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

Closure and Post-Closure Care Plan for the Wood River West Ash Complex at

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

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Executive Summary of Closure Plan and Post-Closure Care Plan

The Wood River West Ash Complex is comprised of West Ash Pond 1, West Ash Pond 2E and West Ash Pond 2W at the Wood River Power Station, located in Alton in Madison County, Illinois. In November 2015, in accordance with 40 CFR Part 257, Subpart D, Dynegy Midwest Generation, LLC submitted to the Illinois Environmental Protection Agency (IEPA) a notice of intent to close the inactive West Ash Pond 2W. A notice of intent to close the West Ash Pond 1 was submitted by August 2016 and a notice of intent to close the West Ash Pond 2E was submitted October 2016.

West Ash Pond 1, West Ash Pond 2E, and West Ash Pond 2W are inactive Coal Combustion Residuals (CCR) 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 Wood River West Ash Complex will be closed by leaving CCR in place and using an alternative geomembrane cover system. 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.

After closure activities are complete, post-closure activities, which include groundwater monitoring and maintenance of the final cover system, will occur. The closure and post-closure care activities will be in accordance with 40 CFR §257.102 and §257.104, respectively.

This document contains a closure plan and a post-closure care plan prepared in accordance with the outline approved by the IEPA on February 23, 2016. Closure construction activities may begin upon approval of this closure and post-closure care plan by the IEPA. The closure activities are estimated to be completed by November 18, 2020.

1 Closure Plan

Following approval by the IEPA and acquisition of required permits, closure activities for the Wood River West Ash Complex will be performed according to this plan. The location of the Wood River West Ash Complex and the individual impoundments are shown on Figure G-100 and Figure G-101.

1.1 Description of Proposed Closure Activities

Closure of the Wood River West Ash Complex will occur over a multi-year construction period and is estimated to be completed no later than November 18, 2020. Closure construction activities will include, but are not limited to, relocating and/or reshaping the existing CCR within the West Ash Complex to achieve acceptable grades for closure and constructing a cover system that complies with 40 CFR Part 257, Subpart D (CCR Rule). Removal of free water may be required prior to the relocation and grading of CCR and fill materials. As part of the reshaping of the CCR, fly ash mined from West Ash Pond 1 may be placed as crown fill material in West Ash Ponds 2W and 2E. The remaining coal in the coal pile will also be used to supplement the fill volume. In addition, CCR (primarily bottom ash) from the Primary East Ash Pond may be beneficially used as crown fill, and soil from a borrow source will be used to supplement the fill volume if necessary in order to reach final grades in preparation for the cap system for the West Ash Complex. Portions of the dike around West Ash Pond 1 will be cut down and the excess soils will be used as capping material in the West Ash Complex. The final cover system will comply with the applicable design requirements of the CCR Rule, including establishment of a vegetative cover to minimize long-term erosion.

Stormwater runoff from the final cover system will be collected and managed. A stormwater management system will be constructed to convey stormwater runoff from the cover system to interior drainage channels and will be routed through culvert pipes to the existing Pond 3. See Figures C-101 and C-102.

An existing transmission tower is located on the dike between the West Ash Ponds 1 and 2W. The transmission tower will remain in place and the area surrounding this transmission tower will be closed in place with a final cover system in compliance with the CCR Rule. See Figures C-101 and C-102.

1.2 Engineering Plans and Specifications for the Proposed Closure Activities

The engineering plans and design specifications for the final cover system and closure activities will meet the requirements of the CCR Rule for closure by leaving CCR in place.

1.2.1 Final Cover System

The final cover system will be constructed in direct contact with the graded CCR material. The final cover system design will meet the requirements of the CCR Rule such that the permeability shall be less than or equal to the permeability of the existing bottom liner or subsoils present below the CCR material, or a permeability no greater than $1x10^{-5}$ cm/sec, whichever is less. This will be achieved for the West Ash Complex through construction of a an alternate geomembrane cover system. The requirement for the final cover system to be less permeable than the bottom layer allows water in the pore space of the CCR to drain into the foundation soils and not accumulate in the closed CCR impoundments. The bottom liner system for Pond 2E consists of a geomembrane. Ponds 1 and 2W are unlined. The closure design achieves the requirements of the low permeability layer and a protective layer to limit accumulation of water in the CCR impoundments. The geomembrane cover system will be installed over Ponds 1, 2W, and 2E and consist of, from bottom to top, a 40-mil LLDPE geomembrane membrane, a geocomposite drainage layer, and a minimum 18-inch protective cover soil layer. An erosion layer consisting of no less than 6-inches of earthen material capable of sustaining native plant growth will be placed on top of the protective cover soil layer. Details of the final cover system can be found on Figure C-106. Final cover system sections can be found on Figures C-103 through C-105.

1.2.2 Final Slope Design

The geometry of the final cover will provide a series of mounded surfaces for stormwater runoff control. The final cover will have a minimum planar slope of 2%, generally ranging from 2% to 2.75%, and will be graded to convey stormwater runoff to drainage channels. The drainage channels have slopes between 0.5% and 1.0% and will be lined with turf reinforced mats (TRM) where required to reduce the potential for erosion.

The crest elevation of West Ash Pond 1 will be lowered; however, the exterior slope grades will remain unchanged. The interior slopes will be 3H:1V and the top of the berm will be lowered as shown on Figure C-103. The exterior slopes and crest elevation of West Ash Ponds 2E and 2W will remain unchanged. Some limited areas of the West Ash Pond 2W cover system will have a 3H:1V slope near the western edge of the West Ash Complex as shown on Figure C-104.

Grading plans for the Wood River West Ash Complex can be found on Figures C-100 through C-102. The key design elements, including cover permeability, final cover slope and drainage channel slopes, will control the post-closure infiltration into the CCR material left in-place and preclude the probability of future impoundment of water at the units.

1.2.3 Summary of Slope Stability Evaluations

Based on the preliminary geotechnical analysis attached in Appendix C, the final slope of the perimeter berms and cover will meet the stability requirements of the CCR Rule to prevent sloughing or movement of the final cover system. The design allows for settlement as well as incidental, localized settling and subsidence.

1.3 Proposed Timeline for Implementation and Completion of Proposed Closure Activities

Closure of the Wood River West Ash Complex is estimated to be completed no later than November 18, 2020. Closure may commence following IEPA approval of this closure plan and in receipt of applicable permits for closure construction activities. Closure activities are scheduled to begin in 2016. The construction schedule includes time for construction activities such as; mobilization of contractors and setup of construction support facilities, installation of stormwater management system, site maintenance during construction activities, and seasonal shutdowns and demobilization of contractors and construction support personnel.

Estimated timing for major activity phases during each year are as follows:

- Years 1 – 2
  - Acquire applicable permits for construction activities
  - Begin construction activities; possibly including pumping to remove surface water, dewatering of the CCR, relocating and/or reshaping the existing CCR and construction of drainage structures
- Years 2 – 5
  - Continue construction activities; possibly including pumping to remove surface water, dewatering of the CCR, relocating and/or reshaping the existing CCR, construction of drainage structures and construction of the final cover system
- Years 3 – 5
  - Complete construction activities; possibly including pumping to remove surface water, dewatering of the CCR, relocating and/or reshaping the existing CCR, construction of drainage structures and construction of the final cover system
  - Complete construction of final cover system
  - Establish final cover vegetation
  - Perform final grading and contouring of the storm water management system
  - Perform regulatory compliance follow-up with state agency

1.4 Description of the Construction Quality Assurance Program for Proposed Closure Activities

The Construction Quality Assurance (CQA) Plan describes the CQA program for the closure of the Wood River West Ash Complex. The CQA Plan contains procedures for inspecting, monitoring, testing, and sampling to confirm compliance with the project plans and specifications. The site-specific CQA Plan is attached in Appendix E.

Key elements of the CQA Plan include:

- Establishment of several key project personnel roles and responsibilities, including a CQA consultant to serve as an on-site representative, to perform field tests and provide written documentation that the final cover system is constructed in accordance with the applicable plans and specifications. The CQA consultant team will include a CQA Officer who is an Illinois-licensed Professional Engineer and who will supervise inspections and testing, certify on-site activities, and review and approve weekly construction reports.
- Regularly scheduled safety and construction progress meetings.
- Standards and inspection and testing procedures for the following materials: earth cover and CCR materials, aggregates, geosynthetics, piping, concrete and grout.
- Specifications for surveying to verify that thickness and grade tolerances of construction components are in accordance with plans and specifications.
- Compilation of project documentation including plans, specifications, schedules, and inspection and testing logs in weekly summary reports certified by the CQA Officer. Additional progress reports at regular intervals are detailed in the CQA Plan.

1.5 Summary of Groundwater Monitoring Plan

The proposed groundwater monitoring plan, which has been developed based on the data presented in the Natural Resource Technology (NRT) Hydrogeologic Characterization Report (Appendix A), is provided in Appendix B. Groundwater will be monitored to evaluate post-closure groundwater quality and trends and demonstrate compliance with groundwater quality standards for Class I: Potable Resource Groundwater throughout the post-closure care period. The proposed groundwater monitoring system is designed to enable detection and measurement of CCR constituents if they should enter the groundwater from the Wood River West Ash Complex.

The proposed groundwater monitoring well network consists of a sufficient number of wells, installed at appropriate locations and depths, to monitor post-closure compliance with groundwater quality standards. The well network consists of 11 existing monitoring wells, seven of which will be used for groundwater quality monitoring and an additional four for monitoring of groundwater elevations. In addition to field parameters, seven of these monitoring wells (two upgradient, one background, and four downgradient) will be used for compliance sampling and analytical testing for the following parameters: inorganic totals for chloride, fluoride, sulfate, Total Dissolved Solids (TDS), and Radium 226/228; and metal totals for antimony, arsenic, barium, beryllium, boron, cadmium, calcium, chromium, cobalt, lead, lithium, mercury, molybdenum, selenium, and thallium. The locations of the proposed groundwater monitoring wells can be found on Figure 5 of the Natural Resource Technology (NRT) report in Appendix B.

Specifications for each monitoring well will meet IEPA design and construction requirements. Monitoring wells will be inspected during each groundwater sampling event. Maintenance will be performed as needed to assure that the monitoring wells provide representative groundwater samples.

Statistical analysis of the laboratory analytical data will be reported to IEPA with the annual report for the facility. Compliance with applicable groundwater quality standards will be achieved when there are no statistically significant increasing trends detected at the downgradient boundaries that are attributed to the Wood River West Ash Ponds 1, 2E, and 2W. Details of the proposed groundwater monitoring plan can be found in the attached NRT report in Appendix B.

The monitoring well network as proposed also meets USEPA CFR Part 257 requirements for monitoring the Uppermost Aquifer, which is the Primary Sand Unit that underlies the entire Wood River Power Station. The proposed USEPA CCR network consists of the same three upgradient/background wells and four downgradient wells as the proposed IEPA monitoring well network. Groundwater samples will be collected and analyzed for all Appendix III and IV parameters as listed in the CCR Rule. Reporting requirements will be in accordance with the CCR Rule.

1.6 Professional Certification and Seal

CCR Unit: Dynegy Midwest Generation, LLC; Wood River Power Station; Wood River West Ash Complex

I, Victor Modeer, PE, D.GE., being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this Closure Plan dated October 2016 has been prepared in accordance with the accepted practice of engineering.

Victor A. Modeer Jr

Printed Name

10/27/16

Date

VICTOR ALBERT MODEER JR.
062-043112
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

11/30/2017

2 Environmental Impacts of Proposed Closure Activities

The information referenced in this section was derived from various reports prepared by NRT, including the Hydrogeologic Site Characterization Report, Groundwater Monitoring Plan, Hydrostatic Modeling Report, and the Groundwater Management Zone Application. An Illinois licensed Professional Geologist signed the attached documents prepared by NRT (Appendix A – D and F).

2.1 Summary of Pre-Closure Groundwater Conditions

Sampling and analysis of groundwater from monitoring wells at the Wood River West Ash Ponds 1, 2E, and 2W has been conducted quarterly or semi-annually since 1995. Parameters that have been detected in groundwater in downgradient monitoring wells at concentrations exceeding the Class I groundwater quality standards include boron, manganese, TDS, and pH, with exceedances of manganese, TDS, and pH attributable to anthropogenic sources or naturally occurring geochemical variability. Boron is the only primary indicator of the presence of CCR leachate constituents in groundwater for this site. Hydrogeological site characterization and groundwater quality data are discussed in detail in the NRT Hydrogeologic Site Characterization Report attached as Appendix A.

2.2 Summary of Modeled Post-Closure Groundwater Conditions

The Hydrologic Evaluation of Landfill Performance (HELP) model was used to calculate the time for groundwater beneath each of the three CCR units to reach hydrostatic equilibrium. Hydrostatic model results, discussed in detail in the NRT Hydrostatic Modeling Report attached as Appendix C, indicate equilibrium for the geomembrane cover system at West Ash Pond 1 and West Ash Pond 2W will be reached approximately ten years after installation of the final cover design meeting CCR Rule requirements. The NRT report indicates equilibrium for the West Ash Pond 2E is not reached within the 100-year simulation. However, hydraulic head for the geomembrane cover system meeting CCR Rule requirements at West Ash Pond 2E is expected to keep decreasing beyond the 100-year simulation duration following cap completion, with heads decreasing from current 120 inches average head to less than 60 inches, as a result of the basal composite/synthetic liner system already in place.

A groundwater flow and transport model, Groundwater Model Report, included in Appendix D, was prepared for the entire West Ash Complex. The Groundwater Model Report indicates the following:

- Under baseline conditions with no cover on any of the three West Ash Complex impoundments, the primary CCR indicator, boron, is predicted to reach peak concentrations in approximately 300 years before starting to decrease.
- The CCR plume extent with a geomembrane cover system at West Ash Complex is predicted to begin contracting after one year.
- Based on the maximum modeled plume extents, under both baseline conditions and the planned cover closure scenario, no potable or non-potable water supply wells are predicted to show exceedances of groundwater quality standards related to CCR leachate. The only known wells (excluding monitoring wells and piezometers) that exist in the vicinity of the West Ash Complex, or within the area of actual or modeled Class I groundwater exceedances, are pressure relief wells along the adjacent levee.

Closure in place of the Wood River Ash Complex, as proposed, will result in a reduction of leachate production, decreasing boron concentrations along with other CCR leachate parameters, and contraction of the groundwater contaminant plume. 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 possible exception of a narrow strip along the Great River Road (i.e., Route 143) that is not owned by Dynegy Midwest Generation, LLC (DMG). DMG owns the property both north and south of the Great River Road extending to the banks of the Mississippi River. The modeled boron plume exceeding the Class I standard extends southward and southeastward towards the Mississippi River, but within the Wood River Power Station’s property.

2.3 Anticipated Effects of the Closed Impoundment on Nearby Surface Waters

Groundwater flow in the Primary Sand Unit that underlies the Wood River Ash Complex is predominantly south and southeast towards the Mississippi River. Groundwater in the Primary Sand Unit discharges via base flow to the Mississippi River during base stage and low river levels. During spring flooding and high Mississippi River stages groundwater flow is northerly. After flood levels subside, the flow direction reverts to more normal conditions and groundwater again discharges to the river.

Impacts of groundwater with elevated concentrations of CCR constituents, principally boron, from beneath the closed Wood River Ash Complex on the Mississippi River will be negligible.

