strength at Break (min. avg.)	60	lb/in.		50,000 SF
2. Elongation at Break (min. avg.)	250	percent		50,000 SF
Tear Resistance (min. avg.)	22	lbs	ASTM D1004, Die C	50,000 SF
Puncture Resistance (min. avg.)	44	lbs	ASTM D 4833	50,000 SF
Carbon Black Content	2-3	percent	ASTM D1603	50,000 SF
Carbon Black Dispersion[3]	Category 1 or 2	Rating	ASTM D5596	50,000 SF
Low Temperature Brittleness	-76	°F	ASTM D 746, Procedure B	50,000 SF
Dimensional Stability	±2	percent	ASTM D 1204, 212°F, 15 min	50,000 SF
Notched Constant Load Stress Cracking	≥200	hours	ASTM D 5397	50,000 SF

(1) Minimum of ten readings must be equal to or greater than the minimum specified thickness

(2) Or as required to meet the interface shear requirements for the project. See Section 4 of the CQA Plan. Minimum of ten readings must average specified height. Eight of the readings must be ≥ 7 mils, and the lowest reading must be ≥ 5 mils. No visible variation across the width of the roll will be allowed.

(3) Carbon dispersion for 10 different views: 9 of 10 views will be Category 1 or 2 with one view allowed in Category 3.

(4) Manufacturer's Quality Control testing will be performed at a frequency of one test per every 50,000 ft^2 or one test per resin lot, whichever is more frequent. Thickness testing will be performed on each roll.

(5) Asperity Height measurements will be performed on every roll, alternating between measurements for top of sheet and bottom of sheet.

TABLE 7B – REQUIRED PROPERTIES FOR 40-MIL TEXTURED LLDPE GEOMEMBRANE – CONFORMANCE TESTING

Material Property	Value[1]	Units	Test Method	Frequency
Thickness[1]	40	mil	ASTM D 5994	100,000 SF
Specific Gravity (min.)	0.939	gm/cm^3	ASTM D 792 or ASTM D 1505	100,000 SF
Asperity Height[2] (min. avg.)	10	mil	GRI GM12	100,000 SF Top & Bottom
Tensile Strength at Break (min. avg.)	60	lb/in.	ASTM D6693 Type IV	100,000 SF
Elongation at Break (min. avg.)	250	percent	ASTM D6693 Type IV	100,000 SF
Tear Resistance (min. avg.)	22	lbs	ASTM D1004, Die C	100,000 SF
Puncture Resistance (min. avg.)	44	lbs	ASTM D 4833	100,000 SF
Carbon Black Content	2-3	percent	ASTM D1603	100,000 SF
Carbon Black Dispersion[3]	Category 1 or 2	Rating	ASTM D5596	100,000 SF

(1) Minimum of ten readings must be equal to or greater than the minimum specified thickness.

(2) Or as required to meet the interface shear requirements for the project. See Section 4 of the CQA Plan. Minimum of ten readings must average specified height. Eight of the readings must be ≥ 7 mils, and the lowest reading must be ≥ 5 mils.

(3) Carbon dispersion for 10 different views: 9 of 10 views will be Category 1 or 2 with one view allowed in Category 3.

(4) Conformance testing will be performed by the Certification Engineer or TVA at a minimum frequency of one test per 100,000 ft2 or one test per resin lot, whichever is more frequent. Take samples across the entire width of the roll and do not include the first 3 lineal ft. unless otherwise specified, samples are to be 3 ft long by the roll width. If applicable, mark the machine direction on the samples with an arrow.

TABLE 7C. REQUIRED 40 MIL TEXTURED LLDPE SEAM PROPERTIES

Material Property	Value	Units	Test Method
Shear Strength – Fusion and Extrusion[1]	60	lb/in.	ASTM 6392 Strain rate: 2 in./min. 1 in. strip.
Peel Adhesion			ASTM D6392 Strain rate: 2 in./min. 1 in. strip.
Fusion[2]	50	lb/in.	
Extrusion[3]	44	lb/in.	
Air Channel Testing[4]	25	psi	ASTM D5820
Vacuum Box Testing[5]	3	psi	ASTM D5641

(1) For Shear Testing of both fusion and extrusion welds, the strength of 4 out of 5 specimens should meet or exceed the given value. The 5th can be as low as 80% of the tested value. Required laboratory seam testing will be performed by a geomembranes testing laboratory at a frequency of one test per 500 linear feet of seam constructed for both extrusion and fusion welding equipment unless otherwise directed by the CQA consultant.

