SCS ENGINEERS

Ash Impoundment Closure Report

Independence Power & Light
Blue Valley Power Station
21500 East Truman Road
Independence, Missouri 64056

Prepared for:

Independence Power & Light
P.O. Box 1019
Independence, Missouri 64051

Prepared by:

SCS ENGINEERS
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Overland Park, Kansas 66213
(913) 681-0030

April 2018
Revised June 2018
File No. 27215142.00

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PROFESSIONAL ENGINEER CLOSURE CERTIFICATION

I hereby certify, as a Professional Engineer in the State of Missouri, that based on the observations of field staff and review of tests performed during the following activities:

1. The closure of the **approximately 16.7 acre North Fly Ash (NFA) pond** located at the Blue Valley Power Station was completed in accordance with the requirements of Section 257.100, paragraphs (b)(1) through (4) of the CCR Rule (Closure by leaving CCR in place);

2. The closure of the **approximately 13.8 acre South Fly Ash (SFA) pond** located at the Blue Valley Power Station was completed in accordance with the requirements of Section 257.100, paragraphs (b)(1) through (4) of the CCR Rule (Closure by leaving CCR in place);

3. The closure of **approximately 5.4 acres of the 8.1-acre Bottom Ash (BA) pond** located at the Blue Valley Power Station was completed in accordance with the requirements of Section 257.100, paragraph (b)(1) through (4) of the CCR Rules (Closure by leaving CCR in place); and

4. The clean closure of **approximately 2.7 acres of the of the 8.1-acre BA pond** located at the Blue Valley Power Station was completed in accordance with the requirements of Section 257.100, paragraph (b)(5) of the CCR Rule (Closure through removal of CCR).

Patrick M. Goeke, P.E. (E-19041) (License renewal date is 12/31/18)

1 INTRODUCTION

Independence Power & Light (IP&L) owns and operates the Blue Valley Power Station (BVPS) located east of Independence, Missouri. The BVPS has three former coal combustion residuals (CCR) surface impoundments. The CCR surface impoundments are considered inactive as they ceased accepting CCR prior to October 14, 2015.

This report summarizes the activities performed during closure of the BVPS inactive ash impoundments from July 2016 through December 2017. Additionally, this report discusses the post-closure care IP&L will be required to complete to maintain the final cover system (cap) on the ash impoundments and comply with the Post-Closure Plan for a period of 30 years as required by 257.104 (c)(1), except as provided in 257.104 (c)(2) (pending active 257.50(c) & 257.100 litigation as discussed in Post Closure Care Plan under separate cover).

1.1 FACILITY BACKGROUND

Three surface impoundments containing CCR are located on the BVPS property, north of the power station. The original CCR surface impoundments, or ash impoundments, built in 1978, consisted of the South Fly Ash (SFA) Pond (approximately 13.8 acres) and the Bottom Ash (BA) Pond (approximately 8.1 acres). A third impoundment, the North Fly Ash (NFA) Pond (approximately 16.7 acres), was constructed in 1989. The maximum depth of ash in the three impoundments is approximately 15 feet.

The SFA and BA Ponds are separated from the NFA Pond by a ditch that drains storm water from the power plant and residential properties to the west of the BVPS property. Water in the ditch discharges to the BVPS Missouri storm water permit Outfall 004.

Storm water and sluice water from the ponds flowed via underground piping and temporary above ground piping to the BA Pond. From there, the water discharged to the Little Blue Valley Sewer District (LBVSD) through Outfall 002, which is located at a discharge structure in the southeast corner of the BA Pond.

1.2 CLOSURE UNDER FEDERAL REGULATIONS

Power plant ash impoundments containing CCR are regulated under Section 257.100 of the Code of Federal Regulations (CFR) 40 Part 257. Under this "Closure Rule" regulation, the ash impoundments are required to be closed with a final cover system and maintained during a specified post-closure period. Closure of the CCR surface impoundments under 40 CFR 257.100 may be completed in one of two ways:

- Closure by leaving CCR in place [257.100(b)(1) through (4)] or "Closure-in-Place", or
- Closure through removal of CCR [257.100(b)(5)] or "Clean Closure".

Closure-in-Place

1. The CCR surface impoundment must be capped in a manner that
   a. Minimizes post-closure infiltration of liquids into the ash or the release of CCR, contact water, or contaminated run-off to the ground, surface waters, or air;
   b. Prevents the probability of future impoundment of water;
   c. Prevents a slope failure or movement of the cover system; and
   d. Minimizes the need for further maintenance of the CCR unit.

2. Prior to final cover installation,
   a. Free liquids must be eliminated by removing liquid waste and solidifying remaining wastes; and
   b. The remaining waste must be stabilized sufficiently to support the final cover system.

3. The final cover system, or cap, must meet the following requirements:
   a. The permeability of the final cover system must be less than or equal to the bottom layer or underlying natural soil ($1x10^{-7}$ cm/sec)
   b. The thickness of the compacted soil in the barrier soil layer must be a minimum of 18 inches of earthen material
   c. An erosion layer capable of sustaining native plant growth must be a minimum thickness of 6 inches, and
   d. The cover must be designed to minimize settlement and subsidence.

4. An alternate cover system meeting the requirements of number 3 above may be used. Alternative covers may include a geosynthetic clay liner (GCL) or other materials approved by the owner.

Clean Closure

1. The CCR must be removed and properly disposed.

2. Any liner soils from the impoundments must be removed and properly disposed.

3. Any soils impacted by the CCR must be removed and properly disposed.

IP&L decided to close the three ash impoundments using both closure-in-place and clean closure methodologies. The final cover system is an alternative cover system which includes a GCL and a minimum of 12 inches of erosion layer capable of sustaining native plant growth (referred to as topsoil). The specifics to the project are included in Sections 2.1 and 2.2.

2 PROJECT OVERVIEW

2.1 CLOSURE DESIGN SUMMARY

The ash impoundments at the BVPS were closed with both the closure-in-place and clean closure methods. Clean closure occurred in an approximate 2.7-acre area in the southern portion of the BA pond. The remaining ash impoundment areas were closed-in-place.

The clean closure area was converted to a sedimentation basin to manage facility process water flowing into Outfall 002, and discharging to the LBVSD.

The closure-in-place areas consisted of the remaining ash impoundments. The ash was generally used as the subgrade to the final cover system. The ash was graded at slopes of approximately 1 percent or more to drain water off the cover system. The constructed final cover system generally includes the following from top to bottom:

- Vegetation
- Minimum of 12 inches of topsoil
- Geosynthetic Clay Liner (GCL)
- Subgrade consisting of fly ash or other stabilized material

During the design process, the volume and/or elevation of water that would remain in the ash following installation of the final cover system was unknown. Depending on the elevation of the pore water in the ash, there is the potential for the pore water to induce an uplift pressure on the underside of the cap, where the elevation of the cap is the lowest. To provide a method to monitor and possibly relieve potential uplift pressure on the cap, a pressure relief system was designed and installed in the areas where uplift could likely occur, and Coal Ash Resistance (CAR) GCL was used in lieu of the regular GCL.

The pressure relief system was installed in four areas with uplift concern, which coincided with four of the five surface runoff outlet areas. These outlet areas were created by breeching and grading the impoundment embankment once the ash was protected from storm water.

Some auxiliary items were completed on site, including regrading the roads and side slopes (where feasible), abandoning the pump house and associated piping, and rerouting piping and structures associated with the new sedimentation basin.

A reduced size copy of the design drawings used for construction are included in **Appendix A**.

2.2 CLOSURE ACTIVITIES AND TIMELINE

Closure construction started in July 2016 and was completed in November 2017. Construction activities generally progressed from the NFA pond, to the SFA Pond, and finally to the BA Pond. A general project timeline is included in **Appendix B**.

The closure of the inactive surface impoundments generally included the following activities:

- Dewatering and draining the CCR impoundments (Section 3.1);
- Grading the CCR in preparation of the final cover subgrade (Section 3.2);
- Installing the pressure relief system (Section 7.2);
- Placing the GCL and CAR GCL (Section 4);
- Placing and mixing the topsoil (Section 5);
- Breeching the pond embankment to allow storm water drainage (Section 7.1);
- Seeding and establishing vegetation (Section 6);
- Clean-closing the area for the new sedimentation basin (Section 8.1);
- Constructing the sedimentation basin (Section 8.2); and
- Implementing other miscellaneous site closure activities (Section 9).

2.3 CONSTRUCTION QUALITY ASSURANCE PROCEDURES

Construction quality assurance (CQA) procedures included part-time oversight by the CQA consultant. The CQA consultant included the certifying engineer and the staff the certifying engineer managed, including field technicians and other support staff.

Part-time oversight was completed by coordinating with the Facility Owner and Contractor as to the activities that were scheduled, and determining when it was appropriate for CQA staff to be on site. The CQA consultant reviewed information provided by the Facility Owner and Contractor when CQA staff was not present for closure activities. Site observations and activities were recorded on and included with photographs. Copies of construction photographs are included in **Appendix C**.