3 Post-Closure Care Plan

Following closure of West Ash Complex, post-closure care will be performed according to this plan. The closed impoundments will be monitored and maintained for a post-closure period that is anticipated to continue for 30 years. The post-closure period may extend beyond 30 years if additional groundwater monitoring is required to assess groundwater constituents as compared to background levels.

3.1 Description of Post-Closure Care Activities

Throughout the post-closure care period, periodic, typically annual, visual inspections of the final cover system for evidence of settlement, subsidence, erosion, or other damage that may affect the integrity of the final cover system will be performed. Noted damage will be repaired in order to maintain the effectiveness of the final cover system. Repair activities may include, but are not limited to replacing cover soil and repairing drainage channels that have been eroded, filling in depressions with soil, and reseeding areas of failed vegetation.

Groundwater samples will be collected and analyzed for inorganic chemical parameters that are indicator constituents for CCR leachate. In addition, each groundwater sampling event will measure field parameters and groundwater levels. The proposed groundwater monitoring plan will monitor and evaluate groundwater quality to demonstrate compliance with the groundwater quality standards for Class II: General Resource Groundwater.

The end of the post-closure period will be documented in accordance with the CCR Rule. Post-closure documentation will be maintained for at least five years in accordance with the CCR Rule.

3.2 Description of the Planned Use of the Property during the Post-Closure Care Period

Following closure, a notation will be recorded on the deed to the property or on some instrument that is normally examined during a title search to identify that the land has been used as a CCR impoundment. The notation will provide notice that use of the land is restricted to activities that will not disturb the integrity of the final cover system or groundwater monitoring system.

The Wood River Power Station will not continue to be used as a power generating facility after closure of the Wood River West Ash Complex. Activity on and around the final cover and stormwater systems for the closed impoundments will include ongoing post-closure inspection, maintenance and monitoring activities. Planned post-closure use of the property will not disturb or damage the integrity of the final cover system or groundwater monitoring system.

3.3 Stormwater Management

The key design elements of the stormwater management system, including cover permeability, final cover slope and drainage channel slopes will minimize post-closure infiltration of liquids into the CCR left in-place and will preclude the probability of future impoundment of water at the impoundments. The stormwater management system is designed for a 25-year, 24-hour storm event and will be constructed during closure and grading of the final cover system. Stormwater management features and erosion controls will be integrated with reshaping of the CCR surface and placement of the cover system to promote positive surface drainage and minimize erosion.

Stormwater from the finished cover system on the Wood River West Ash Complex will drain through a series of drainage channels on the cover system, through culverts and eventually draining into the existing Pond 3. The drainage channels on the cover system will be earthen channels lined with grass and TRM where required. The culverts are sized to be 24-inch diameter pipes to pass the 25-year storm without ponding of water on the cover system, and to pass the 100-year storm with minimum ponding while attenuating the discharge into Pond 3. There will be no permanent storage of storm or surface water upstream of Pond 3. The external embankments of Pond 3 will be raised to increase freeboard for preventing overtopping of stormwater during the design storm. See Figure C-100. Details of drainage channels are provided on Figure C-106.

3.4 Professional Certification and Seal

CCR Unit: Dynegy Midwest Generation, LLC; Wood River Power Station; Wood River West Ash Complex

I, Victor Modeer, PE, D.GE., being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this Post-Closure Care Plan dated October 2016 has been prepared in accordance with the accepted practice of engineering.

Victor A Modeer Jr

Printed Name

10/27/16

Date

VICTOR ALBERT MODEER JR
062-043112

11/30/2017

Figures

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DYNEGY MIDWEST GENERATION, LLC

WOOD RIVER POWER STATION

ALTON, ILLINOIS

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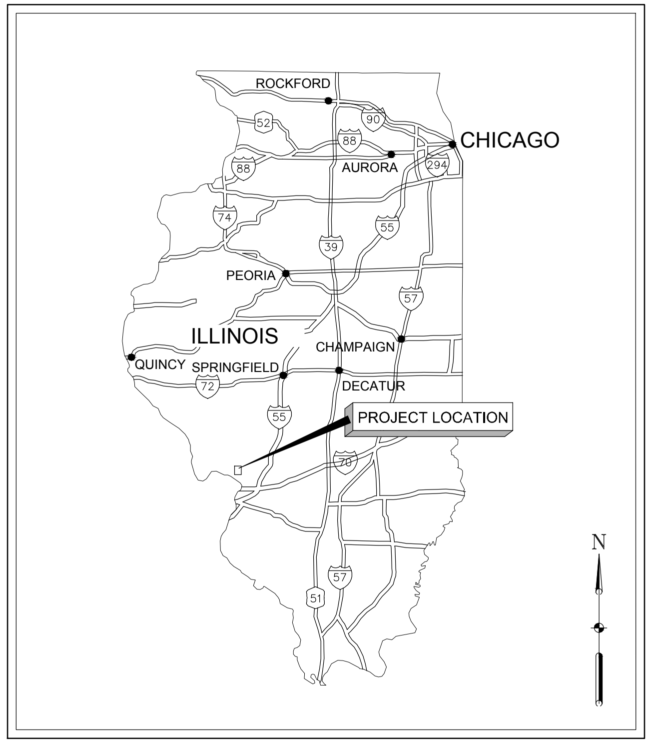
FOR CLOSURE OF THE WOOD RIVER WEST ASH COMPLEX



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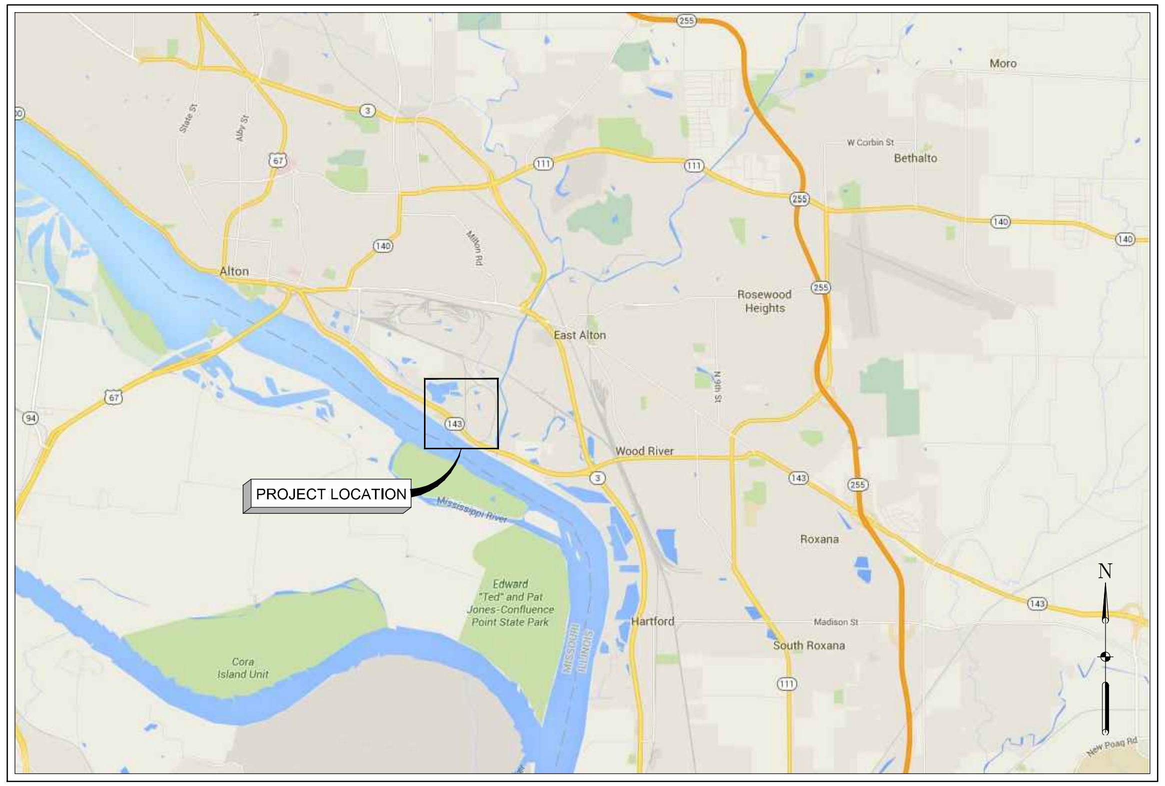

LOCATION MAP

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DRAWINGS LIST

SHEET NO.	DRAWING NO.	DRAWING TITLE
1	G-100	COVER SHEET AND LOCATION MAP
2	G-101	EXISTING CONDITIONS
3	C-100	OVERALL GRADING PLAN
4	C-101	GRADING PLAN
5	C-102	GRADING PLAN
6	C-103	SECTION A
7	C-104	SECTIONS B AND C
8	C-105	SECTIONS D AND E
9	C-106	DETAILS

PRELIMINARY
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WOOD RIVER
POWER STATION
ALTON, IL

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COVER SHEET AND
LOCATION MAP

G-100

SHEET 1 OF 9

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EXISTING CONDITIONS

G-101

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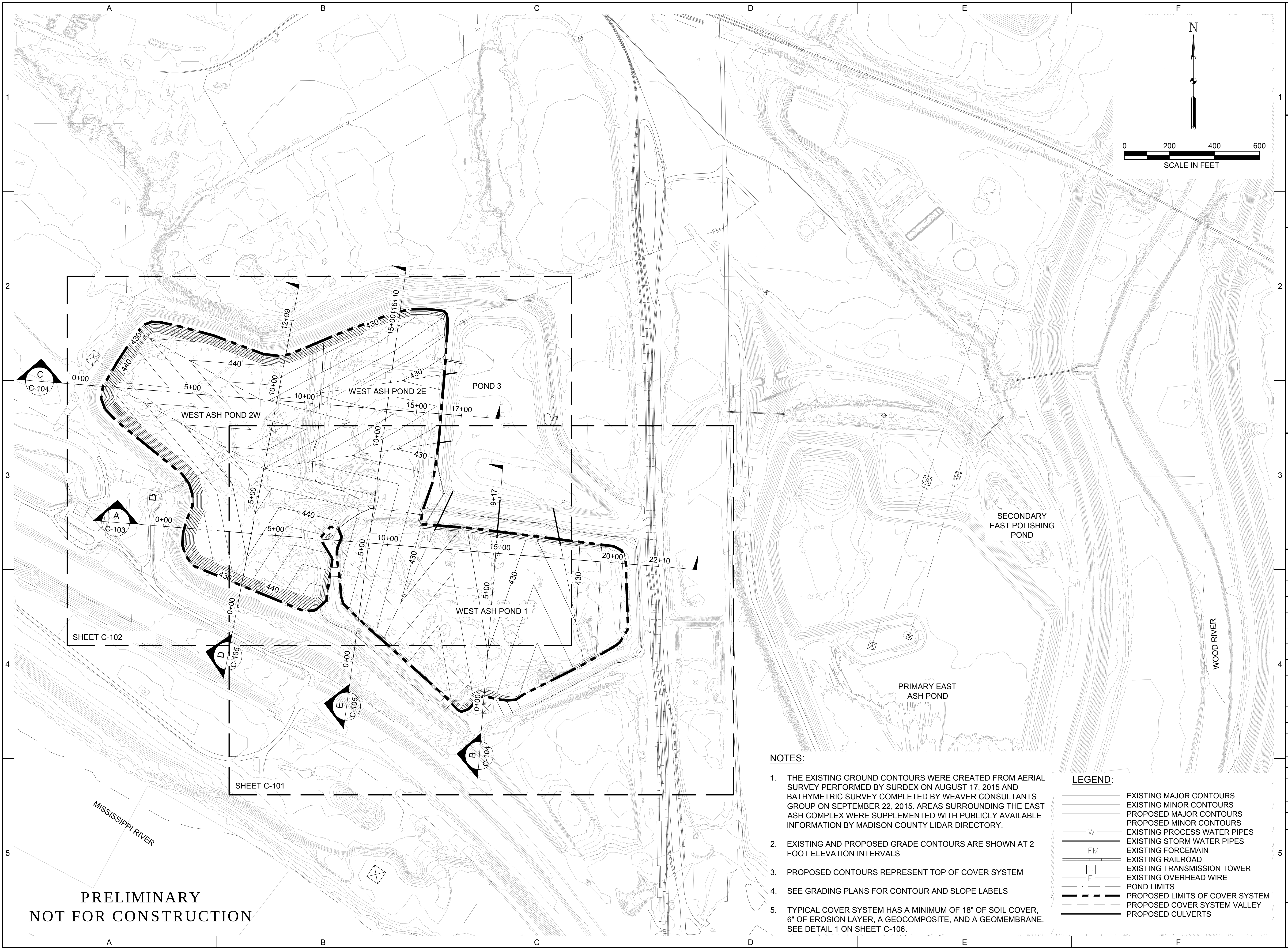

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NOTES:

1. THE EXISTING GROUND CONTOURS WERE CREATED FROM AERIAL SURVEY PERFORMED BY SURDEX ON AUGUST 17, 2015 AND BATHYMETRIC SURVEY COMPLETED BY WEAVER CONSULTANTS GROUP ON SEPTEMBER 22, 2015. AREAS SURROUNDING THE EAST ASH COMPLEX WERE SUPPLEMENTED WITH PUBLICALLY AVAILABLE INFORMATION BY MADISON COUNTY LIDAR DIRECTORY.
2. EXISTING AND PROPOSED GRADE CONTOURS ARE SHOWN AT 2 FOOT ELEVATION INTERVALS
3. PROPOSED CONTOURS REPRESENT TOP OF COVER SYSTEM
4. SEE GRADING PLANS FOR CONTOUR AND SLOPE LABELS
5. TYPICAL COVER SYSTEM HAS A MINIMUM OF 18" OF SOIL COVER, 6" OF EROSION LAYER, A GEOCOMPOSITE, AND A GEOMEMBRANE. SEE DETAIL 1 ON SHEET C-106.