(2) For Peel Testing of fusion welds the strength of 4 out of 5 specimens should meet or exceed the given value. The fifth can be as low as 80% of the tested value. All specimens will fail due to film tear bond or with greater than 25% incursion of the weld (peel).

(3) For Peel Testing of extrusion welds, 1 out of 5 specimens may either achieve <52 lb/in but be ≥41.6 lb/in. or exhibit greater than 25% incursion of the weld (peel). The remaining four specimens must meet the specified strength and have a maximum of 25% incursion of the weld (peel).

(4) For Air Channel Testing of fusion welds, specimen must maintain pressure for 5 minutes with no less than 3 psi pressure drop. Note pressure drop when far seam is cut.

(5) For Vacuum Box Testing of extrusion welds, examine weld for 10 seconds at the required test pressure through the vacuum box window for evidence of leaks.

Table 8 CALIBRATION OF TESTING EQUIPMENT

Equipment	Required Test	Minimum Frequency	Acceptance Criteria
Nuclear Density Gauge	Radioactive Source Wipe Testing and Systems Electronics Check	Annually by manufacturer or specialty testing firm qualified to inspect and calibrate nuclear source equipment	Certificate of Calibration and Safety by Testing Firm
Tensiometer	Tensile strength calibration to standard	Prior to arrival to project site. Tensionmeter to be field verified at the discretion of the CQA Consultant	+/- 3 psi
Air Pressure Gauges	Pressure in psi compared to standard	Prior to arrival to project site or documentation that the product is new	+/- 1 psi
Other	As Determined by the Engineer	As Recommended by the manufacturer, or required by State Auditor of Measurement Devices	As guaranteed by the manufacturer

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BORING AND MONITORING WELL LOCATION MAP

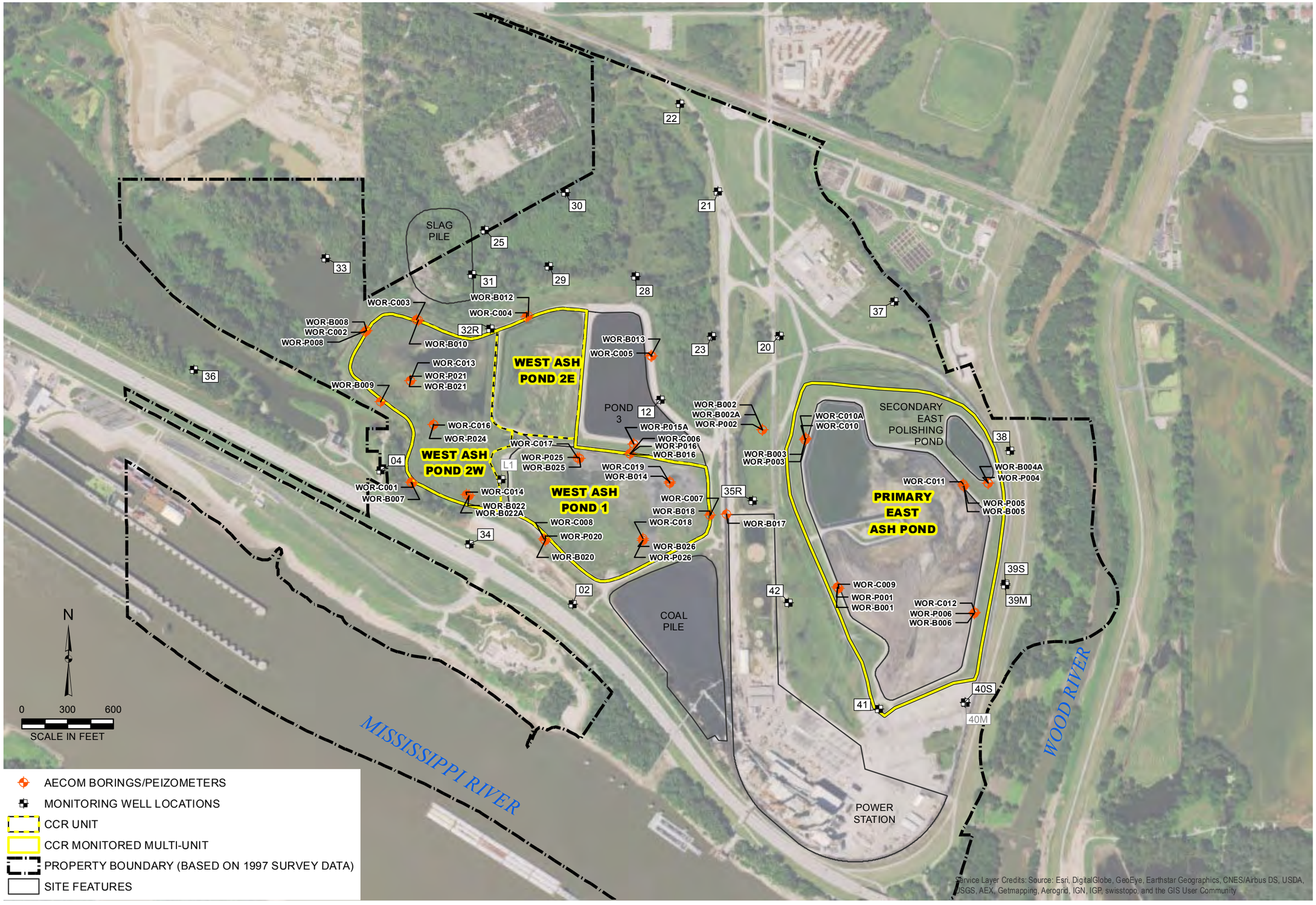
HYDROGEOLOGIC CHARACTERIZATION REPORT
WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