2.4 ORGANIZATION

The following parties had substantial involvement in the closure project described herein.

Facility Identification

Blue Valley Power Station
21500 E. Truman Rd
Independence, MO 64056

Facility Owner

Independence Power & Light
17221 E. 23rd St. South
Independence, MO 64051
816-325-6286

Contractor

Radmacher Brothers Excavating Co., Inc.
2201 N. 7 Highway, Suite B
Pleasant Hill, MO 64080
816-540-3614

Design Engineer and CQA Consultant

SCS Engineers
7311 West 130th St, Suite 100
Overland Park, KS 66213
913-681-0030

2.5 MEETINGS

A pre-construction "kick-off" meeting was held on June 28, 2016 to:

- Introduce parties involved in the project;
- Establish lines of communication;
- Develop a mutual understanding of the work, including CQA requirements; and
- Review the project schedule and site safety procedures.

In addition to the "kick-off" meeting, monthly progress meetings were held between the Facility Owner, Contractor, and CQA Consultant for the duration of the project. These meetings were held at the site at the beginning of each month starting in August 2016. These monthly meetings discussed general construction progress, upcoming schedules, needed information, questions, and concerns. Additional meetings and calls were held as needed to address specific construction items, daily activities, or schedule coordination.

3 SUBGRADE PREPARATION

Prior to constructing the final cover, the free water within the impoundments required removal. Therefore, the CCR was dewatered to allow for final grading to the final cover subgrade elevations. The following subsections present the CCR dewatering and subgrade preparation activities.

The CQA Consultant's representative was on site part time (approximately once per month) to observe the dewatering and general grading operations.

3.1 DEWATERING AND DRAINING ASH IMPOUNDMENTS

The ash impoundments had varying degrees of moisture at the start of construction. Some areas were dry with sparse vegetation, while other areas were submerged in standing water. The first course of action to prepare the subgrade was to pump standing water from the impoundments.

Following removal of the free water from the NFA Pond, the contractor used two methods to further dewater the ash. One method consisted of trenching drainage channels to a low point, or sump, in the ash. This allowed the water to drain from the ash into the trench and flow to the collection sumps. The excavated ash from the trenches was stockpiled to allow pore water to drain from the ash piles, further dewatering the ash. As the ash dewatered, the trenches were deepened into the ash. When the bottom of the ash was encountered in the trench, a clean sand was placed in the bottom of the trench to convey additional pore water drainage to the sump pumps. The water that collected in the sumps was pumped either to one of the other ponds, or to Outfall 002, which discharges to the LBVSD.

The second method was used for approximately one month and consisted of installing a well point dewatering system in the NFA Pond. The contractor determined the well points system was less effective than the trenching method. Therefore, the well points system was removed and the Contractor continued the remainder of the ash dewatering using the trench and sump method.

Another method of dewatering, draining, and drying included excavating the wet ash and stockpiling in another location in the ash impoundment to allow the ash to dry. During these activities, ash was not moved between ponds; ash remained in the pond from which it originated.

The contractor used the trench and sump pump dewatering methods for the SFA and BA ponds.

3.2 MATERIAL MOVEMENT AND GRADING

Once the ash was dry enough to support the equipment used to grade the ash, the ash in each pond was graded. As with the dewatering activities, ash was not transferred between the ponds, but was graded within its respective pond. The ash was graded to the base of the cover elevations, which provide a gentle slope of approximately 1 percent or more, to drain surface water falling on the cap to one of five surface water outlets from the ash impoundments. Three outlets were located to drain the surface of the NFA Pond, and two outlets were provided to drain

the surface of the combined SFA and BA Ponds. The BA pond had a sixth breech that lowered the northern portion of the berm between the two southern ponds to allow storm water falling on the BA Pond to flow off of the cap, through the northern outlet for the SFA Pond. The outlets and breeching the ash impoundment embankments are discussed further in Section 7.1.

Low areas, where there was concern for excessively wet ash, were excavated and backfilled with sand/soil and ash to help solidify the material. The grading was completed with GPS equipped machinery to help achieve design grades. Minor fluctuations in elevations from the design grades were acceptable as long as the surface water would not pond on the cap of the ash impoundments.

During the grading, ash was not moved between ash impoundments, and care was taken to prevent storm water that contacted the ash from leaving the ash impoundments.

4 GEOSYNTHETIC CLAY LINER (GCL)

The contractor was given the option of constructing a prescriptive earthen cap or installing an alternate cap using a geosynthetic clay liner (GCL) as the impervious layer component of the final cover system. The GCL liner is a manufactured material consisting of a layer of bentonite clay sandwiched between two geotextile fabrics. The contractor elected to install the alternate cap.

The GCL was installed directly on top of the prepared subgrade (stabilized ash). Two types of GCL were used with this project: regular GCL and Coal Ash Resistance (CAR) GCL. The regular GCL was a bentonite material encased in a geotextile, and the CAR GCL included an amendment to the bentonite to provide more resistance from chemical interactions with liquid that has contacted the ash.

The regular GCL was utilized over the majority of the ash impoundments because the water flowing through the cap system and contacting the GCL would not be impacted by the ash. The CAR GCL was used in four areas where there was potential concern for hydrostatic uplift pressure on the final cover system that could cause impacted pore water to contact the underside of the GCL.

The CQA Consultant's representative was on site part time to observe the placement of the GCL and CAR GCL described above, and the covering of the GCL with the vegetative soil mix. Material inventory and manufacturer certifications were reviewed prior to installation. Copies can be found in **Appendix D**. The GCL was delivered to the site in rolls and was installed on the subgrade generally in a "shingled" pattern. Edges of the GCL panels were overlapped and loose granular bentonite was placed between the sheet overlaps. See **Appendix D** for a copy of the panel placement map.

After GCL placement, the material was covered with soil to protect the GCL during the ongoing construction. The soil was later amended to create the topsoil used to support the final vegetation. Exposed edges of GCL were covered with plastic to protect from rain when there was concern that rainwater could contact the GCL, which would prematurely hydrate the GCL.

Placement of GCL and soil in the NFA pond generally proceeded from the northwest corner toward the east and south. When the GCL installation was generally complete in the NFA Pond, the contractor began installing the GCL in the SFA Pond from north to south in the northern portion of the pond, and from south to north for the southern portion of the pond, with the dewatering trenches being covered last. After the trenched areas were backfilled with ash, the final GCL was placed in the SFA Pond. Following completion of GCL placement in the SFA pond, GCL was placed over the BA Pond, generally from south to north, following the final cap grades.

Two of the three outlet areas in the NFA pond and both outlets in the SFA pond required CAR GCL to be installed above the under-drain system. The CAR GCL, in lieu of regular GCL, was installed above the pressure relief system, further described in Section 7.2.

5 TOPSOIL

The topsoil component of the final cover system was required under the CCR regulations to be at least 6 inches thick. For the GCL alternate cap option, SCS required a minimum topsoil layer of 12 inches or more to sustain vegetation.

The topsoil was created by first laying down a clayey soil material to protect the GCL materials, as described in Section 4. As weather permitted and the time was close to the desirable season for seeding, a sand material was placed over the clayey soil, and the approximate 50/50 combination of clayey soil and sand were mixed together to form the topsoil layer. A disc and a spring-tooth harrow were used to mix the two materials, creating the topsoil layer with a measured thickness of at least 12 inches.

Prior to placement, laboratory testing was conducted on the 50/50 composite mixture of the clay and sand materials to confirm the mixture met the gradation requirements for the topsoil component. Nutrients were also tested to determine what, if any, soil amendments were needed. Copies of these laboratory results are included in **Appendix E**.

The depth of the topsoil was verified after the field mixing was completed by digging test pits or pot holes to the GCL layer at various locations on the final cover system of each pond. The total thickness of soil overlying the GCL and the thickness of the mixed topsoil layer were field measured, then the topsoil placed back into the test pits. A total of 55 test pits were dug throughout the three impoundments, including 24 in the NFA Pond, 21 in the SFA Pond, and 10 in the BA Pond.

The final topsoil product consist of two layers, because the harrow could not be used through the entire topsoil thickness without possibly damaging the GCL layer. A map showing the approximate locations of the thickness verification test pits is included in **Appendix E**. In each test location, the total soil thickness overlying the GCL exceeded 12 inches. In general, the thickness of the mixed soil was at generally 12 inches thick.

6 VEGETATION

After the topsoil placement, the cap and disturbed areas were seeded. The soil was analyzed to determine the recommended amendments, copies of these reports and recommendations are included in **Appendix E**. Soil amendments were added to increase the nutrient content and lower the soil acidity in accordance with testing provided in the project submittal.

The seed was an 80 percent Tall Fescue with 20 percent Red Clover seed mixture, applied at a rate of 4 pounds per 1,000 square feet. A cultipacker type seeder was used to place the seed. The seeded areas were then mulched and crimped. A copy of the seeding plan is included in **Appendix E**.