LEGEND:

──	EXISTING MAJOR CONTOURS
──	EXISTING MINOR CONTOURS
──	PROPOSED MAJOR CONTOURS
──	PROPOSED MINOR CONTOURS
── W ──	EXISTING PROCESS WATER PIPES
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─ ─ ─	PROPOSED COVER SYSTEM VALLEY
━━	PROPOSED CULVERTS

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SHEET TITLE

OVERALL GRADING
PLAN

C-100

SHEET 2 OF 9

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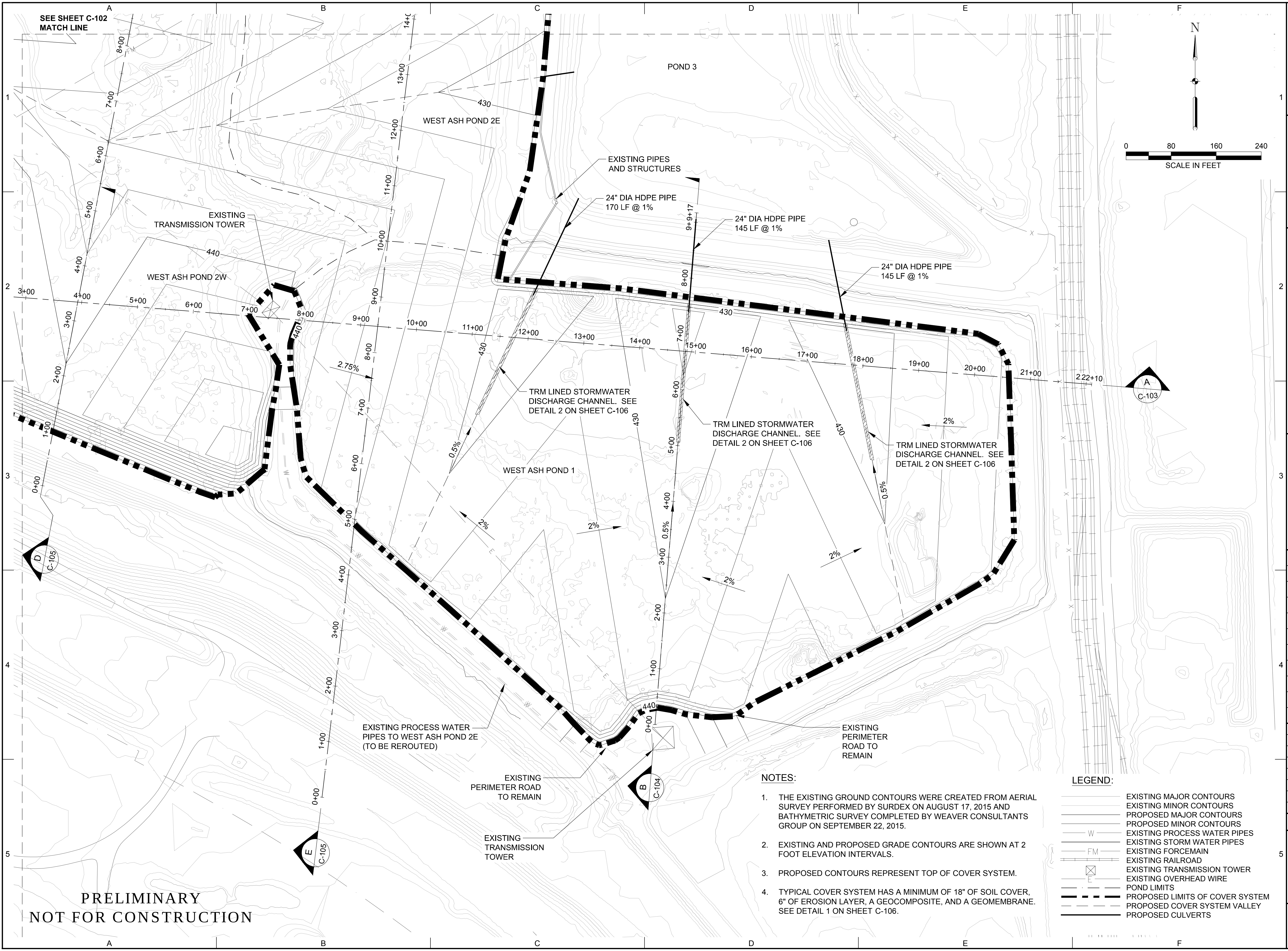

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NOTES:

1. THE EXISTING GROUND CONTOURS WERE CREATED FROM AERIAL SURVEY PERFORMED BY SURDEX ON AUGUST 17, 2015 AND BATHYMETRIC SURVEY COMPLETED BY WEAVER CONSULTANTS GROUP ON SEPTEMBER 22, 2015.

2. EXISTING AND PROPOSED GRADE CONTOURS ARE SHOWN AT 2 FOOT ELEVATION INTERVALS.

3. PROPOSED CONTOURS REPRESENT TOP OF COVER SYSTEM.

4. TYPICAL COVER SYSTEM HAS A MINIMUM OF 18" OF SOIL COVER, 6" OF EROSION LAYER, A GEOCOMPOSITE, AND A GEOMEMBRANE. SEE DETAIL 1 ON SHEET C-106.

LEGEND:

———	EXISTING MAJOR CONTOURS
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———	PROPOSED MINOR CONTOURS
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— · —	POND LIMITS
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— — —	PROPOSED COVER SYSTEM VALLEY
━━━	PROPOSED CULVERTS

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GRADING PLAN

C-101

SHEET 3 OF 9

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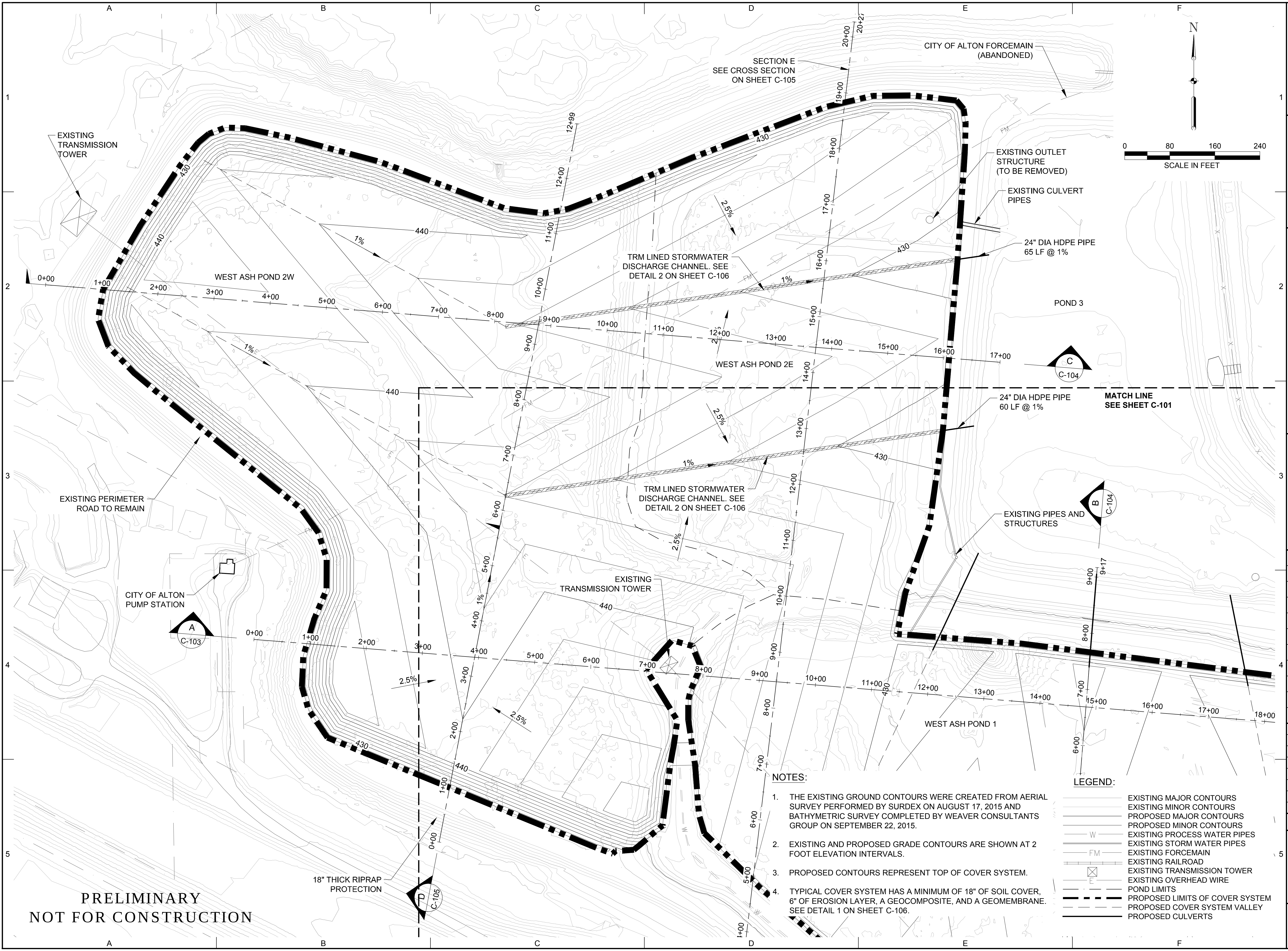

NOTES:

1. THE EXISTING GROUND CONTOURS WERE CREATED FROM AERIAL SURVEY PERFORMED BY SURDEX ON AUGUST 17, 2015 AND BATHYMETRIC SURVEY COMPLETED BY WEAVER CONSULTANTS GROUP ON SEPTEMBER 22, 2015.
2. EXISTING AND PROPOSED GRADE CONTOURS ARE SHOWN AT 2 FOOT ELEVATION INTERVALS.
3. PROPOSED CONTOURS REPRESENT TOP OF COVER SYSTEM.
4. TYPICAL COVER SYSTEM HAS A MINIMUM OF 18" OF SOIL COVER, 6" OF EROSION LAYER, A GEOCOMPOSITE, AND A GEOMEMBRANE. SEE DETAIL 1 ON SHEET C-106.

LEGEND:

EXISTING MAJOR CONTOURS
EXISTING MINOR CONTOURS
PROPOSED MAJOR CONTOURS
PROPOSED MINOR CONTOURS
W — EXISTING PROCESS WATER PIPES
EXISTING STORM WATER PIPES
FM — EXISTING FORCEMAIN
EXISTING RAILROAD
☒ EXISTING TRANSMISSION TOWER
E — EXISTING OVERHEAD WIRE
POND LIMITS
PROPOSED LIMITS OF COVER SYSTEM
PROPOSED COVER SYSTEM VALLEY
PROPOSED CULVERTS

AECOM

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314 429-0462 (fax)

DYNEGY MIDWEST
GENERATION, LLC
1500 East Port Plaza Drive
Collinsville, IL 62234

WOOD RIVER
POWER STATION
ALTON, IL

PERMIT DRAWINGS
FOR CLOSURE OF THE
WOOD RIVER WEST
ASH COMPLEX

ISSUED FOR BIDDING DATE BY

ISSUED FOR CONSTRUCTION DATE BY

REVISIONS

NO.	DESCRIPTION	DATE
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AECOM PROJECT NO:	60501530
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DESIGNED BY:	LEH
CHECKED BY:	RHH
DATE CREATED:	10/15/2015
PLOT DATE:	10/27/2016
SCALE:	1" = 80'
ACAD VER:	2015

SHEET TITLE

GRADING PLAN

C-102

SHEET 4 OF 9

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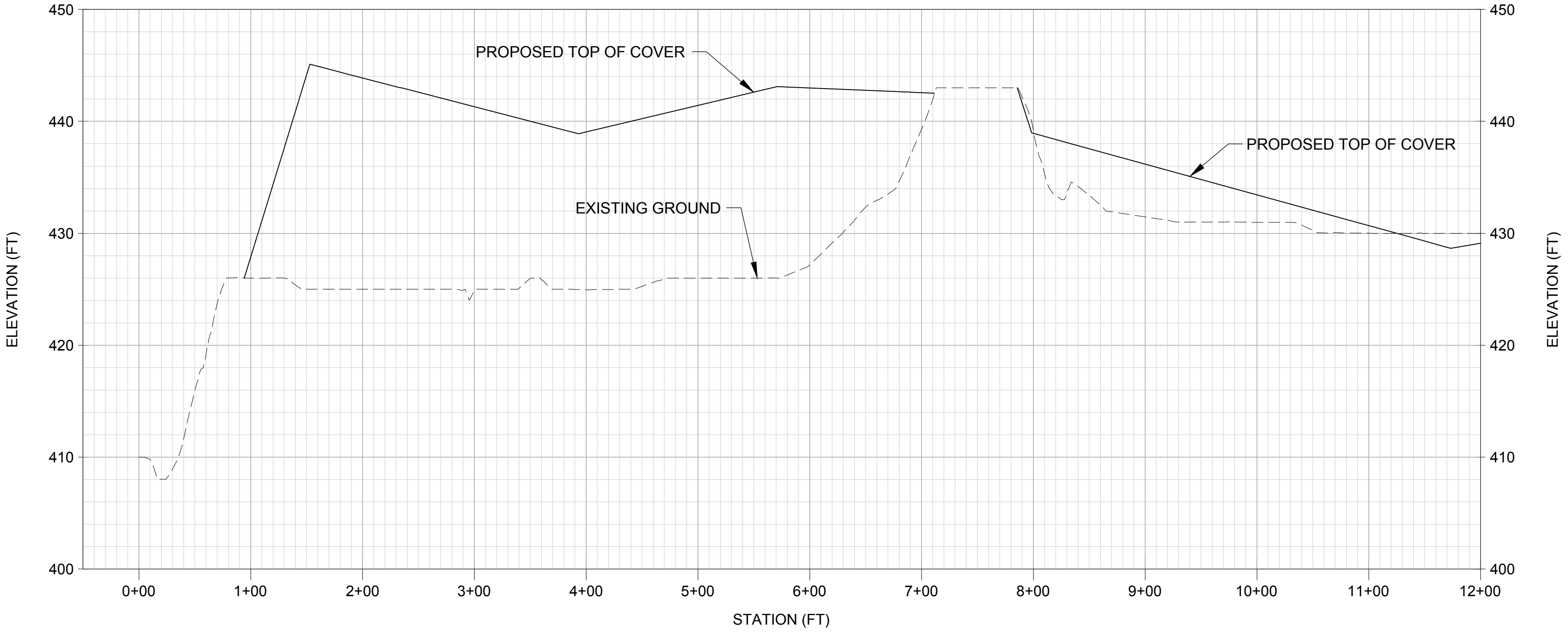

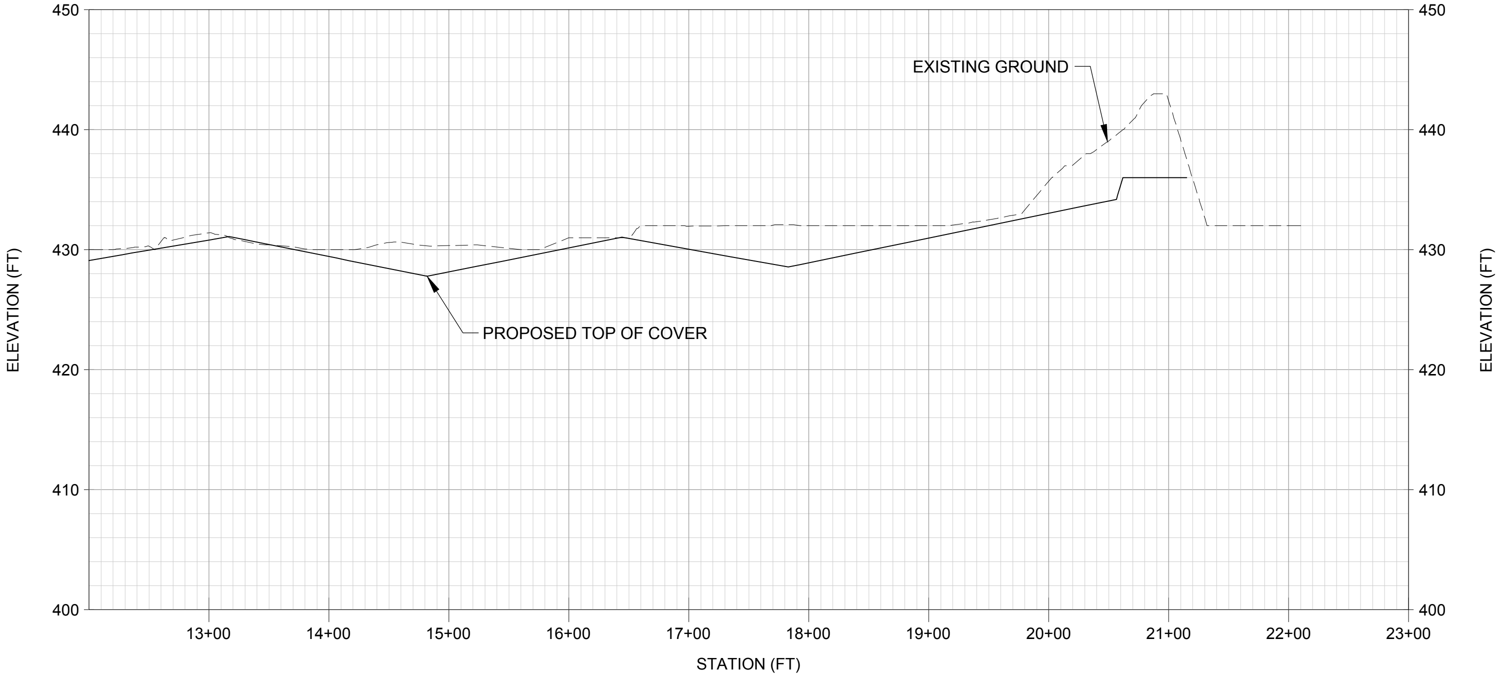

A
C-100

SECTION A

HORIZONTAL SCALE 1" = 80'
VERTICAL SCALE 1" = 8'

NOTES:

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2. EXISTING GRADE ELEVATOINS REFLECT TOP OF ASH WITHIN THE WOOD RIVER WEST ASH COMPLEX AND EXISTING GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.
3. PROPOSED GRADE ELEVATIONS REFLECT TOP OF COVER SYSTEM WITHIN WOOD RIVER WEST ASH COMPLEX AND PROPOSED GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.