DRAWN BY/DATE:
SDS 7/15/16
REVIEWED BY/DATE:
NRK 7/15/16
APPROVED BY/DATE:
SJC 7/28/16

PROJECT NO: 2376

FIGURE NO: 3

NATURAL RESOURCE TECHNOLOGY



Y:\Mapping\Projects\2312376\MXD\Hydrogeologic_CR\Figure 3_Monitor Well Location Map.mxd Author: sstolz: Date/Time: 7/28/2016, 4:51:32 PM

SAND

SILTY SAND/SILT

CLAY/FAT CLAY

SILTY CLAY

ASH

SAND

CLAY

ASH

FILL

GEOLOGICAL CONTACT, DASHED WHERE INFERRED

WELL/BORING

SCREEN

NOTES:

1. COORDINATE SYSTEM IS NAD 83 ILLINOIS STATE PLANE WEST, US SURVEY FOOT.
2. VERTICAL DATUM IS NAVD 88.
3. AERIAL PHOTOGRAPHY SOURCE: ESRI, DIGITALGLOBE, GEOEYE, I-CUBED, EARTHSTAR GEOGRAPHICS, CNES/AIRBUS DS, USDA, USGS, AEX, GETMAPPING, AEROGRID, IGN, IGP, SWISSTOPO, AND THE GIS USER COMMUNITY