7 BERM OUTLET AREAS AND PRESSURE RELIEF SYSTEM

The impoundments were closed using the inverted bowl method designed by SCS. The advantage of this method is that it limits the amount of fill required to achieve design grades, by grading the final cover system to drain to one or more existing low points in existing ash topography, as opposed to grading the ash into a mound. After the ash was graded and the majority of the final cover system placed over the ash, a portion of the existing berm at the low point was removed to allow storm water falling on the final cover to runoff without ponding on the ash impoundment cap.

7.1 BERM BREECH AND OUTLET AREAS

As stated previously in Section 3.2, the ash impoundment embankments were breeched in six locations to facilitate drainage from the final cap, of which five act as outlets to funnel water off of the cap system. Three breeches were made in the NFA Pond cap and two breeches were made in the SFA Pond cap. One breech of the BA Pond embankment was made through the berm between the SFA and BA Ponds to facilitate the drainage of the BA Pond through the northern outlet in the SFA Pond cap.

The location of the breeches were based on the low points of the ash topography. When the berm was removed, the edge of the ash moved inward from the berm, leaving a wide area of compacted clay soil between the edge of the final cap and the outside slope of the embankment. Riprap was not placed over the compacted clay because it was not needed for either erosion control or uplift resistance as discussed in the following section.

Riprap was placed on four of the five outlet areas (two on the NFA Pond cap and two on the SFA Pond cap). The riprap placement generally included a 6-inch thick aggregate bedding layer overlain by a 18-inch thick riprap layer. The gradation of the bedding and riprap layers were visually observed by the CQA Consultant and determined to be sufficient to meet the project requirements. In areas where riprap was placed, an 8-ounce/square yard geotextile was placed over the GCL before the small aggregate bedding layer was placed (approximately 6 inches thick), followed by the larger diameter riprap layer (approximately 18 inches thick).

7.2 PRESSURE RELIEF SYSTEM

During the design phase of this closure project, SCS noted a possible concern for hydrostatic uplift pressures to form beneath the final cover system, especially in the low areas where ash was excavated to allow storm water to flow off the cap. SCS determined the weight of the alternate cap alone might be insufficient to resist the possible uplift pressures. Therefore, SCS added the riprap specification over the final cap in the low areas to serve as dead weight to resist possible uplift pressures and to act as an erosion protection layer for the cap in these areas where runoff is concentrated. Additionally, the pressure relief system was added to provide a means to remove water causing the hydrostatic uplift, without damaging the final cover system. The GCL in the areas of the pressure relief system was Coal Ash Resistant GCL to help prevent degradation of the regular GCL in these areas where the uplift pressure could bring ash-impacted water in contact with the cover system.

The pressure relief system included a trench near the outlet with sand bedding and a high density polyethylene (HDPE) DR 17 pipe. The pipe section placed in the trench within the ash impoundment was perforated, and was solid pipe at the 90 degree turn passing through the earthen berm forming the ash impoundment embankment. A flange was located on the end of the pipe, a valve installed to open and close the pressure relief system, and a pressure port installed in the pressurized portion of the system to check for pressure increases. The remainder of the pressure relief system was constructed to allow pore water under the final cover system to drain towards this pipe. The final cover and pressure relief system from top to bottom consisted of:

- 18-inch minimum thickness riprap layer,
- 6-inch minimum thickness aggregate bedding rock layer,
- 8-ounce per square yard non-woven geotextile,
- CAR GCL, and
- 200-mil double-sided geocomposite (200-mil geonet with 8-ounce per square yard non-woven geotextile on each side).

A detail with the general design requirements for the pressure relief system and a map showing the approximate locations where CAR GCL was installed is included in **Appendix A**.

8 CLEAN CLOSURE AREA AND SEDIMENTATION BASIN

This section discusses the Clean Closure of the southern approximately 2.7 acres of the BA Pond. Following clean closure of this area, a sedimentation basin was constructed in the clean closure footprint by the placement of a low permeability soil liner.

Sedimentation basin construction is not regulated by the CCR rule or Missouri Regulations as water discharges to the LBVSD through Outfall 002 and therefore construction activities are summarized but not discussed in detail with this report.

8.1 CLEAN CLOSURE

In accordance with the CCR Federal Rule [40 CFR Part 257.100], a portion of the BA Pond was "Clean Closed" (per 40 CFR Part 257.100(b)(5)). Under the Federal CCR Rule, clean closure requires the removal of the CCR, any liner that may be present, and soil impacted by the ash.

The BA Pond was designed in 1977 and constructed in 1978. The 1977 Geotechnical Information Report (boring logs and laboratory test data) from the design were provided by IP&L and indicated the foundation soils are high plastic alluvial clays with a permeability in the range of approximately $2x10^{-7}$ to $1x10^{-8}$ centimeters per second (cm/sec). Construction drawings and specifications were unable to be located. Without the construction documents or record drawings, it is unknown whether a liner system was installed under the ash impoundment.

In accordance with the Federal CCR Rule and based on the assumed foundation soil conditions as noted above, the clean closure activities took place in four stages:

1. Ash removal: Removal of the existing ash from the closure area;
2. Liner exploration: Examination of the bottom of the clean closure area to determine if a liner system was present;
3. Clean closure sampling: Sampling of the foundation/bottom of the clean closure area and laboratory analysis to determine if the ash and potentially impacted soils were present and subsequently removed; and
4. Closure sample testing and analytical results evaluation: Laboratory testing and review of the sampling results.

The clean closure area consisted of approximately 2.7 acres of the southern portion of the BA Pond impoundment. The contractor excavated the ash from the impoundment down to the underlying native alluvial clays forming the bottom of the impoundment. The ash excavated from this area was relocated to the north portion of the BA Pond impoundment as part of the final grading for future capping of the ash impoundment.

To determine if a liner system was present under the former bottom ash impoundment, SCS observed the excavation of seven test pits in two phases as the ash excavation progressed (on January 12, 2017 and February 6, 2017). The test pits were visually observed and photographed by a professional geotechnical engineer to determine if there was evidence of a liner system in

the BA Pond impoundment. Visual observation of the test pits did not reveal evidence that a liner system was present on top of the native alluvial clays described in 1977 Geotechnical Information Report. Test pits excavated on the west half of the impoundment visually indicated the presence of native clays, approximately 6 to 12 inches deep, that may have been impacted by the bottom ash. To provide a level base for the new sedimentation basin lining system materials were excavated to an elevation of approximately 747.75 feet mean sea level across the base of the clean closure area.

During the excavation of the seven test pits to explore for a liner system, soil samples were collected from the foundation soils in each test pit. These samples were analyzed to determine if the foundation soils were potentially impacted by the overlying CCR. The results of the clean closure documentation is summarized in a memo included in **Appendix F**. The locations of the test pits are shown on the Figure 1 of the clean closure memo in **Appendix F**. Soil samples were generally collected from depths of 0 to 12 inches, 12 to 24 inches, and 24 to 36 inches below the bottom of the ash excavation. In the test pits on the western portion of the pond bottom, where it was determined that additional excavation would take place, three soil samples were collected from the indicated depths below the soil to be removed at each of the three test pits.

For comparison purposes, three test pits were excavated in the area up gradient and west of the BA Pond impoundment to collect samples of the alluvial clays from the bottom of the borrow area used during the initial pond construction. The elevation of the background test pits and the test pits in the bottom of the ash pond were similar elevations, and the soils appeared similar in visual appearance and color and of a similar soil classification.

The observations of the clean closure test pits and the laboratory data indicate no evidence a liner system was installed during construction of the former bottom ash impoundments. SCS observed the removal of the ash from the clean closure area and soil that visually appeared to have been possibly impacted by the storage of ash. It is SCS's professional opinion that the designated 2.7-acre area of the former BA Pond impoundment has been closed using the "Clean Closure" measures outlined in the Federal CCR Rule [40 CFR Part 257.100(b)(5)].

The results of the analytical testing and analysis of the data are summarized in a memorandum dated May 17, 2017, provided in **Appendix F**.

8.2 SEDIMENTATION BASIN CONSTRUCTION

The sedimentation basin does not require a wastewater permit from the state of Missouri, because the discharge from the pond is to a publicly owned treatment works (POTW). At the request to the Missouri Department of Natural Resources (MDNR), on behalf of IP&L, SCS submitted the closure plans and specifications (which included the sedimentation basin construction) to MDNR for their review to confirm the sedimentation basin was an engineered structure.

The sedimentation basin was constructed to treat plant water and runoff from the coal yard prior to discharge to the LBVSD through Outfall 002. The piping from the plant enters the sedimentation basin in the southwest corner of the basin. The pipe from the coal yard, that

previously discharged into the BA Pond, was modified with the installation of a new manhole to allow the water from the coal yard to enter the sedimentation basin in the northeast corner of the basin. Water from the sedimentation basin discharges into the existing LBVSD outfall (Outfall 002) that was previously used when the BA Pond served as the site sedimentation basin.