PRELIMINARY
NOT FOR CONSTRUCTION

AECOM DRAWING PATH: P:\Projects\Geotech\60428794_DynegyCCR\15_Wood River West Closure Plan\Drawings\WOR-CROSS SECTIONS.dwg

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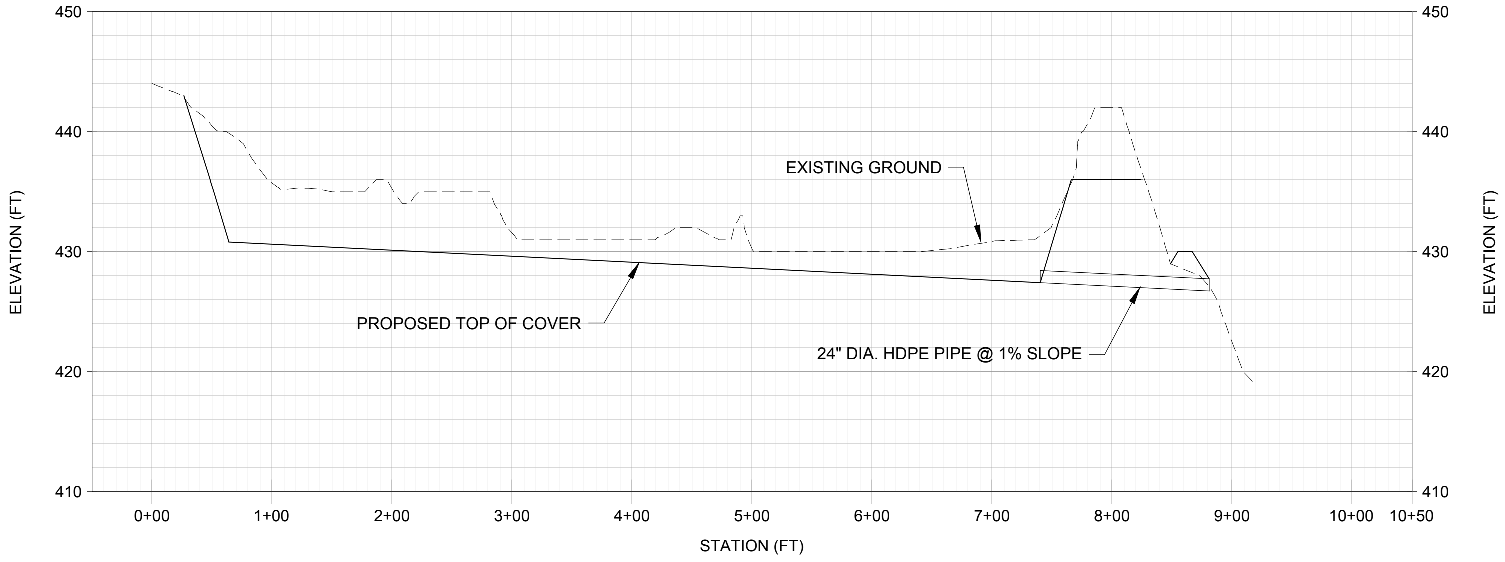
ACAD VER:	2015

SHEET TITLE

SECTION A

C-103

SHEET 5 OF 9



B
C-100

SECTION B

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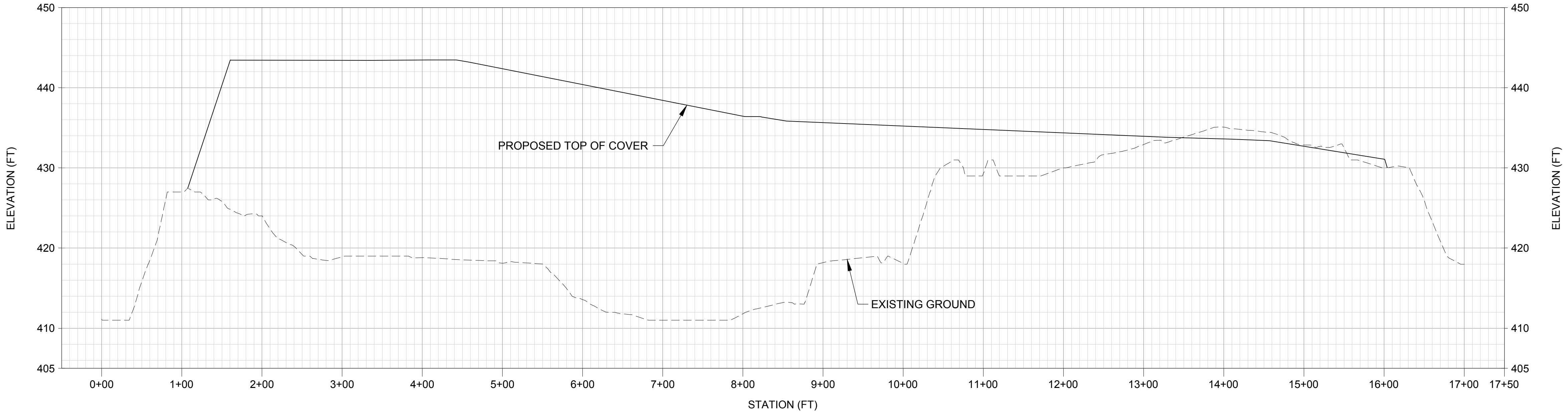

C
C-100

SECTION C

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VERTICAL SCALE 1" = 8'

NOTES:

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2. EXISTING GRADE ELEVATOINS REFLECT TOP OF ASH WITHIN THE WOOD RIVER WEST ASH COMPLEX AND EXISTING GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.
3. PROPOSED GRADE ELEVATIONS REFLECT TOP OF COVER SYSTEM WITHIN WOOD RIVER WEST ASH COMPLEX AND PROPOSED GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.

PRELIMINARY
NOT FOR CONSTRUCTION

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SHEET TITLE

SECTIONS B AND C

C-104

SHEET 6 OF 9

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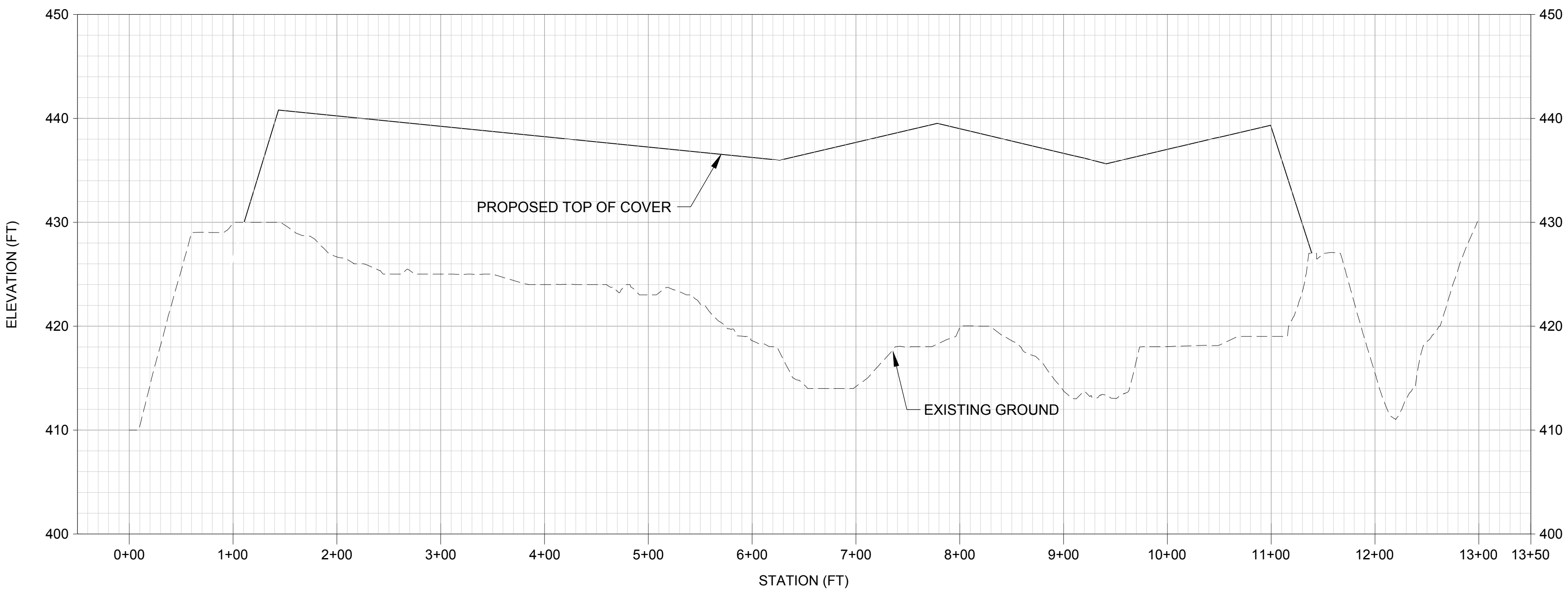

D
C-100

SECTION D

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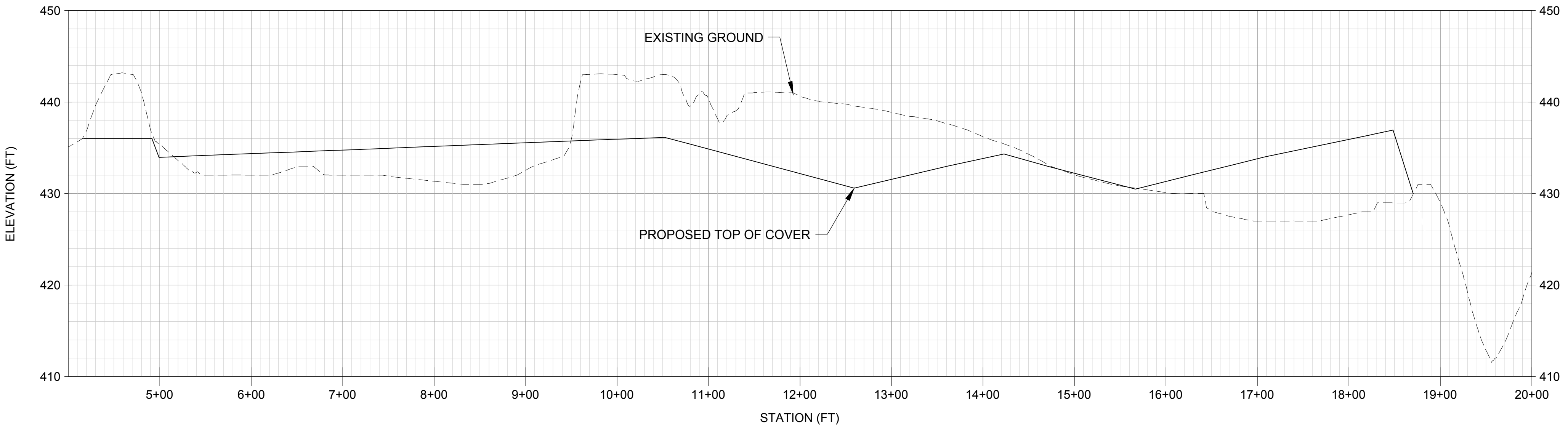

E
C-100

SECTION E

HORIZONTAL SCALE 1" = 80'
VERTICAL SCALE 1" = 8'

NOTES:

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2. EXISTING GRADE ELEVATOINS REFLECT TOP OF ASH WITHIN THE WOOD RIVER WEST ASH COMPLEX AND EXISTING GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.

3. PROPOSED GRADE ELEVATIONS REFLECT TOP OF COVER SYSTEM WITHIN WOOD RIVER WEST ASH COMPLEX AND PROPOSED GROUND SURFACE ELEVATIONS OUTSIDE WOOD RIVER WEST ASH COMPLEX.

PRELIMINARY
NOT FOR CONSTRUCTION

AECOM DRAWING PATH: P:\Projects\Geotech\60428794_DynegyCCR\15_Wood River West Closure Plan\Drawings\WDR-CROSS SECTIONS.dwg

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DESIGNED BY:	LEH
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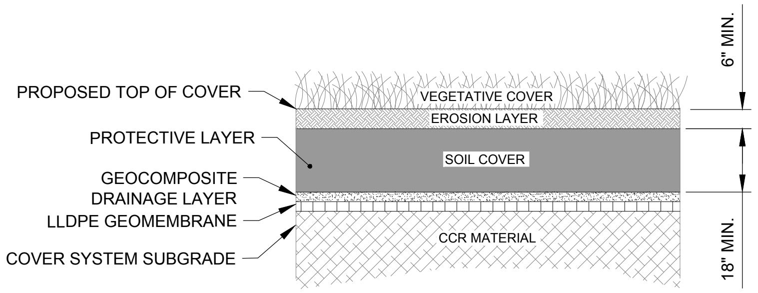
SCALE:	AS SHOWN
ACAD VER:	2015

SHEET TITLE

SECTIONS D AND E

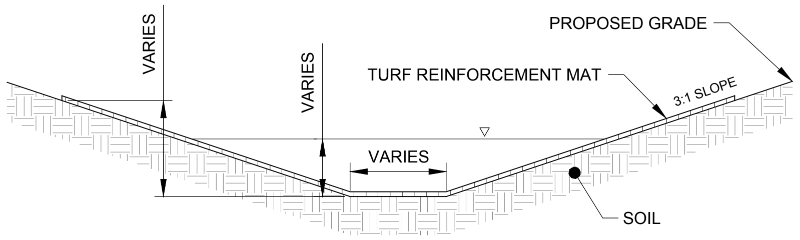
C-105

SHEET 7 OF 9



1 COVER SYSTEM - GEOMEMBRANE

NOT TO SCALE



2 TRM LINED STORMWATER DISCHARGE CHANNEL

NOT TO SCALE

PRELIMINARY
NOT FOR CONSTRUCTION

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POWER STATION
ALTON, IL

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ASH COMPLEX

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PLOT DATE:	10/27/2016
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ACAD VER:	2015

SHEET TITLE

DETAILS

C-106

Appendices

Appendix A. Hydrogeologic Site Characterization Report

SMARTER SOLUTIONS

EXCEPTIONAL SERVICE

VALUE

HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

West Ash Pond Complex
Wood River Power Station
Alton, Illinois

FINAL

October 19, 2016

NATURAL
RESOURCE
TECHNOLOGY

ENVIRONMENTAL CONSULTANTS

NATURAL
RESOURCE
TECHNOLOGY
ENVIRONMENTAL CONSULTANTS

234 W. FLORIDA STREET, FIFTH FLOOR
MILWAUKEE, WISCONSIN 53204
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HYDROGEOLOGIC SITE CHARACTERIZATION REPORT

WEST ASH POND COMPLEX
WOOD RIVER POWER STATION
ALTON, ILLINOIS

Project No. 2376

Prepared For:

Dynegy Operating Company
1500 Eastport Plaza Drive
Collinsville, IL 62234

Prepared By:

Natural Resource Technology, Inc.
234 W. Florida Street, Fifth Floor
Milwaukee, Wisconsin 53204

FINAL
October 19, 2016

Stuart J. Cravens

Stuart J. Cravens, PG
Principal Hydrogeologist

Nathaniel R Keller

Nathaniel R. Keller, PG
Hydrogeologist

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FIGURES

TABLES

APPENDICES

1 INTRODUCTION

1.1 Overview

This Hydrogeologic Site Characterization Report was prepared by Natural Resource Technology, Inc. (NRT) in support of a Closure Plan for impoundments located at the Wood River Power Station (WRPS) which is owned by Dynegy Midwest Generation, LLC (DMG). This report and the Closure Plan will apply specifically to Coal Combustion Residuals (CCR) surface impoundments associated with the Wood River West Ash Pond Complex which includes the following components:

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

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. Another CCR unit, the Wood River East Ash Pond Complex is not the subject of this closure plan. However, information from previous investigations at this unit are incorporated herein to provide a more complete analysis of the site conditions.