VERTICAL SCALE IN FEET: 30

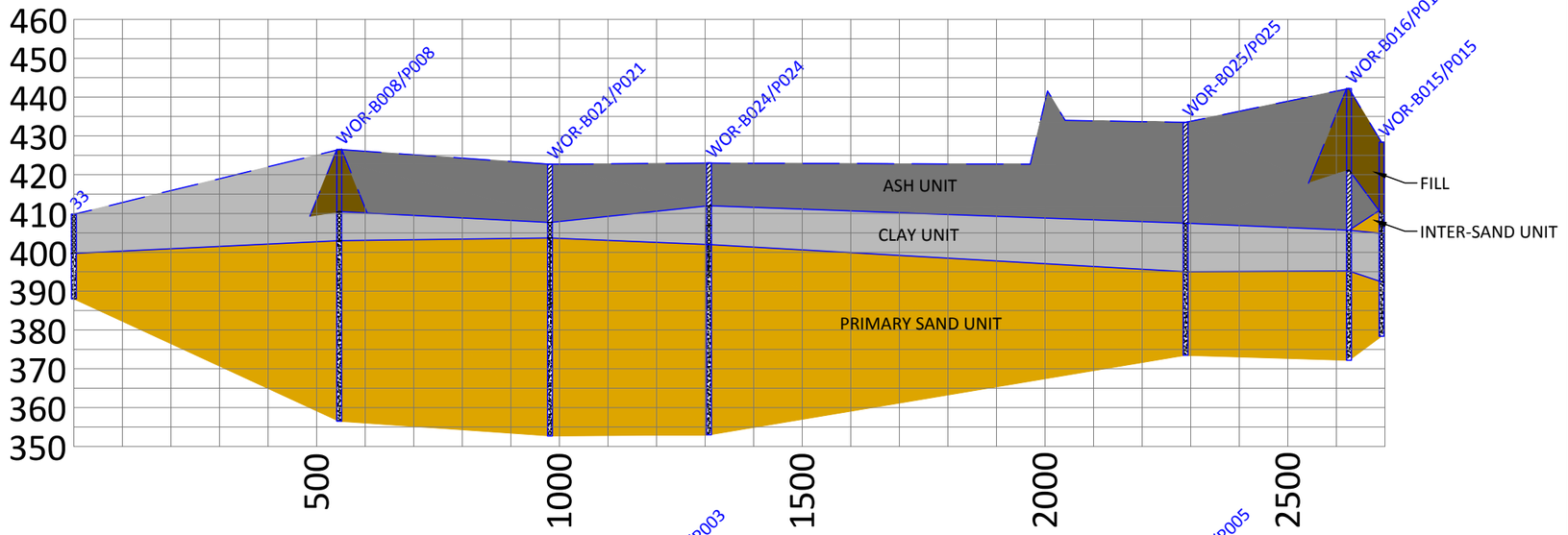
HORIZONTAL SCALE IN FEET: 240

VERTICAL EXAGGERATION = 8

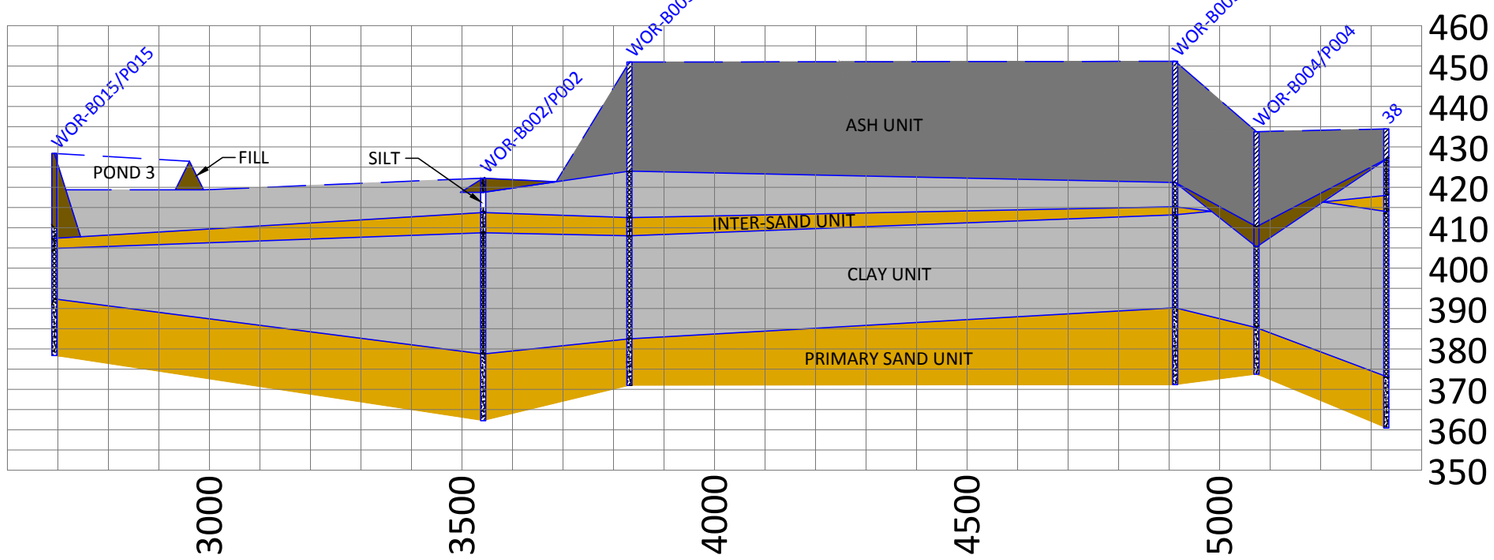
0 300 600

SCALE IN FEET

SECTION A-A'



SECTION A-A' (CONT.)



DRAWN BY:	HJG	DATE: 7/27/16
CHECKED BY:	NRK	DATE: 7/28/16
APPROVED BY:	SJC	DATE: 7/28/16
DRAWING NO:	Fig 4A_Geol Xsects AA & BB	
REFERENCE:	.	

GEOLOGIC CROSS-SECTION A-A'

HYDROGEOLOGIC CHARACTERIZATION REPORT
WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

NATURAL RESOURCE TECHNOLOGY

PROJECT NO.
2376/1.0

FIGURE NO.
4