Following the clean closure determination for the sedimentation basin footprint, the contractor removed additional foundation soil to achieve the design subgrade elevation for the compacted clay liner of the sedimentation basin.

The contractor constructed a divider berm between sedimentation basin and the BA Pond. The divider berm was constructed to confine the bottom ash to the north of the sedimentation basin so that the northern berm of the sedimentation basin would not be constructed on or over bottom ash, in compliance with Federal regulations. The divider berm included the clay liner system.

The contractor then placed the 12-inch thick low permeability soil liner and conducted nuclear density testing to check for permeability of the soil liner system. The liner was constructed over the east and west sidewalls and the bottom of the excavation. Based on field conditions and concerns of elevated groundwater levels in fill located south of the sedimentation basin, a field modification was made to the southern slope to be a more robust soil buttress with additional riprap added at the toe of the slope. Additionally, a pressure relief groundwater interceptor trench was also constructed to help alleviate potential pressure build up behind the buttress on the southern slope.

IP&L elected to have the contractor install riprap on the clay embankment for both erosion protection and to control vegetation and maintenance on the sedimentation pond side slopes.

9 OTHER SITE ACTIVITIES

As part of the ash impoundments closure project, the following other activities were conducted.

9.1 ROAD REGRADING

The embankment crests for the ash ponds were previously paved with gravel to allow for vehicle crossings around the site for maintenance, as well as for access of heavy equipment to serve the power lines crossing over the closed ponds. Since access around the impoundments for maintenance is no longer needed, most of the gravel roads were removed as part of the closure, except for the gravel roads needed to access the power poles for the power transmission line(s).

9.2 SIDE SLOPE GRADING

As part of the design, where the crest elevation of the embankment was being lowered as part of the final cap grading, the contractor flattened certain side slopes to allow for easier maintenance of the remaining slopes.

9.3 PUMP HOUSE ABANDONMENT

The pump house located at the north end of the BA Pond included pumps to distribute ash sluice water from the plant to the various ponds, and to return sluice water from the ponds back to the plant.

Prior to the start of the closure activities, IP&L removed the pumps and salvageable electrical equipment from the pump house. When the dewatering activities for the BA Pond were complete, the contractor pumped grout into the line into the pump house and installed blank flanges on the pipes. The pipes were grouted and blank-flanged to prevent pore water from the ash under the cap from seeping out of the ponds through the old process piping. Following pipe grouting, the pump house pit was backfilled with clean gravel.

10 SURVEY

The contractor used GPS-controlled dozers to grade the ash and topsoil to the design grades. The Contractor provided surveys of the clean closure area and locations of the test pits for topsoil thickness verification and the pressure relief system valves.

Following completion of the final cover system, the contractor completed a final topographic survey of the cap on each pond. A copy of the final as-built topographic survey is presented in **Appendix G**.

11 POST-CLOSURE CARE PLAN [40 CFR 257.104(d)]

A Post-Closure Care Plan was prepared for the former Blue Valley CCR Surface Impoundments as is a separate document. The plan was prepared by SCS Engineers dated January 2018.

12 GENERAL COMMENTS AND CONCLUSIONS

This Closure Report summarizes the construction activities related to closure of three ash impoundments at the Blue Valley Power Station in Independence, Missouri. The closure construction was observed by the CQA Consultant on a part time basis and documented by photographs in **Appendix C**. Other information included in this report, not observed by the CQA Consultant, was provided by the Contractor or the Facility Owner.

Certification of this closure report does not relieve the Facility Owner from appropriately managing, reporting, and/or documenting any legal requirements of the CCR Rule and the Post-Closure Care Plan (Section 11).

Appendix A

Construction Design Drawings with As-Built Notes

A1: Design Drawings with Construction As-Built Notes
A2: Pressure Relief System

A1: Design Drawings with Construction As-Built Notes

INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION

ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI
FEBRUARY 2016

SITE LOCATION MAP

PREPARED FOR:

INDEPENDENCE POWER & LIGHT

21500 E. TRUMAN RD
INDEPENDENCE, MISSOURI

PREPARED BY:

SCS AQUATERRA

MISSOURI STATE CERTIFICATE OF AUTHORITY #935
PROJECT NUMBER 27215142.00
7311 W. 130 ST., SUITE 100
OVERLAND PARK, KANSAS 66213
PH (913) 681-0030 FAX NO. (913) 681-0012
WWW.SCSENGINEERS.COM

Sheet List Table

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LEGEND:

- APPROXIMATE ASH IMPOUNDMENT BOUNDARY
- FENCE (APPROXIMATE)
- EXISTING ROAD
- RAILROAD TRACKS
- OHE — OVERHEAD ELECTRIC (APPROXIMATE)
- POWER / LIGHT POLE
- PLANT WATER/CONTACT WATER PIPELINES
- COAL PILE WATER UNDERGROUND PIPING
- ABOVEGROUND PIPING

NOTES:

1. AERIAL IMAGE FROM SHAFER, KLINE, & WARREN, INC. DATED JULY 2015.
2. ASH IMPOUNDMENT BOUNDARIES, FENCING, EXISTING ROADS, RAILROAD TRACKS, STRUCTURES, AND UTILITIES ARE APPROXIMATE.
3. UTILITY LOCATIONS WILL BE VERIFIED BY CONTRACTOR PRIOR TO CONSTRUCTION.
4. OVERHEAD POWER LINE TO BE REMOVED BY INDEPENDENCE POWER & LIGHT BEFORE START OF CONSTRUCTION.

NORTH FLY ASH IMPOUNDMENT

SOUTH FLY ASH IMPOUNDMENT

BOTTOM ASH IMPOUNDMENT

POWER POLE

OVERHEAD POWER LINE SEE NOTE 4

STORM WATER CULVERT

UNDERGROUND PIPING FROM PUMP HOUSE AND BOTTOM ASH POND

PUMP STRUCTURE (CONCRETE)

METAL PUMP HOUSE BUILDING

MANHOLE

DISCHARGE PIPE FROM COAL PILE

UNDERGROUND PIPE WITH STORM WATER FROM COAL YARD

OUTLET STRUCTURE TO LITTLE BLUE VALLEY SEWER DISTRICT (ELEVATION NOT DEPICTED)

FUTURE SEDIMENTATION BASIN (AREA TO BE CLEAN CLOSED)

COAL YARD

ABOVEGROUND PIPE

PLANT WASTE WATER PIPE TRANSITION TO UNDERGROUND PIPE

PLANT WASTE WATER ABOVEGROUND PIPE

INLET STRUCTURE FOR PLANT WASTE WATER (CONCRETE STRUCTURE)

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ORIGINAL SUBMITTAL

SHEET TITLE
AERIAL SURVEY

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
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BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

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DSN. BY: RDT
DWN. BY: RDT
CHK. BY: PMG
Q/A RVW BY: PMG
PROJ. MGR PMG

CADD FILE: D2 AERIAL.DWG

DATE: 2/3/16

DRAWING NO. **2** of 15

LEGEND:

- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- APPROXIMATE ASH IMPOUNDMENT BOUNDARY
- FENCE (APPROXIMATE)
- EXISTING ROAD
- RAILROAD TRACKS
- OVERHEAD ELECTRIC (APPROXIMATE)
- POWER / LIGHT POLE
- PLANT WATER/CONTACT WATER PIPELINES
- COAL PILE WATER UNDERGROUND PIPING
- ABOVEGROUND PIPING

NOTES:

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NORTH FLY ASH IMPOUNDMENT BOUNDARY
POWER POLE
NORTH FLY ASH IMPOUNDMENT
OVERHEAD POWER LINE SEE NOTE 4
SOUTH FLY ASH IMPOUNDMENT BOUNDARY
SOUTH FLY ASH IMPOUNDMENT
POWER POLE
STORM WATER CULVERT
UNDERGROUND PIPING FROM PUMP HOUSE AND BOTTOM ASH POND
BOTTOM ASH IMPOUNDMENT
POWER POLE
MANHOLE
DISCHARGE PIPE FROM COAL PILE
MANHOLE
UNDERGROUND PIPE WITH STORM WATER FROM COAL YARD
OUTLET STRUCTURE TO LITTLE BLUE VALLEY SEWER DISTRICT (ELEVATION NOT DEPICTED)
COAL YARD
PUMP STRUCTURE (CONCRETE)
METAL PUMP HOUSE BUILDING
BOTTOM ASH IMPOUNDMENT BOUNDARY
PLANT WASTE WATER PIPE TRANSITION TO UNDERGROUND PIPE
ABOVEGROUND PIPE
PLANT WASTE WATER ABOVEGROUND PIPE
INLET STRUCTURE FOR PLANT WASTE WATER (CONCRETE STRUCTURE)
POWER POLE

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SHEET TITLE
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PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

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RDT	PMG	PMG

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2/3/16

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3 of **15**

NOTES:

1. TOPOGRAPHIC SURVEY FROM SHAFER, KLINE, & WARREN, INC. DATED JULY 2015.
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- EXISTING 1' CONTOUR
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- FENCE (APPROXIMATE)
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- OVERHEAD ELECTRIC (APPROXIMATE)
- POWER / LIGHT POLE
- PLANT WATER/CONTACT WATER PIPELINES
- COAL PILE WATER UNDERGROUND PIPING
- ABOVEGROUND PIPING

NORTH FLY ASH IMPOUNDMENT BOUNDARY

POWER POLE

NORTH FLY ASH IMPOUNDMENT

OVERHEAD POWER LINE SEE NOTE 4

SOUTH FLY ASH IMPOUNDMENT BOUNDARY

POWER POLE

SOUTH FLY ASH IMPOUNDMENT

STORM WATER CULVERT

UNDERGROUND PIPING FROM PUMP HOUSE AND BOTTOM ASH POND

METAL PUMP HOUSE BUILDING

PUMP STRUCTURE (CONCRETE)

BOTTOM ASH IMPOUNDMENT

BOTTOM ASH IMPOUNDMENT BOUNDARY

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EXISTING NORTH ASH IMPOUNDMENT

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DSN. BY: RDT				

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D3-D5 EXISTING CONDITIONS.DWG

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2/3/16

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4 of **15**

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NOTES:

1. TOPOGRAPHIC SURVEY FROM SHAFER, KLINE, & WARREN, INC. DATED JULY 2015.
2. ASH IMPOUNDMENT BOUNDARIES, FENCING, EXISTING ROADS, RAILROAD TRACKS, STRUCTURES, AND UTILITIES ARE APPROXIMATE.
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- EXISTING 1' CONTOUR
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- ABOVEGROUND PIPING

SOUTH FLY ASH IMPOUNDMENT BOUNDARY

OVERHEAD POWER LINE SEE NOTE 4

POWER POLE

SOUTH FLY ASH IMPOUNDMENT

STORM WATER CULVERT

UNDERGROUND PIPING FROM PUMP HOUSE AND BOTTOM ASH POND

BOTTOM ASH IMPOUNDMENT

METAL PUMP HOUSE BUILDING

PUMP STRUCTURE (CONCRETE)

BOTTOM ASH IMPOUNDMENT BOUNDARY

NORTH FLY ASH IMPOUNDMENT BOUNDARY

POWER POLE

MANHOLE

DISCHARGE PIPE FROM COAL PILE

MANHOLE

OUTLET STRUCTURE TO LITTLE BLUE VALLEY SEWER DISTRICT (ELEVATION NOT DEPICTED)

UNDERGROUND PIPE WITH STORM WATER FROM COAL YARD

INLET STRUCTURE FOR PLANT WASTE WATER (CONCRETE STRUCTURE)

PLANT WASTE WATER PIPE TRANSITION TO UNDERGROUND PIPE

ABOVEGROUND PIPE

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SHEET TITLE
EXISTING SOUTH ASH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

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BLUE VALLEY POWER STATION
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SCS AQUATERRA
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PH. (913) 681-0030 FAX. (913) 681-0012

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DWN. BY:	RDT		
CHK. BY:	PMG		

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D3-D5 EXISTING CONDITIONS.DWG

DATE:
2/3/16

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5 of **15**

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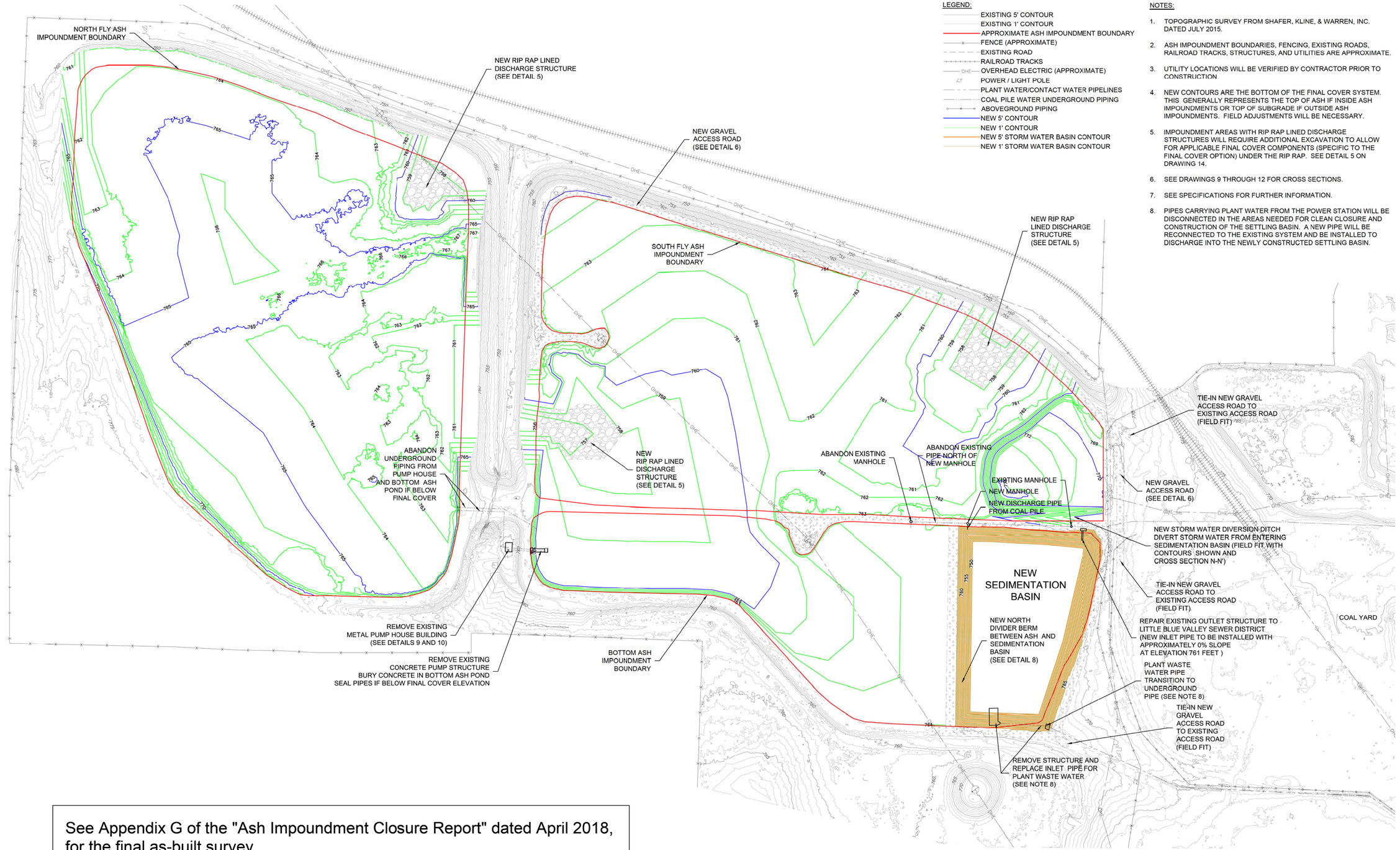

LEGEND:

- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- APPROXIMATE ASH IMPOUNDMENT BOUNDARY
- FENCE (APPROXIMATE)
- EXISTING ROAD
- RAILROAD TRACKS
- OHE OVERHEAD ELECTRIC (APPROXIMATE)
- POWER / LIGHT POLE
- PLANT WATER/CONTACT WATER PIPELINES
- COAL PILE WATER UNDERGROUND PIPING
- ABOVEGROUND PIPING
- NEW 5' CONTOUR
- NEW 1' CONTOUR
- NEW 5' STORM WATER BASIN CONTOUR
- NEW 1' STORM WATER BASIN CONTOUR

NOTES:

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4. NEW CONTOURS ARE THE BOTTOM OF THE FINAL COVER SYSTEM. THIS GENERALLY REPRESENTS THE TOP OF ASH IF INSIDE ASH IMPOUNDMENTS OR TOP OF SUBGRADE IF OUTSIDE ASH IMPOUNDMENTS. FIELD ADJUSTMENTS WILL BE NECESSARY.
5. IMPOUNDMENT AREAS WITH RIP RAP LINED DISCHARGE STRUCTURES WILL REQUIRE ADDITIONAL EXCAVATION TO ALLOW FOR APPLICABLE FINAL COVER COMPONENTS (SPECIFIC TO THE FINAL COVER OPTION) UNDER THE RIP RAP. SEE DETAIL 5 ON DRAWING 14.
6. SEE DRAWINGS 9 THROUGH 12 FOR CROSS SECTIONS.
7. SEE SPECIFICATIONS FOR FURTHER INFORMATION.
8. PIPES CARRYING PLANT WATER FROM THE POWER STATION WILL BE DISCONNECTED IN THE AREAS NEEDED FOR CLEAN CLOSURE AND CONSTRUCTION OF THE SETTLING BASIN. A NEW PIPE WILL BE RECONNECTED TO THE EXISTING SYSTEM AND BE INSTALLED TO DISCHARGE INTO THE NEWLY CONSTRUCTED SETTLING BASIN.