Numerous hydrogeologic investigations have been performed concerning the CCR Units (Multi-Units) located at WRPS. The information presented in this site characterization report includes recent data collected to comply with the Federal CCR Rule (40 CFR Part 257) as well as comprehensive data collection and evaluations from prior hydrogeologic investigation reports (recent to oldest), including, but 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 Wood River 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.

In conjunction with this report, a Groundwater Monitoring Plan and a Groundwater Management Zone Application are being prepared to support the closure of the West Ash Pond Complex. In addition, the groundwater flow and transport models were updated to evaluate the effect of various ash pond closure scenarios on groundwater quality and to predict the fate and transport of CCR leachate components. Modeling has also been conducted to enable estimation of the time required for hydrostatic equilibrium of groundwater to be achieved beneath the West Ash Pond Complex.

1.2 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. The power plant 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 site.

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 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 Pond 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 an alternative geomembrane cover system. 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). All impoundments of the West Ash Pond Complex have been extensively evaluated during previous hydrogeologic investigations, groundwater quality assessments, and modeling.

1.3 Site History

WRPS began operation in 1949 and ash from the first coal fired unit was disposed of in the Old East Ash Pond (OEAP). The OEAP was located on the eastern edge of the site along the Wood River and was utilized for approximately 30 years until the West Ash Pond Complex was constructed in 1978. The West Ash Pond Complex was reworked several times, and individual ponds were renamed as shown below. This report references the pond designations used from 1997 to 1999, which is consistent with nomenclature used in documents and figures prepared in response to 40 CFR 257.

<table>
<tr><th colspan="5">West Ash Pond Complex Designation</th><th>Period When Designations Were Used</th></tr>
<tr><td><i>Pond 1</i></td><td><i>Pond 2W</i></td><td><i>Pond 2E</i></td><td colspan="2"><i>Pond 3</i></td><td>← <i>1997-1999</i>
<i>(<u>used in this report</u>)</i></td></tr>
<tr><td>Pond 1</td><td colspan="2">Pond 2</td><td>Pond 3</td><td>Pond 4</td><td>← 1993-1996</td></tr>
</table>

In addition to nomenclature changes, several modifications to the West Ash Pond Complex and its operation have been made following construction including the following:

- The primary pond was subdivided into two ponds (ponds 1 and 2) in 1993. At that time, the berm surrounding new pond 1 was raised. From 1993 to 1997 sluice water passed through the four ponds before discharge at the NPDES permitted outfall.
- During a plant shutdown in 1997, DMG began reconstruction of the ponds. All ash was removed from ponds 3 and 4, and a new double-lined pond (Ash Pond 3, previously called New Ash Pond #2) with leachate collection was constructed in their place.
- In 1998 DMG began mining ash from pond 2. After removing all ash from the eastern half of the pond, a new pond (Ash Pond 2E, also called New Ash Pond #1) with a composite clay/synthetic liner was constructed.
- Beginning in 1999 all fly ash was managed through a dry handling system. The dry ash was sold as cement additive and bottom ash was sluiced to the lined ponds (ponds 2E and 3) where the ash settled and the sluice water discharged via the NPDES permitted outfall.
- Ash was handled through the west pond complex until 2006-2007, at which time it was redirected to the New East Ash Pond (also called the Primary East Ash Pond) following its construction.
- Ash from ponds 1 (Old Ash Pond #1) and 2W (Old Ash Pond #2) has been mined periodically since closure in 2006.

2 GEOLOGY AND HYDROGEOLOGY

Significant site investigation and characterization has been completed at WRPS. The initial site investigation was completed in 1984 and has been supplemented by additional activities to characterize the geology, hydrogeology and groundwater quality. Additional investigations have been conducted at both the West and East Ash Pond Complexes and include groundwater monitoring, in addition to groundwater flow and transport modeling. The most recent investigation completed in 2015 by AECOM obtained geotechnical information to comply with the Federal CCR Rule. The most recent groundwater report (NRT, January 2016) summarized groundwater monitoring completed in 2015 and compared groundwater results to projections from the modeling completed at closure. While all data sources listed in Subsection 1.2 were reviewed, this report focuses on the results of more recent investigations where the data is the most complete.

2.1 Regional Geology

The WRPS and associated ash complexes are situated in the northern end of an area of extensive alluvial deposits known as the American Bottoms. The geology of this area was described by Bergstrom and Walker (1987) and is summarized here. Alluvial and glacial sediments fill the Mississippi River valley in this area commonly to depths of 100 feet but can extend to more than 140 feet. The sediments generally coarsen downward; the contact between the alluvium and glacial sediments is typically indistinguishable in the Wood River area. Very coarse sediments generally occur near the base of these valley-fill materials and these layers form a highly productive aquifer.

The sand and gravel in the Alton/Wood River area is overlain by low-permeability alluvial silt and clay and is underlain in places by low-permeability clay. Bedrock in the region consists of Pennsylvanian and Mississippian age shale, sandstone and limestone. The bedrock formations yield relatively little water compared to the overlying sand and gravel formation.

2.2 Site Geology

The geology has been extensively evaluated 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 bedrock at the WRPS may be the Mississippian-age St. Geneieve limestone, which dips gently to the east; elevation of the bedrock surface at the WRPS is estimated at approximately 300 feet above mean sea level (Hampton and O’Hearn, 1984).

For the purposes of this report, the silty clay units are combined because they are compositionally and hydraulically similar. The silt, sandy silt, and clay diamicton are not discussed further because they are only encountered on a limited portion of the site. A description of the units and their occurrence near the West Ash Pond Complex are included below. Boring locations of existing wells and recent AECOM boring/piezometer locations are shown on Figure 3. Boring logs are included in Appendix A and cross-sections depicting the geology are included in Figures 4 and 5. Laboratory reports for recent grain size analysis and hydraulic conductivity tests are included in Appendices B1 and B2, respectively.

2.2.1 Fill and Coal Ash

The thickest accumulations of coal ash at the West Ash Pond Complex occur in Pond 1 with a maximum depth of approximately 26 feet at boring WOR-B026. Ash thickness in Pond 2W ranged from 11 ft in boring WOR-B024 to 18.5 feet in WOR-B024. Within most areas of Pond 1 and Pond 2W the base of the coal ash (top of the silty clay unit) is at a fairly uniform elevation of approximately 407 feet (this is consistent with construction details in previous reports). No borings were advanced in Pond 2E because it is a lined unit; however, it is estimated that the maximum ash thickness is less than 25 feet (calculated from ground surface at 440 ft minus the liner elevation at 415 ft). Borings installed near or through berms did not indicate ash fill, with the exception of WOR-B018 which encountered 14 feet of ash fill at depth. The boring log for this location indicates that ash fill lies directly on top of the primary sand. However, based on the grain size analysis (81% fines) and cone penetrometer test (CPT) in the interval below the ash fill, it is likely that the silty clay unit underlies the ash at this location.

2.2.2 Silty Clay Units

The silty clay units are composed of layers and lenses of clay, silty clay, and silt with varying amounts of sand, but is predominantly clay and silty clay. Visual descriptions included on boring logs indicate both fat and lean clays. Across most of the site the silty clay unit is split into an upper and lower unit. The units are separated by the inter-sand unit which occurs at an elevation between approximately 408-418 feet. The presence and thickness of the inter-sand unit is discussed in detail below in subsection 2.2.3.

The upper silty clay unit and portions of the inter-sand were removed during impoundment construction in the vicinity of the West Ash Pond Complex, such that the CCR is in contact with the inter-sand unit (i.e. WOR-B015) or the lower silty clay (i.e. WOR-B016, B021, B024, B025, B026). In areas where both the upper silty clay unit and the inter-sand were removed, the lower silty clay unit separates the CCR of the West Ash Pond Complex impoundments from the primary sand unit and acts as a barrier to downward migrating leachate from Pond 1 and Pond 2W. In addition to the silty clay unit, Pond 2E and Pond 3 have designed liners consisting of polyethylene membrane and compacted clay which further limit the vertical migration of leachate. At the East Ash Pond complex where the upper silty clay unit is thin or absent (either naturally, or it was removed during construction, i.e. southeast portion of the NEAP), the potential exists for leachate to migrate into the inter-sand layer. In locations where the upper silty clay has been removed, the remaining thickness of the lower silty clay unit separates the ash fill from the primary sand unit.

The total thickness of the silty clay unit beneath West Ash Pond Complex ranges from less than 5 feet in the southeast corner of Pond 1 and the northwest section of Pond 2W (where the inter-sand layer was removed during filling), to greater than 20 feet beneath Pond 2E. Under the East Ash Pond Complex the minimum clay thickness is less than 5 feet in the southeast corner of the NEAP near Well 40M, and increases to the north up to 40 ft thick near Well 38. The thickness of the lower clay unit is shown in Figure 6. Based on the lateral extent and thickness of the unit, it appears clay and silt alluvial sediments were deposited in a historical channel of the Mississippi or Wood River which trends east-west across the center of the ash pond complex. The thickness of the silty clay unit decreases to the north and the south of the ash pond complex as the base of the unit approaches the ground surface.

Field testing of former Monitoring Wells 10 and 11, which were screened entirely within the silty clay unit, indicated a geometric mean horizontal hydraulic conductivity of 2.4×10^{-5} cm/s (NRT, 2000). Laboratory tests of vertical hydraulic conductivity on clay samples ranged from 1.7×10^{-8} cm/s (Kelron, 2004) to 1.2×10^{-6} cm/s (AECOM, 2015). Hydraulic conductivity values are summarized in Table 1. These low values are indicative of a confining layer.

2.2.3 Inter-Sand Unit

The inter-sand unit occurs between the upper and lower silty clay units beneath most portions of the site at an elevation between approximately 408 and 418 feet. The inter-sand unit is composed of heterogeneous fine to medium-grained sand and silty sand that ranges from well to poorly sorted. The inter-sand unit was encountered in borings located along the historical drainage channel shown in the clay thickness map (Figure 6). The top of the inter-sand unit is deepest at the center of the clay valley and rises to the south and to the north. Some historical borings (i.e. Wells 21, 22, 28, 30, in the northern portion of the site indicate that the inter-sand unit may intersect the primary sand unit, and no upper silty clay unit is present. However, interpretations from historical borings (prior to 2000) are difficult because soil was not continuously sampled. The maximum thickness of the inter-sand unit is 5 feet beneath the northwest corner of the NEAP at WOR-B002, and monitoring well 20. The inter-sand unit thins to the south to 1 foot in the southeast corner of the NEAP and may intersect the primary sand to the north where borings indicate the top of the primary sand unit rises to an elevation similar to that of the inter-sand (Wells 21 and 22).

There are no monitoring wells present onsite that are screened exclusively in the inter-sand unit, and no field hydraulic conductivities have been measured. However, based on the visual characterization (silty sand, fine sand) it is expected to be less than that of the primary sand unit. The hydraulic conductivity (estimated from literature values) in this unit is expected to be in the range of 10^{-4} to 10^{-3} cm/sec. (Fetter, 2001).

2.2.4 Primary Sand Unit

The primary sand unit is the uppermost aquifer of the American Bottoms area, and has been extensively developed for water supply. The estimated thickness of the permeable valley fill at WRPS is approximately 120 feet to 140 feet and the sand and gravel constitutes 80 to 100 feet of this thickness. According to the Illinois State Geological Survey (ISGS), the upper 80 feet of the valley fill has been extensively reworked due to river flooding events (Bergstrom and Walker, 1956). Below this depth, the deposits are glacial outwash and older alluvium. Large boulders are encountered below 80 feet, which can sometimes limit drill penetration and are likely remnants of older Illinoian till.

The top of the primary sand unit is mapped on Figure 7 and illustrates the former river channel which trends east-west across the site. The top of the primary sand ranges in elevation from approximately 420 ft in the northern portion of the WRPS property, to approximately 375 ft in a former channel located in the center of the West Ash Pond Complex. The top of the sand unit is near the surface (<5 feet below ground surface [bgs]) in the northern portion of the WRPS property (Wells 21 and 22) and is up to 60 feet deep in the center of the historical channel (Well 38).

Field testing of monitoring wells screened entirely within the sand and gravel unit 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). A summary of the hydraulic conductivities measured in monitoring wells is included in Table 2. Hydraulic conductivity within the primary sand unit is variable within the stated range, but there is no correlation of hydraulic conductivity to elevation or depth within the sand unit (Kelron, 2004).

2.3 Hydrogeology

Monitoring wells were initially installed in 1982 around both the East and West Ash Pond Complexes. The number and location of monitored wells has been modified as knowledge of the site has increased and facility operations have changed. A summary of the current well network and construction details is included in Table 3. Since initial installations in 1982, the hydrogeology of the site had been characterized and described through multiple investigations and computer flow modeling. This section discusses information collected since 1995, including the existing well network and piezometers installed by AECOM in 2015 as well as appropriate historical data.

2.3.1 Groundwater Occurrence and Elevations

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 when groundwater elevations exceed approximately 410 ft. Measured groundwater elevations typically range from about 399 ft during low water conditions in Well 2 near the Mississippi River, to 432 ft in upgradient wells to the north. However, water elevations generally fluctuate between 402 and 414 feet. The Mississippi River and Wood River stages strongly influence and control the elevations in the groundwater.

A summary of groundwater elevations from 2010-2015 for existing wells is included in Table 4 and hydrographs for representative well locations are included in Appendix C. Table 5 summarizes water elevations from piezometers located within and adjacent to the West and East Ash Pond Complex

Water levels are elevated within the impoundments relative to groundwater elevations measured both outside and below the impoundment in the primary sand unit. Within the impoundment, measurements collected from L1 and AECOM piezometers P002, P003, P004, P005, P016, P025, and P026 indicate the CCR porewater elevation ranges between 418 and 431 (Table 5). Table 5 also includes elevations from piezometers P006, P008, P015, P020, P021 and P024 which are screened below the impoundments in the primary sand unit. Groundwater elevations in the primary sand unit are generally 10- 20 feet lower than those measured within the impoundment.