See Appendix G of the "Ash Impoundment Closure Report" dated April 2018, for the final as-built survey.

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6	2/2016	PMG

CRIGINAL SUBMITTAL

SHEET TITLE
NEW BASE OF FINAL COVER GRADE

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
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DATE:
5/25/18

DRAWING NO.
6 of **15**

REGRADE STEEP EMBANKMENT AREA TO SHALLOWER SLOPES (SEE DETAIL 3)

NORTH FLY ASH IMPOUNDMENT BOUNDARY

REGRADE STEEP EMBANKMENT AREAS TO SHALLOWER SLOPES (SEE DETAIL 3)

NEW RIP RAP LINED DISCHARGE STRUCTURE (SEE DETAIL 5)

REGRADE STEEP EMBANKMENT AREAS TO SHALLOWER SLOPES (SEE DETAIL 3)

NEW GRAVEL ACCESS ROAD (SEE DETAIL 6)

SOUTH FLY ASH IMPOUNDMENT BOUNDARY

See Appendix G of the "Ash Impoundment Closure Report" dated April 2018, for the final as-built survey.

BOTTOM OF NEW FINAL COVER ELEVATIONS (SEE DETAIL 1)

REGRADE STEEP EMBANKMENT AREAS TO SHALLOWER SLOPES (SEE DETAIL 3)

ABANDON UNDERGROUND PIPING FROM PUMP HOUSE AND BOTTOM ASH POND IF BELOW FINAL COVER

NEW RIP RAP LINED DISCHARGE STRUCTURE (SEE DETAIL 5)

REMOVE EXISTING CONCRETE PUMP STRUCTURE BURY CONCRETE IN BOTTOM ASH POND SEAL PIPES IF BELOW FINAL COVER ELEVATION

REGRADE STEEP EMBANKMENT AREAS TO SHALLOWER SLOPES (SEE DETAIL 3)

REMOVE EXISTING METAL PUMP HOUSE BUILDING (SEE DETAILS 9 AND 10)

BOTTOM ASH IMPOUNDMENT BOUNDARY

REGRADE STEEP EMBANKMENT AREAS TO SHALLOWER SLOPES (SEE DETAIL 3)

LEGEND:

- EXISTING 5' CONTOUR
- EXISTING 1' CONTOUR
- APPROXIMATE ASH IMPOUNDMENT BOUNDARY
- FENCE (APPROXIMATE)
- EXISTING ROAD
- RAILROAD TRACKS
- OVERHEAD ELECTRIC (APPROXIMATE)
- POWER / LIGHT POLE
- PLANT WATER/CONTACT WATER PIPELINES
- COAL PILE WATER UNDERGROUND PIPING
- ABOVEGROUND PIPING
- NEW 5' CONTOUR
- NEW 1' CONTOUR
- NEW 5' STORM WATER BASIN CONTOUR
- NEW 1' STORM WATER BASIN CONTOUR

SCALE: 60 0 60 120 FEET

NOTES:

1. TOPOGRAPHIC SURVEY FROM SHAFER, KLINE, & WARREN, INC. DATED JULY 2015.
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5. IMPOUNDMENT AREAS WITH RIP RAP LINED DISCHARGE STRUCTURES WILL REQUIRE ADDITIONAL EXCAVATION TO ALLOW FOR APPLICABLE FINAL COVER COMPONENTS (SPECIFIC TO THE FINAL COVER OPTION) UNDER THE RIP RAP. SEE DETAIL 5 ON DRAWING 14.
6. SEE DRAWINGS 9 THROUGH 12 FOR CROSS SECTIONS.
7. SEE SPECIFICATIONS FOR FURTHER INFORMATION.
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5	2/2016	PMG

CRIGINAL SUBMITTAL

SHEET TITLE
NEW NORTH ASH IMPOUNDMENT

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St, Ste. 100
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CADD FILE:
D6-D8 PROPOSED CONDITIONS.DWG

DATE:
5/25/18

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7 of **15**

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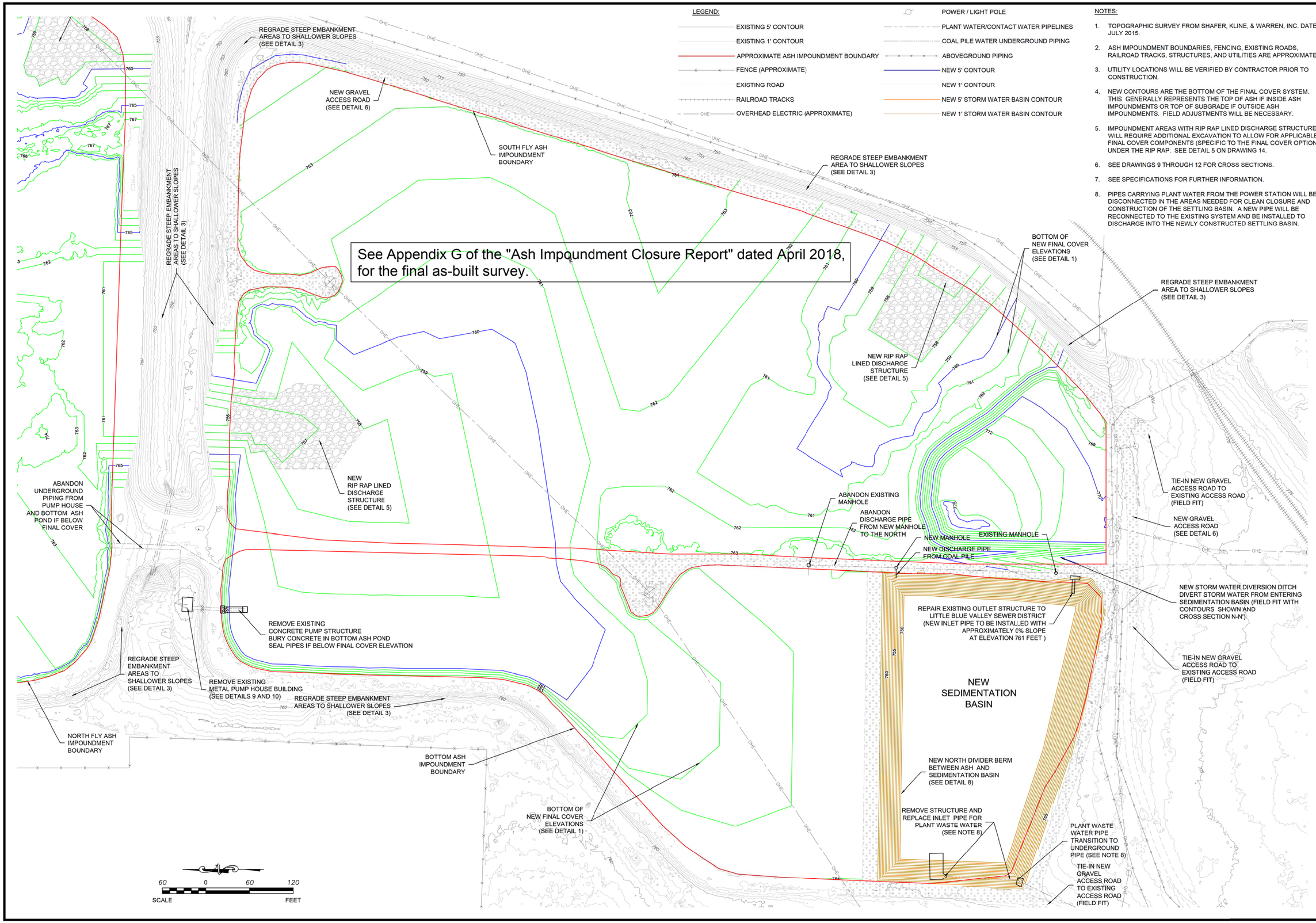

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E	-	-
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CRIGINAL SUBMITTAL

SHEET TITLE
NEW SOUTH ASH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

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BLUE VALLEY POWER STATION
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272151142.00	RDT	PMG
DSN. BY:	CHK. BY:	PROJ. MGR
RDT	PMG	PMG