2.3.2 Groundwater Flow

Potentiometric maps prepared from elevation data measured in monitoring wells reveal 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. The horizontal gradient between well 29 and 2, as measured in 2015, is 0.001 feet/feet (ft/ft). A representative potentiometric map is shown in Figure 8

During spring flooding and high Mississippi River stages, groundwater flow is northerly, with either an easterly or westerly component. After flood levels subside, the flow direction reverts to more normal conditions and groundwater again discharges to the rivers. The flooding and high river stages only occur periodically and the dominant flow direction during any given year is toward the rivers. Horizontal gradients during flood events are high near the river, on the order of 0.003 ft/ft, although gradients can be aerially variable due to the transience of the system during flood stage. A potentiometric map of groundwater flow during high water level conditions is shown on Figure 9.

2.3.3 Vertical Groundwater Gradients

Nested monitoring wells were historically present at six locations (Wells 02/01, 04/03, 32/05, 08/07, 11/10, 13/12) and currently there are two sets of nested wells (Wells 39S/39M, 40S/40M) at WRPS. Wells 13, located adjacent to 12 on the northeast corner of the west ash complex, and 11, located on the northeast corner of the Old East Ash Pond, were screened in the silty clay, and historical elevations measured when both wells were present indicate general downward flow of water from the silty clay into the primary sand unit. Near the rivers, calculated gradients are flat, to upward (I.e. upward in wells 01/02, 40S/40M). A summary of representative historical and current vertical gradients is included in Table 6.

2.3.4 Water Well Assessment

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 it's property east of the Wood River.

The results of the water well survey are provided in Appendix D. Based on all of the well information acquired from the listed sources, water supply wells within at least 2,500 feet of the WRPS property boundary are shown on Figure 2 in Appendix D. The current status of some of these wells (i.e., operational, abandoned, or sealed) is not known.

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 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.

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3 GROUNDWATER QUALITY

3.1 Summary of Groundwater Monitoring Activities

Groundwater sampling at the West Ash Pond Complex was initiated in 1984; however, consistent data collection began in 1996. The following discussion presents an analysis of data collected from 2010 to 2015. Groundwater data from the East Ash Pond Complex is not included in this report.

Currently, groundwater monitoring is completed in accordance with the Closure Work Plan (CWP) (NRT, 2000) approved by the Illinois EPA on December 13, 2000. As called for by the 2000 CWP, DMG is required to sample groundwater quarterly, submit the results quarterly to the Illinois EPA, and provide an annual data assessment. However, some modifications to the 2000 CWP proposed in the "2005 Closure Work Plan Annual Report" and cover letter were approved by the Illinois EPA in a letter to DMG dated June 15, 2006. Modifications approved by the Illinois EPA include, reduction of monitoring frequency from quarterly to semiannually and semiannual submittals of data discs to Illinois EPA

The current monitoring program for groundwater consists groundwater samples collected from 12 monitoring wells and analyzed forfollowing parameters:

Laboratory Parameters		
Boron	Manganese (total)	Sulfate
Total Dissolved Solids (TDS)		
Field Parameters		
pH	Depth to Water (ft below mp)	
Specific Conductance	Groundwater Elevation (ft)	
Temperature		

Groundwater monitoring results are reported to the Illinois EPA annually in accordance with the approved Closure Work Plan with the most recent data and analysis submitted in a report titled '*2015 Closure Work Plan Annual Report'* dated January 20, 2016.

Additional groundwater monitoring was initiated in November 2015 at 7 existing well locations to comply with the 40 CFR 279 CCR rule. Sampling is conducted at 3 background wells and 4 downgradient wells for an expanded list of parameters, including the following:

Metals (totals)			
Antimony	Boron	Cobalt	Molybdenum
Arsenic	Cadmium	Lead	Selenium
Barium	Calcium	Lithium	Thallium
Beryllium	Chromium	Mercury	
Inorganics (totals)			
Fluoride	Chloride	Sulfate	Total Dissolved Solids
Field			
pH	Dissolved Oxygen	Specific Conductivity	Turbidity
Oxidation/Reduction Potential	Temperature		

Data for the expanded parameter list for the federal CCR sampling will be reported in accordance with the groundwater monitoring plan.

3.2 Groundwater Monitoring Results and Analysis

Analytical results from January 2010 through December 2015, are summarized in Appendix E. Statistics showing the minimum and maximum concentrations detected in the groundwater samples is included for each well in Table 6. Also, a comparison of groundwater data from wells to the Groundwater Quality Standards for Class I: Potable Groundwater is shown. The well locations are shown on Figure 3.

Parameters that have been detected in groundwater at concentrations exceeding the Class I groundwater quality standards include the following: boron, manganese, pH, and total dissolved solids (total filterable residue). A summary of recent exceedances is included below for parameters of concern. A statistical summary for the monitored inorganic groundwater quality parameters is provided in Table 7. Table 8 provides a summary of exceedances for 2010 through 2015, and are representative and consistent with historical data collected prior to 2010. Time-series graphs for each of the groundwater parameters at the 12 monitoring wells are included in Appendix F covering 2006 through 2015. Each of the parameters is discussed below.

Boron

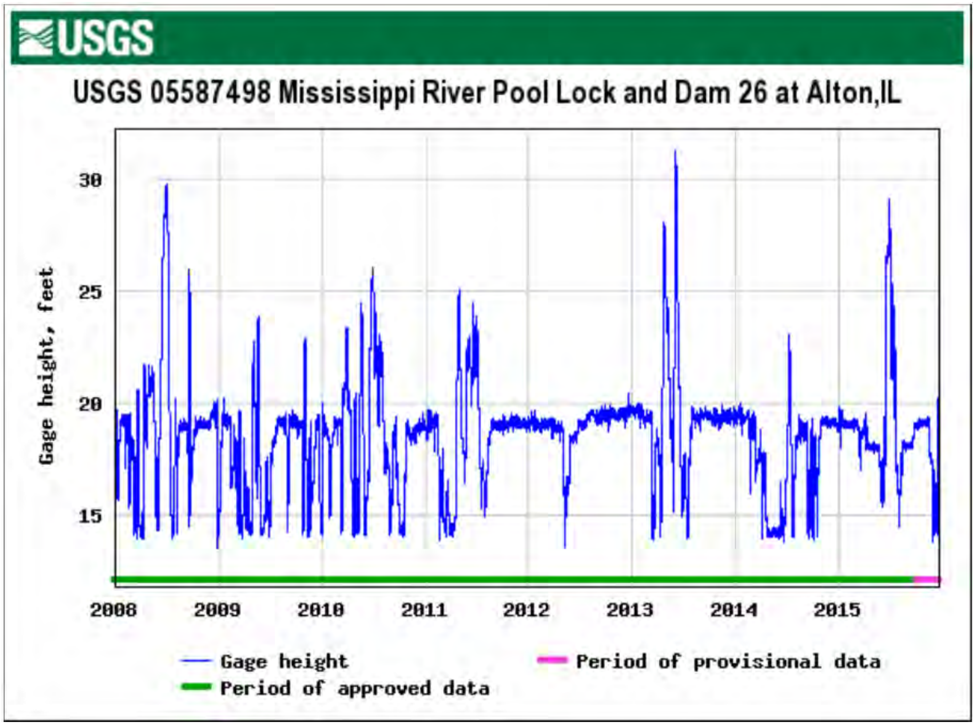
Boron exceeded the 2 mg/L standard at three of the 12 monitoring wells from 2013 through 2015. In 2012 only two wells exceeded the standard. Well 02 had boron concentrations of 2.50 and 3.45 mg/L, and Well 34 had a boron concentration of 5.95 mg/L in the 2nd Quarter that rose to 7.49 m/L in the 4th Quarter. Wells 02 and 34 are located to the south and downgradient of the West Ash Pond Complex. Well 12 had boron concentrations of 2.21 and 2.05 mg/L during the 2nd and 4th Quarters of 2015, respectively. Well 12 is located to the east and downgradient of the West Ash Pond Complex.

Annual median boron concentrations have decreased since the unlined ponds were removed from service (prior to 1998) in eight of the eleven downgradient monitoring wells (Table 9) currently monitored, while concentrations have increased only in wells 02, 12, and 34. The median boron concentration at Well 02 has ranged from 4.60 mg/L one year after the final unlined pond was removed from service to 2.10 mg/L in 2008, but increased to 2.98 mg/L in 2015. The concentrations have decreased from the peak concentration observed shortly after removing the unlined ponds from service, although the concentration trend has been slightly upward from 2012 to 2015.

The median boron concentration at Well 12 was 1.80 mg/L in 2011 and below the Class I Standard, but increased slightly from 2012 through 2015, beginning at 2.04 in 2012 to 2.13 mg/L in 2015. Annual median boron concentrations at Well 34 increased from 0.88 and 1.37 mg/L in 2011 and 2012, respectively, to 4.15, 3.99, and 6.72 mg/L in years 2013-2015, respectively. Based on Mann-Kendall trend analysis results, monitoring wells with a statistically significant upward Sen Slope trend are 02, 12, and 34 (Table 7). The monitoring wells with a statistically significant downward trend are 20 and 31.

The recent increases in boron (and other coal indicator parameters) may be attributed to several factors.

Mississippi River Stage: Unusually stable southerly groundwater flow directions prevailed from 2012 through 2015. Groundwater flow is generally southerly for two-thirds of the year, with flow reversals—caused by high water in the Mississippi River—for one-third of the year. Observed river stage data indicate fewer periods of high river stage and corresponding groundwater flow reversals since 2012 than prior to 2012 (see figure below). As a result, groundwater from beneath the West Ash Pond Complex is flowing south, and east toward Wells 02, 12 and 34 for longer periods than historically observed.



Levee Drainage Improvements: Factors that may have also disrupted groundwater flow direction and quality is significant construction activities which were conducted during 2014 and 2015 off-site between the West Ash Pond Complex and the Mississippi River levee by the Southwestern Illinois Flood Prevention District Council. Work completed during this time period included new relief well installations, existing relief well conversions and upgrades, drainage weirs for out letting water, blanket drain installation, placement of rip rap, and installation of new piping systems to handle groundwater from relief wells.

Ash Reuse/Recycling: Large amounts of ash were removed from Pond 1 in 2015 for beneficial reuse, possibly creating temporary ponding and increased infiltration within the ash excavations. The increased infiltration would result in increased mobilization of boron and other ash indicator parameters.

The observed increase in boron concentrations in these wells results from one, or a combination of the above factors.

Sulfate

Sulfate, like boron, is a primary indicator of coal ash leachate, and exceeded the 400 mg/L standard at wells 02 and 25 prior to removing the unlined impoundments from service in 1998. No wells have exceeded the sulfate standard for 18 consecutive years, from 1999 through 2015, with the exception of Well 02 in 2004. Since then, or for eleven consecutive years, sulfate concentrations have remained below the standard.

Sulfate concentrations in groundwater at the 11 downgradient wells ranged from below the detection limit of 5 mg/L to 307 mg/L during 2010- 2015. Sulfate concentrations indicate a statistically significant downward Sen Slope trend at Well 31 and background Well 36. Concentrations at Wells 02 and 34 indicate statistically significant upward trends (Table 7) consistent with trends in boron concentrations. However, although these concentrations are increasing, they remain below the Class I standard (400 mg/L). The sulfate concentration at Well 02 had a median concentration of 213 mg/L. Although the six year statistically significant trend at this well is upward, concentrations at Well 02 in 2014 and 2015 were below the peak measured during the same time period of 298 mg/L in 2013. Sulfate concentrations over the past six years at Well 34 are well below the Class I standard, with a median of 10 mg/L and a maximum concentration of 47 mg/L. The highest median sulfate concentration, 240 mg/L, was encountered at Well 25. This well is downgradient of and impacted by recharge through the off-site slag pile.

Manganese

Median manganese concentrations exceeded the Class I standard of 0.15 mg/L at 6 of the 12 monitoring wells in 2015 (Table 9), compared to 7 of the 12 monitoring wells in 2014. As in prior years, background

Monitoring Well 36 had one of the higher manganese concentrations during 2015, with a concentration of 3.19 mg/L in the 2nd Quarter. Only Monitoring Wells 04 and 34 had similarly high concentrations, ranging from 4.96 to 6.70 mg/L in 2015.Mann-Kendall analyses of manganese concentrations indicate statistically significant upward trends at downgradient Monitoring Wells 02, 04, 23, and 28.

The occurrence of elevated manganese concentrations in groundwater at the West Ash Pond Complex is primarily associated with natural geochemical factors and, only secondarily related to the impoundments. Manganese concentrations are generally highest (greater than 2 mg/L) in wells 04, 34, and 36, which are located nearest to the Mississippi River and where sulfate, and typically boron, concentrations are low, indicating the primary source of manganese in these wells is not related to the West Ash Pond Complex.

Concentrations of manganese generally decrease with distance from the river. Elevated manganese concentrations in groundwater, which do not correlate to elevated boron and sulfate, are indicative of both off-site sources located north of the West Ash Pond Complex and naturally occurring conditions unrelated to the ash ponds. EPRI research on the occurrence and distribution of manganese in groundwater at the West Ash Pond Complex System was presented previously in the 2003 and 2004 Closure Work Plan Annual Reports (Kelron, 2003 and 2004).

Total Dissolved Solids

TDS concentrations regularly exceed the Class I standard of 1,200 mg/L at Wells 25 and 31 located adjacent to the off-site slag pile. TDS reflects concentrations of major ions in groundwater. At Wells 25 and 31 the highest median TDS concentrations and the greatest statistical variability (as measured by standard deviation on Table 7) reflect elevated chloride concentrations (>500 mg/L) in the leachate from the slag pile. The highest observed TDS concentrations at Wells 25 and 31 in 2015 were 1,320 and 2,240 mg/L, respectively.

TDS concentration trends in wells other than 25 and 31 generally mirror those of sulfate, which is the major inorganic parameter related to the ash impoundments. The median concentrations of TDS in other wells ranged from 510 mg/L to 936 mg/L between January 2010 to December 2015 (Table 7).

pH

From 2010-2015, Wells 20 and 23 had median pH values lower than 6.5 Standard Units (S.U.) (Table 7). pH values measured in Wells 28, 31, and 34 were also below 6.5 S.U. at least once during the last 6 years. With the exception of well 34 all of these wells are located north and generally upgradient of the ash complex. The cause of frequent pH exceptions in wells 20 and 23 is not clear. However, these two wells are upgradient of the East and West Ash Pond Complexes near other wells (Wells 21 and 22) that also exhibited relatively low 2010-2015 median concentrations of boron (0.29 mg/L to 0.38 mg/L in 2015 [Table 7]). Measured

The lack of correlation between pH and the ash indicator parameter boron suggests that the low pH values observed at this facility are either naturally occurring or due to influences other than the East and West Ash Pond Complexes. This conclusion is supported by pH measurements from leachate well L1. This leachate well has yielded ash pore water samples on several occasions and pH values from those samples ranged from 6.9 to 8.3 S.U., with a median of 7.68 S.U. (Appendix A, 1998 Closure Work Plan Report). pH values from this well suggest that the ash leachate is neutral to alkaline and is therefore not the source of acidity causing low pH values in groundwater.