CADD FILE:
D6-D8 PROPOSED CONDITIONS.DWG

DATE:
5/25/18

DRAWING NO.
8 of **15**

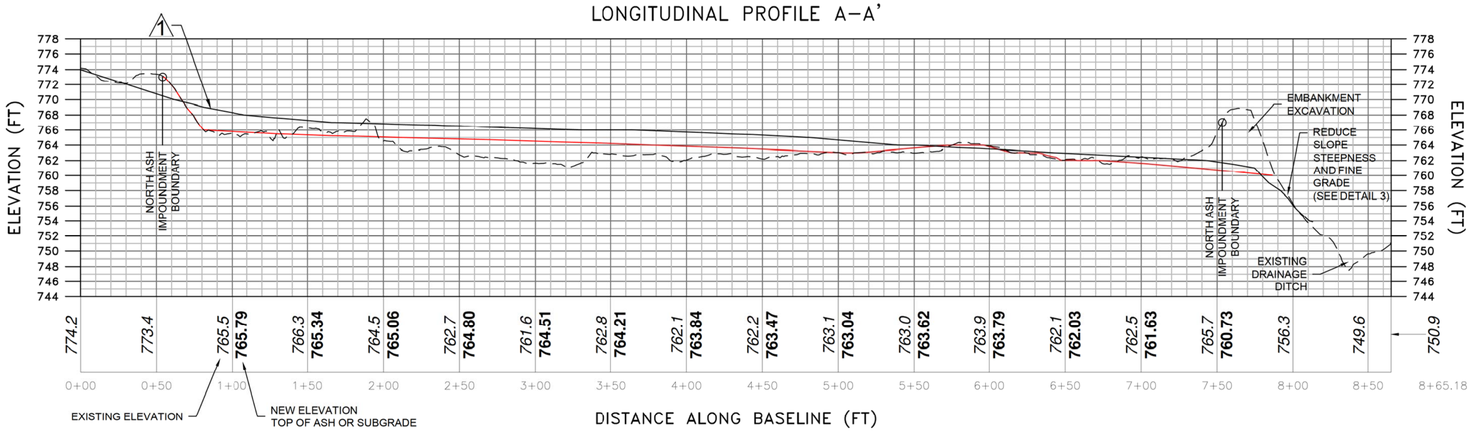
LEGEND

- EXISTING GRADE
- DESIGN TOP OF SUB-GRADE
- AS-BUILT FINAL GRADE ⚠

NOTES:

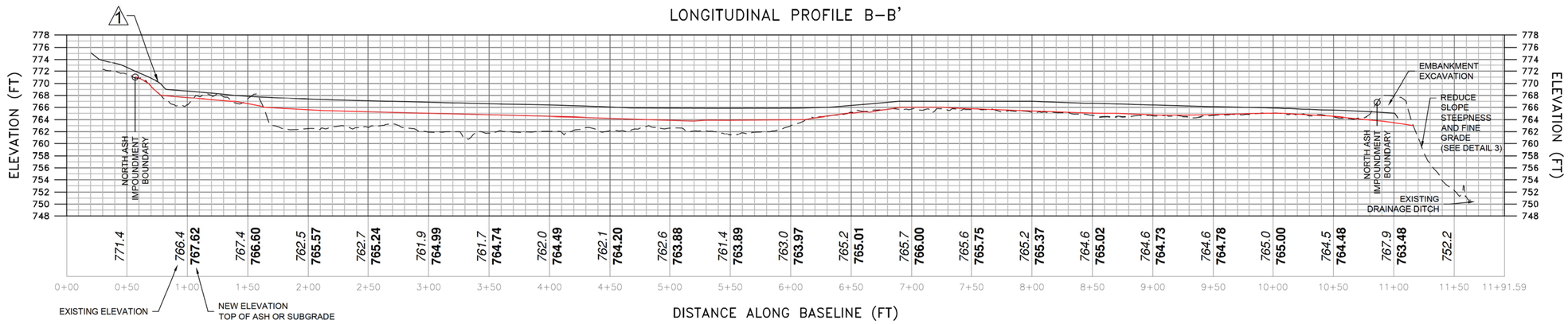
1. IMPOUNDMENT BOUNDARIES ARE APPROXIMATE.
2. FINAL COVER EXTENDS TO LIMITS OF ASH WHERE CAP TIES INTO EXISTING CLAY EMBANKMENT.

LONGITUDINAL PROFILE A–A'



PROFILE SCALE:
HORIZ: 1"=50'
VERT: 1"=10'

LONGITUDINAL PROFILE B–B'



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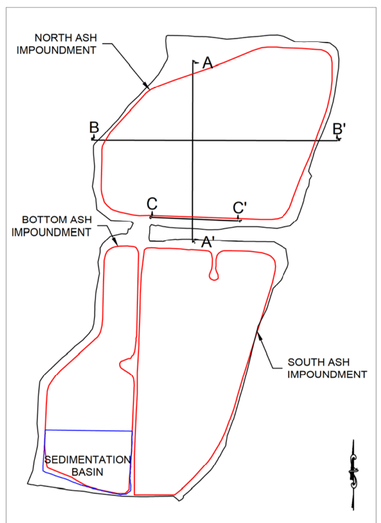

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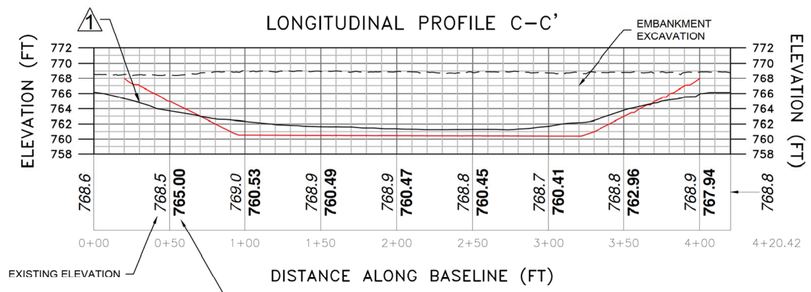

PROFILE SCALE:
HORIZ: 1"=50'
VERT: 1"=10'

50 0 50 100 FEET
SCALE
20 10 0 10 FEET
SCALE

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6	2/2016	PMG

CRIGINAL SUBMITTAL

SHEET TITLE
CROSS SECTIONS 1 - NORTH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

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7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH: (913) 681-0030 FAX: (913) 681-0012

PROJ. NO. 272151142.00
DSN. BY: RDT
DWN. BY: RDT
CHK. BY: PMG
Q/A R/W BY: PMG
PROJ. MGR PMG

CADD FILE:
D9-D12-CROSSSECTIONS.DWG

DATE:
5/25/18

DRAWING NO.
9 of **15**

LEGEND

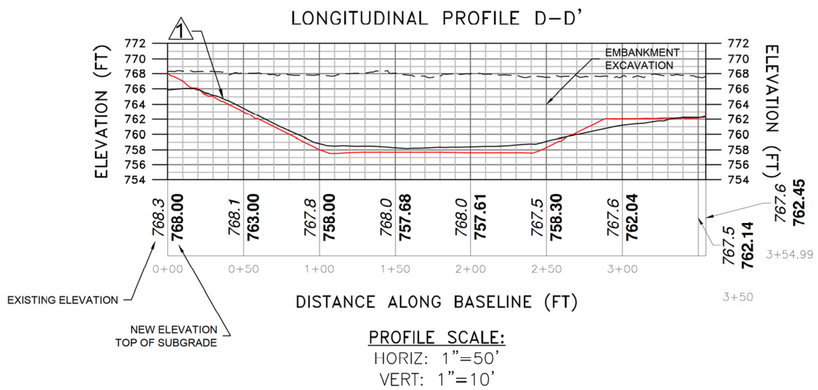
EXISTING GRADE

DESIGN TOP OF SUB-GRADE

AS-BUILT FINAL GRADE ⚠

NOTES:

1. IMPOUNDMENT BOUNDARIES ARE APPROXIMATE.
2. FINAL COVER EXTENDS TO LIMITS OF ASH WHERE CAP TIES INTO EXISTING CLAY EMBANKMENT.



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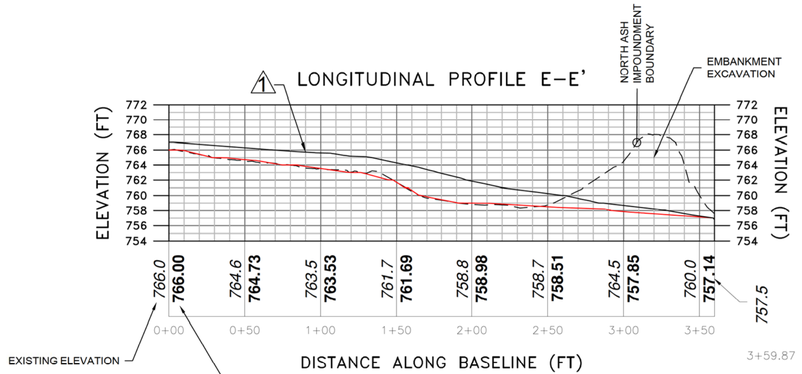

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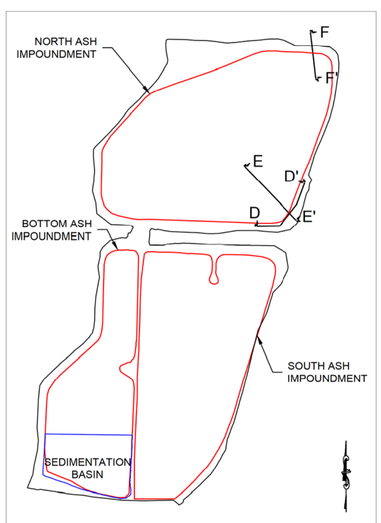