The pH concentrations as measured in the field exhibit significant upward trends at Wells 04, 22, 28, 31, and 34. Although these trends are upward, the pH measured at all monitoring wells remains near neutral and is below the maximum Class 1 groundwater standard of 9.0.

4 CONCLUSIONS

Based on extensive investigation and monitoring since 1984, the site has been well characterized and a detailed site conceptual model has been developed. In conjunction with the hydrogeologic investigation, a groundwater model has also been developed to predict the effect of various ash pond closure scenarios on groundwater quality. The groundwater model report is being submitted under separate cover.

WRPS and the West and East Ash Pond Complexes are located on top of river deposits which consist of three major geologic units:

- Silty Clay Unit
- Inter-sand Unit
- Primary Sand Unit

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.

Groundwater is encountered in the primary sand unit, and occasionally in the inter-sand unit when Mississippi River water levels are high. The groundwater elevations are significantly influenced by the Mississippi and Wood Rivers, flowing toward the rivers during normal river stages and away from the rivers during flood events when river water recharges the groundwater. Based on hydraulic conductivities and vertical gradients, horizontal groundwater flow in the silty clay is negligible. Groundwater flow occurs in the primarily in the primary sand unit and occasionally in the inter-sand unit during river flooding events.

Water levels within the West Ash Pond Complex are elevated and generally 10-15 feet above groundwater outside of the impoundments. Groundwater quality effects from the West Ash Pond Complex occur within the primary sand unit where the silty clay is not present or possibly through the silty clay unit where it is thin. Groundwater in the inter-sand unit may be impacted during periods of high groundwater elevations when it becomes saturated.

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.

In general boron concentrations are declining, with the exception of wells 02, 12, and 34 which have shown recent increases. However, concentration increases at these wells remain below the peak concentrations measured following ash handling operational changes in 2000, and in 2006 when the impoundment stopped operation following the construction of the primary east ash pond. Increasing trends measured at these wells are attributed to one or a combination of the following factors:

- Less frequent recharge of groundwater from high Mississippi and Wood River stages
- Increased surface water ponding and infiltration within the impoundments resulting from ash excavations and recycling
- Construction of levee drainage and flood prevention improvements between the West Ash Pond Complex and the Mississippi River

Given the current groundwater data and site information, groundwater quality is expected to improve following closure, as capping will reduce the infiltration of water and leachate generation from the West Ash Pond Complex. Because CCR will remain in the West Ash Pond Complex, a groundwater monitoring plan and groundwater management zone application are being submitted with this closure plan. These documents will enable monitoring of improvements in groundwater quality until the Class 1 groundwater quality standards are achieved.

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FIGURES

PROPERTY BOUNDARY (BASED ON 1997 SURVEY DATA)

Service Layer Credits: Copyright:© 2013 National Geographic Society, i-cubed

Y:\Mapping\Projects\23\2376\MXD\Hydrogeologic_CR\Figure 1_Site Location Map.mxd Author: sstolz; Date/Time: 7/28/2016, 11:38:24 AM

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

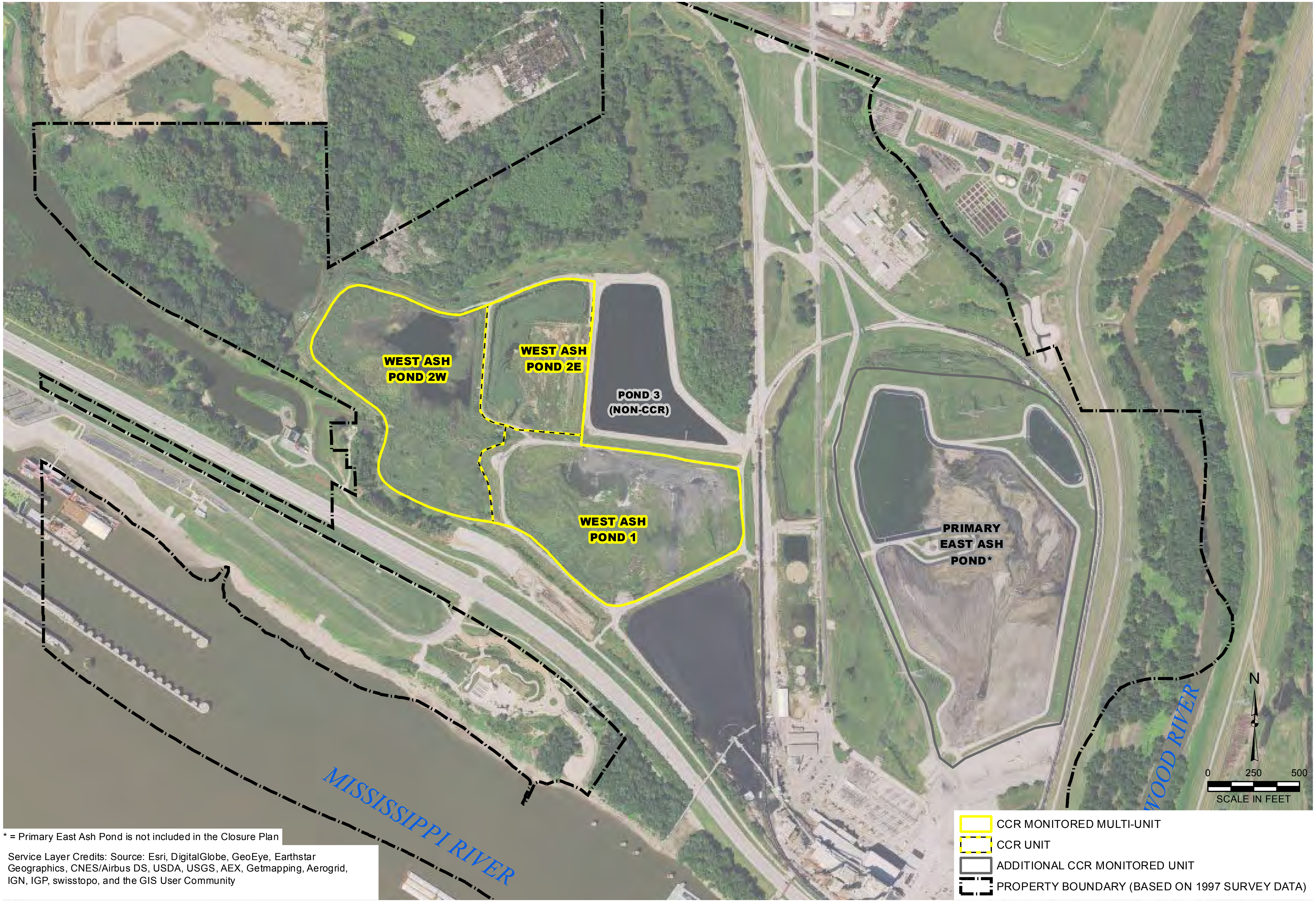
SITE LOCATION MAP

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

PROJECT NO: 2376

FIGURE NO: 1

NATURAL RESOURCE TECHNOLOGY



* = Primary East Ash Pond is not included in the Closure Plan

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

Y:\Mapping\Projects\23\2376\MXD\Hydrogeologic_CCR\Figure 2_Site Location Map - Wood River West Ash Pond.mxd Author: sstolz; Date/Time: 7/28/2016, 11:22:09 AM

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

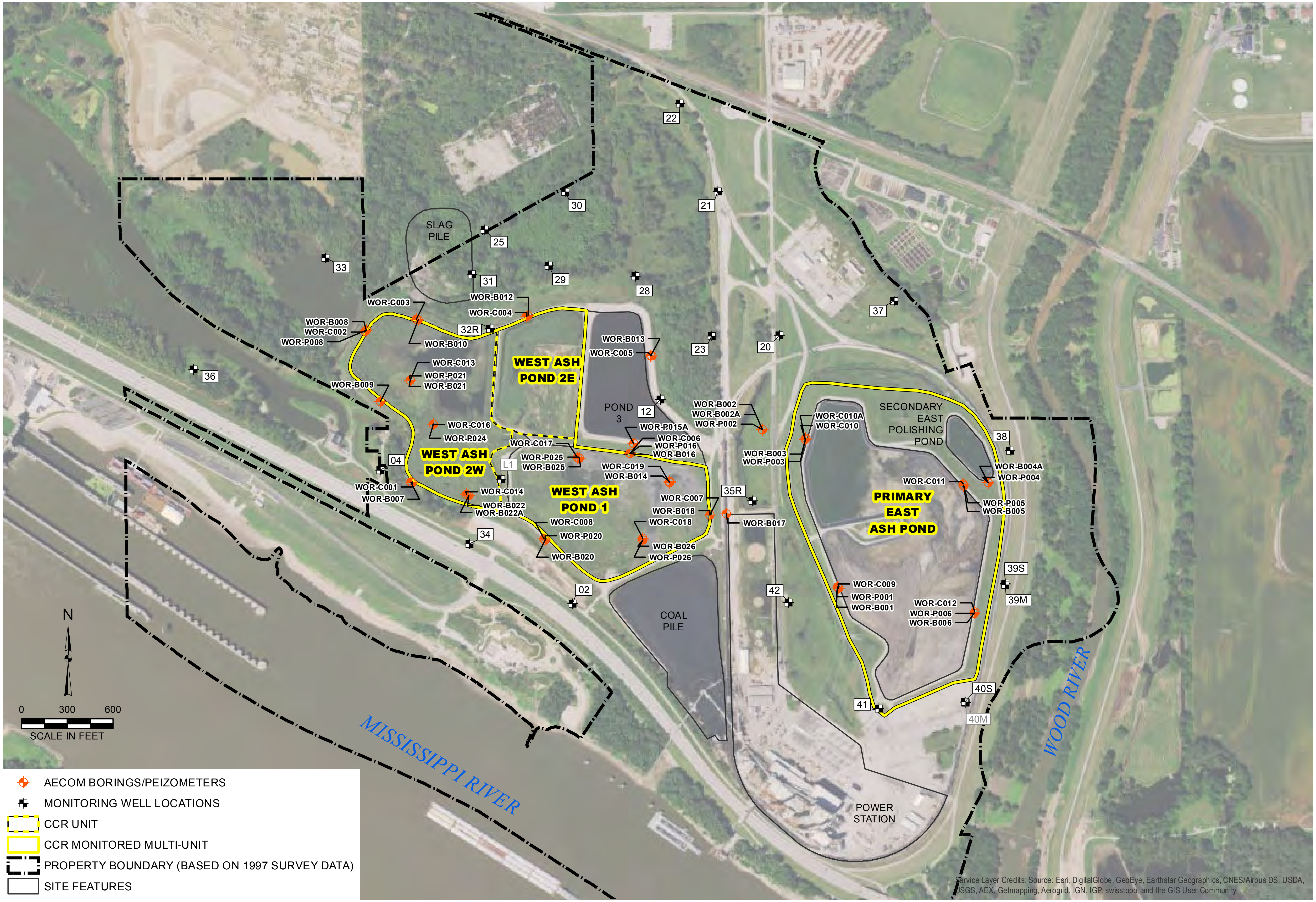
OVERVIEW OF ASH POND SYSTEM

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

PROJECT NO: 2376

FIGURE NO: 2

NATURAL RESOURCE TECHNOLOGY



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

Y:\Mapping\Projects\23\2376\MXD\Hydrogeologic_CR\Figure 3_Monitor Well Location Map.mxd Author: sstolz; Date/Time: 7/28/2016, 4:51:32 PM

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

BORING AND MONITORING WELL LOCATION MAP

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

PROJECT NO: 2376

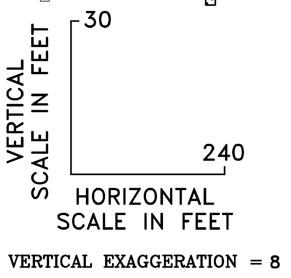
FIGURE NO: 3

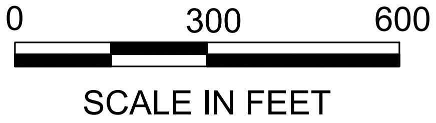
NATURAL RESOURCE TECHNOLOGY

- ▨ SAND
- ▨ SILTY SAND/SILT
- ▨ CLAY/FAT CLAY
- ▨ SILTY CLAY
- ▨ ASH
- 🟧 SAND
- ⬜ CLAY
- ⬛ ASH
- 🟫 FILL
- WELL/BORING
- SCREEN
- ── GEOLOGICAL CONTACT, DASHED WHERE INFERRED

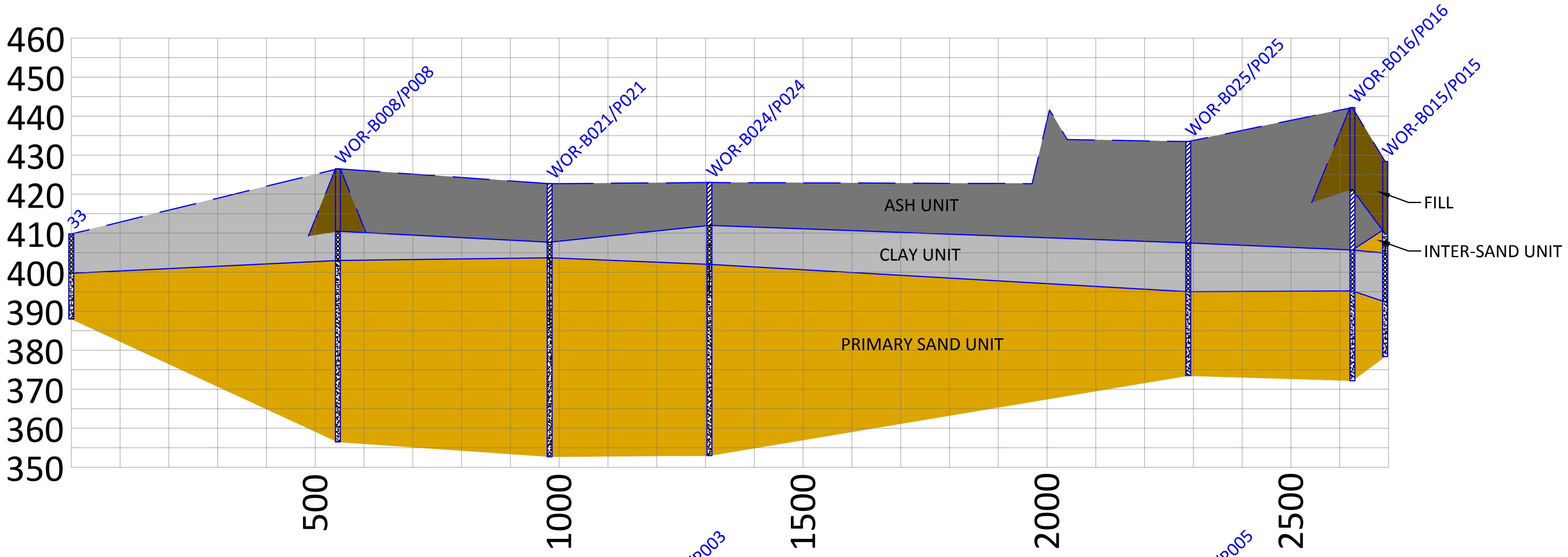
NOTES:

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

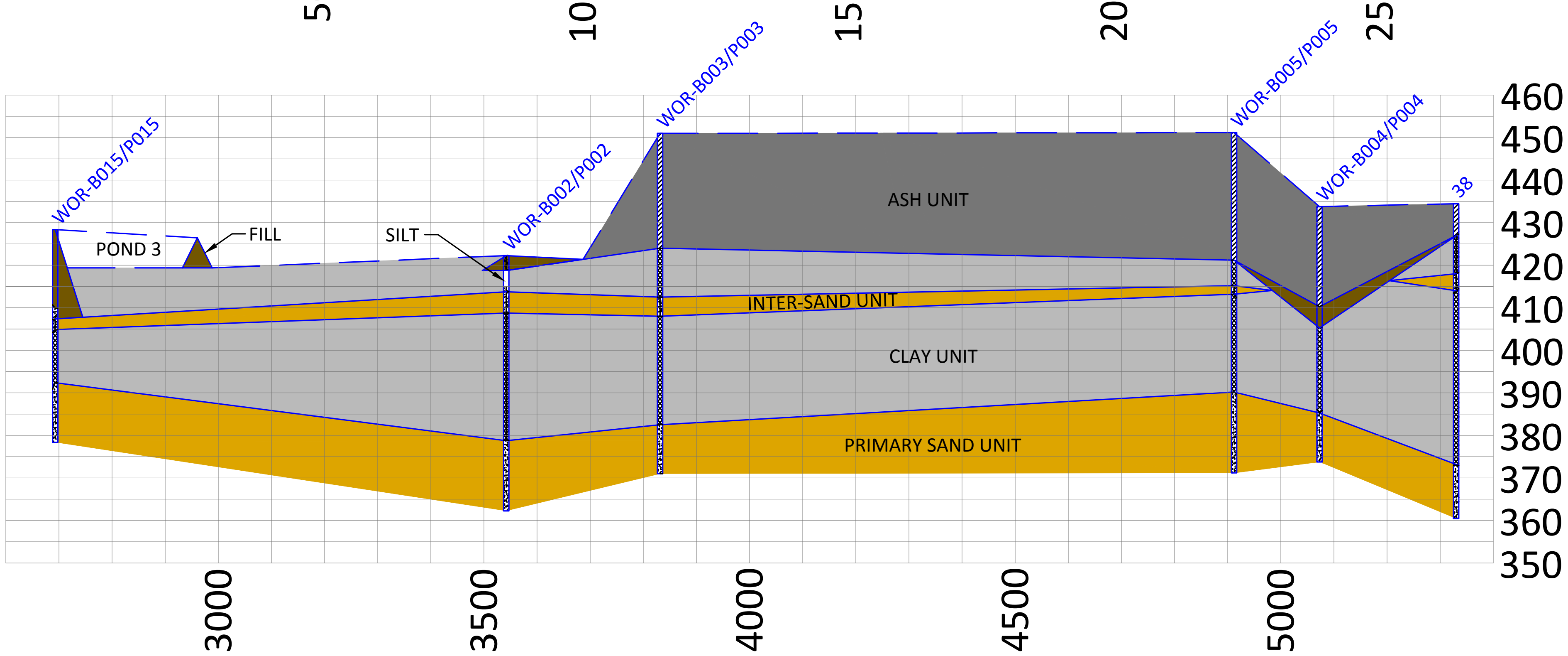




SECTION A-A'



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

Jul 27, 2016 8:34am PLOTTED BY: Harlan SAVED BY: Harlan
S:\2016\NRT\Wood River\2376 – Wood River\Cross_sections_grid.dwg A–A
IMAGES: .\aerial.PNG;
XREFS:

▨ SAND
▨ SILTY SAND/SILT
▨ CLAY/FAT CLAY
▨ SILTY CLAY
▨ ASH

▨ SAND
▨ CLAY
▨ ASH
▨ FILL

WELL/BORING

SCREEN

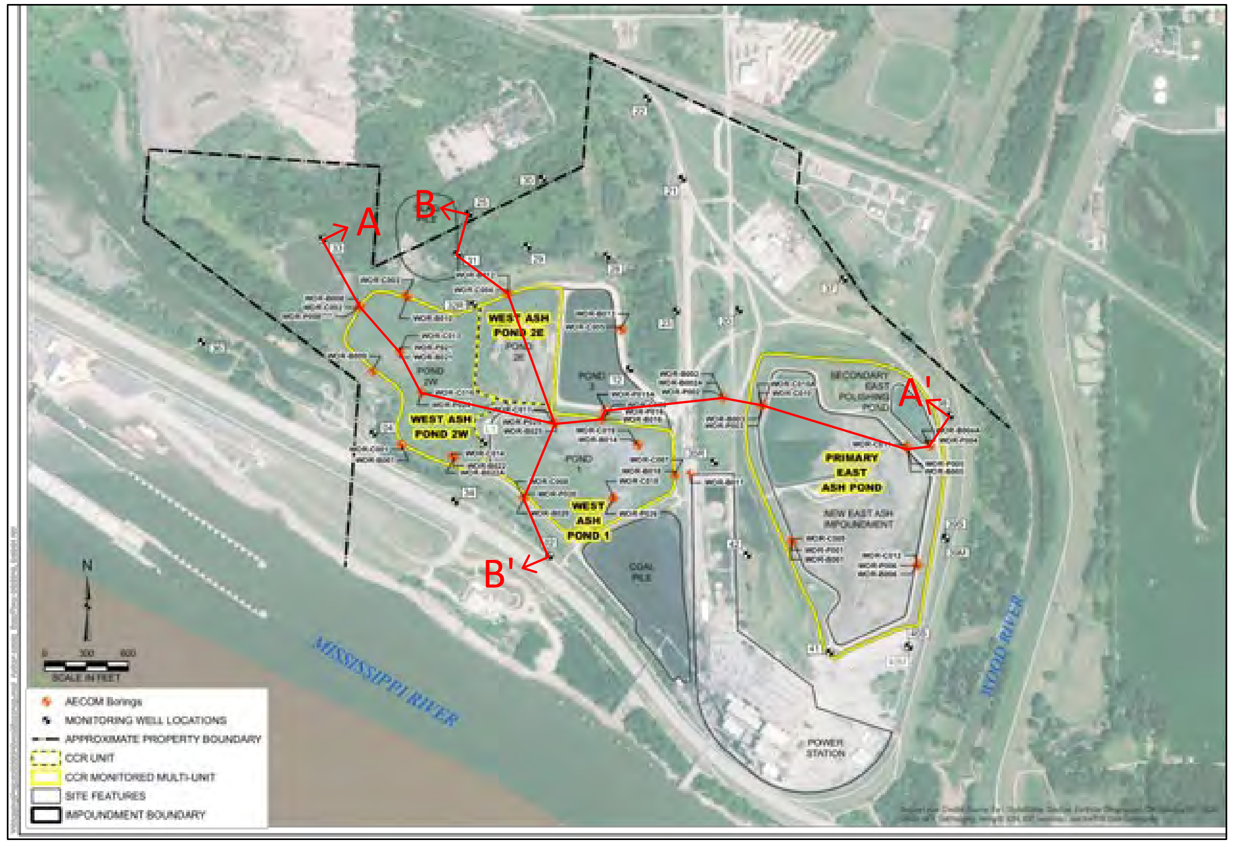
GEOLOGICAL CONTACT,
DASHED WHERE INFERRED

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

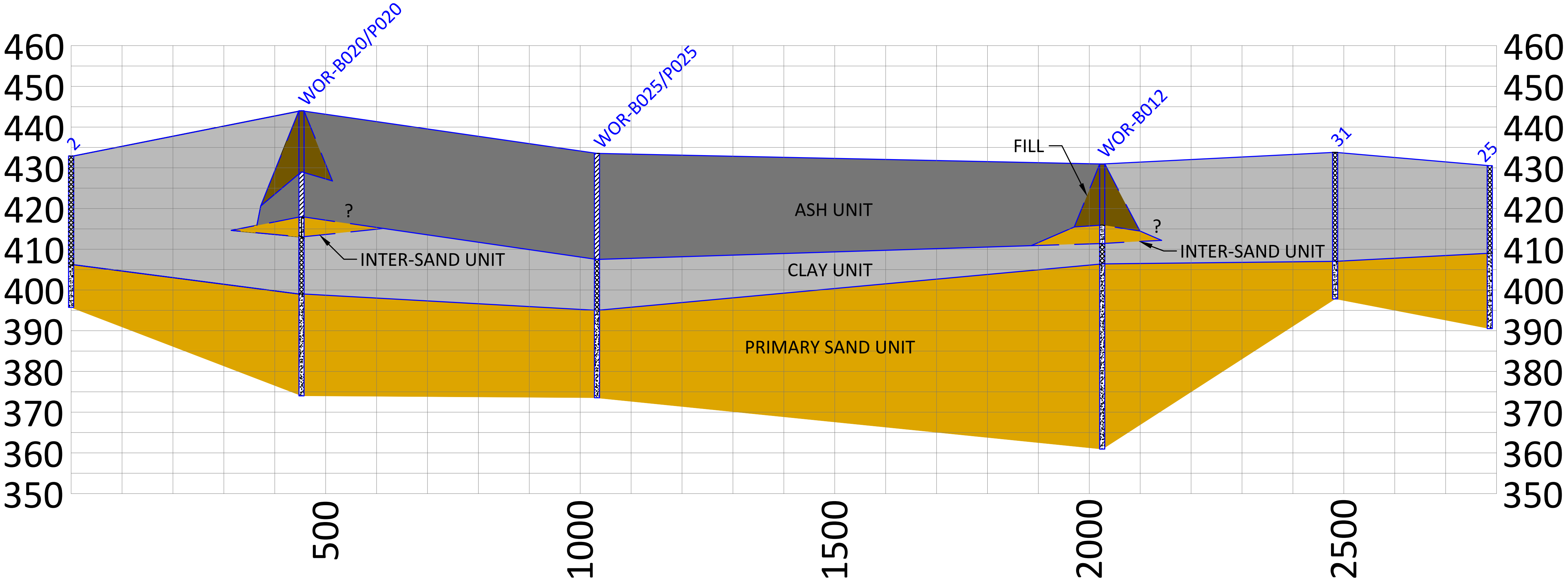
VERTICAL SCALE IN FEET 30
240
HORIZONTAL SCALE IN FEET

VERTICAL EXAGGERATION = 8



0 250 500
SCALE IN FEET

SECTION B-B'



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: .

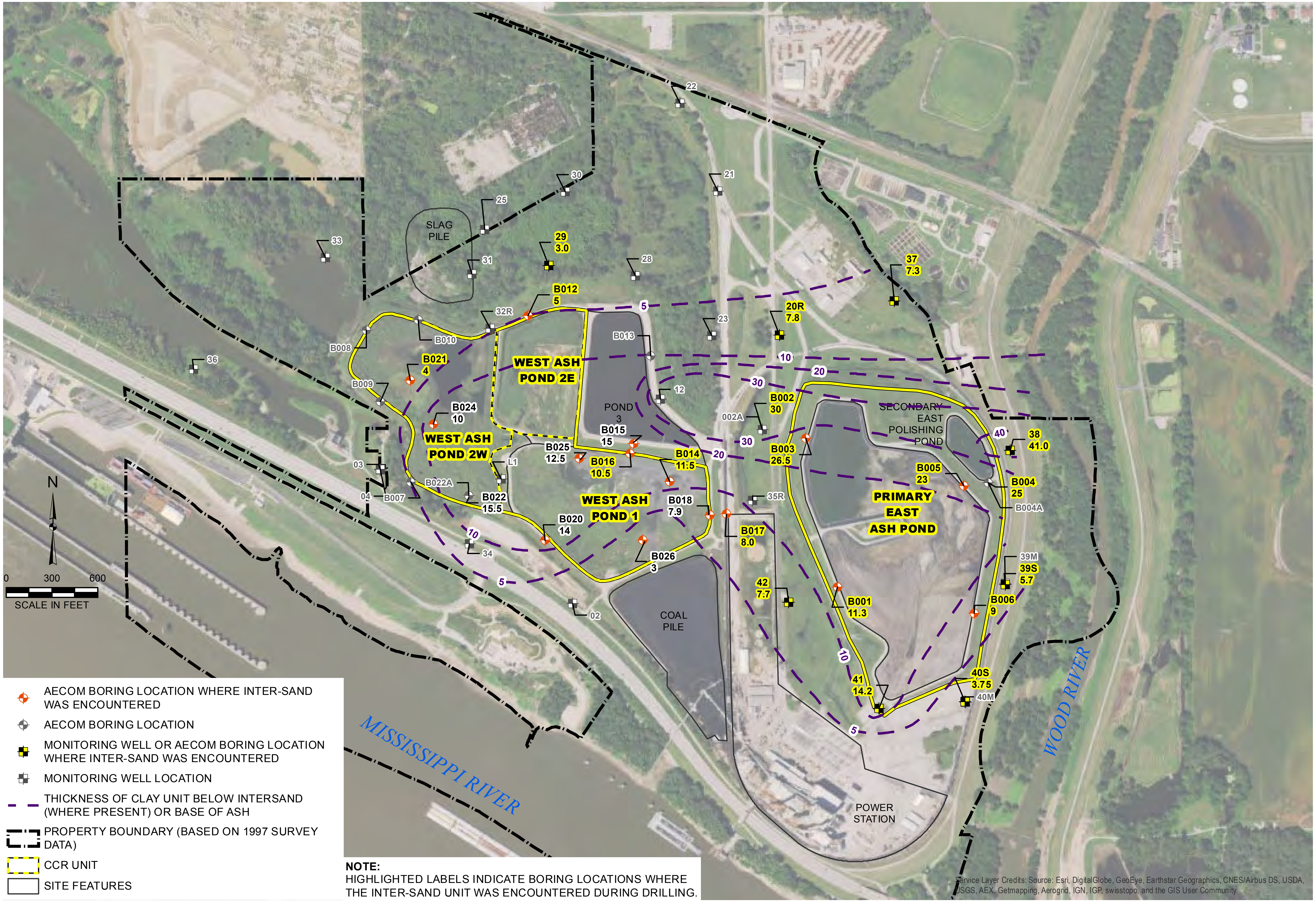
GEOLOGIC CROSS-SECTION B-B'

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

NATURAL
RESOURCE
TECHNOLOGY

PROJECT NO.
2376/1.0

FIGURE NO.
5



- 🔶 AECOM BORING LOCATION WHERE INTER-SAND WAS ENCOUNTERED
- ◈ AECOM BORING LOCATION
- ▣ MONITORING WELL OR AECOM BORING LOCATION WHERE INTER-SAND WAS ENCOUNTERED
- ▣ MONITORING WELL LOCATION
- – – THICKNESS OF CLAY UNIT BELOW INTERSAND (WHERE PRESENT) OR BASE OF ASH
- ▭ PROPERTY BOUNDARY (BASED ON 1997 SURVEY DATA)
- ▭ CCR UNIT
- ▭ SITE FEATURES

NOTE:
HIGHLIGHTED LABELS INDICATE BORING LOCATIONS WHERE THE INTER-SAND UNIT WAS ENCOUNTERED DURING DRILLING.

Y:\Mapping\Projects\23\2376\MXD\Hydrogeologic_CR\Figure 6_Thickness of clay.mxd Author: sstolz; Date/Time: 7/28/2016, 5:28:24 PM

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

CLAY THICKNESS BELOW ASH COMPLEX OR INTER-SAND UNIT

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

PROJECT NO: 2376

FIGURE NO: 6

NATURAL RESOURCE TECHNOLOGY