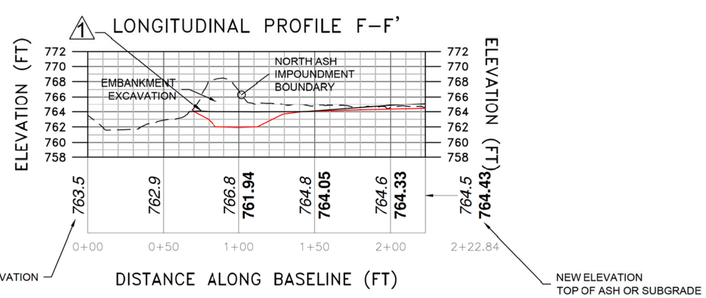

PROFILE SCALE:
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VERT: 1"=10'

SCALE: 50 0 50 100 FEET

SCALE: 20 10 0 10 FEET

REV.	DATE	CK. BY
1	–	–
2	–	–
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4	–	–
5	–	–
6	2/2016	PMG

CRIGINAL SUBMITTAL

SHEET TITLE
CROSS SECTIONS 2 - NORTH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DWN. BY:	D/A RVW BY:
27215142.00	RDT	PMG
DSN. BY:	CHK. BY:	PROJ. MGR
RDT	PMG	PMG

CADD FILE:
D9-D12-CROSSSECTIONS.DWG

DATE:
5/25/18

DRAWING NO.
10 of **15**

N:\City of Independence\Independence Power & Light\Projects\27215142.00 - Ash Pond Closure Design\Solar Panel Assistence\D9-D12-CrossSections.dwg May 25, 2018 - 3:24pm Layout Name: 10 Cross Sections 2 - North Impoundments By: 4470d_w

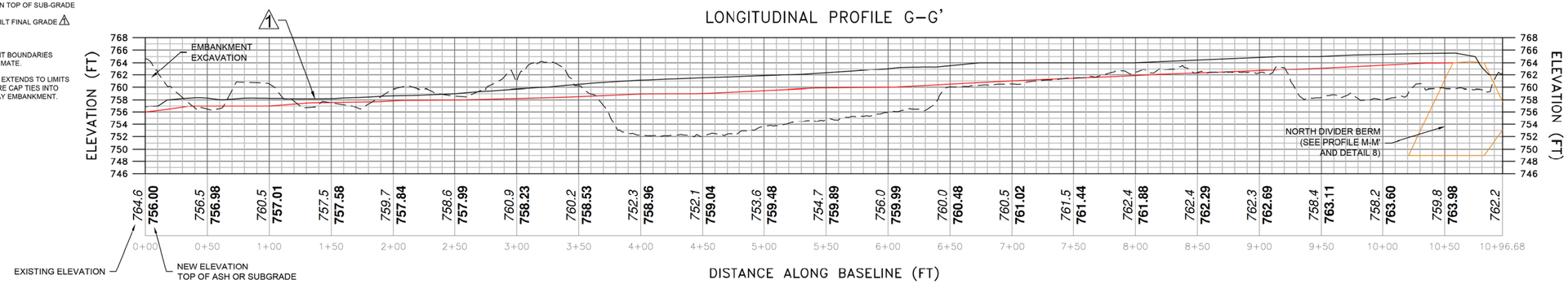
LEGEND

- EXISTING GRADE
- DESIGN TOP OF SUB-GRADE
- AS-BUILT FINAL GRADE ⚠1

NOTES:

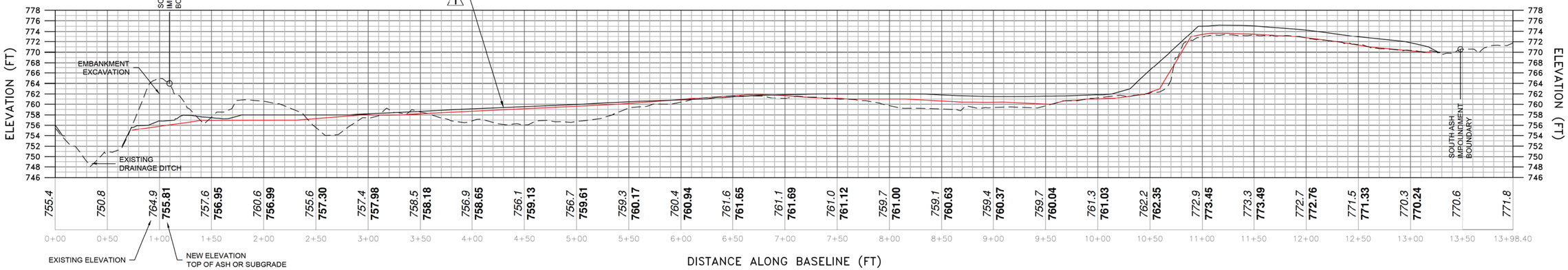
1. IMPOUNDMENT BOUNDARIES ARE APPROXIMATE.
2. FINAL COVER EXTENDS TO LIMITS OF ASH WHERE CAP TIES INTO EXISTING CLAY EMBANKMENT.

LONGITUDINAL PROFILE G–G'



PROFILE SCALE:
HORIZ: 1"=50'
VERT: 1"=10'

LONGITUDINAL PROFILE H–H'



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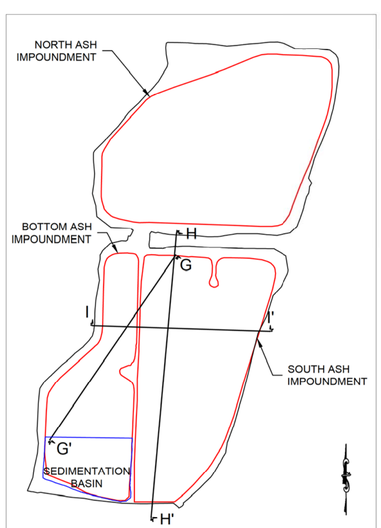
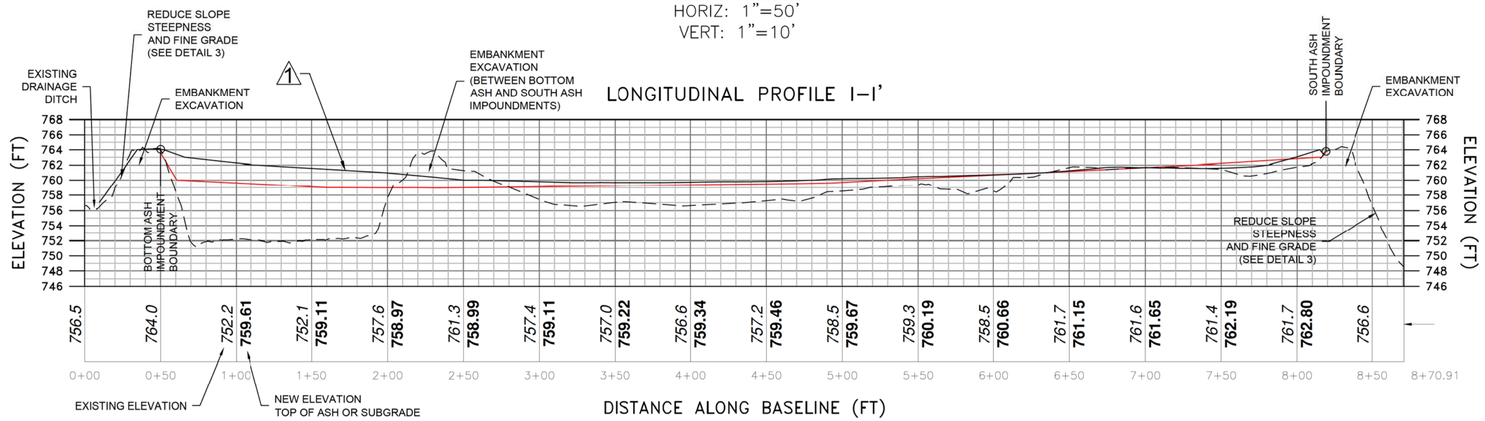


LONGITUDINAL PROFILE I–I'



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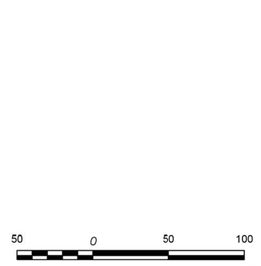

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5	–	–
6	2/2016	PMG

ORIGINAL SUBMITTAL

SHEET TITLE
CROSS SECTIONS 3 - SOUTH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
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PROJ. NO.	DWN. BY:	CHK. BY:	O/A RVW BY:	PROJ. MGR
27215142.00	RDT	PMG	PMG	PMG
DSN. BY: RDT				

CADD FILE: D9-D12-CROSSSECTIONS.DWG

DATE: 5/25/18

DRAWING NO.
11 of 15

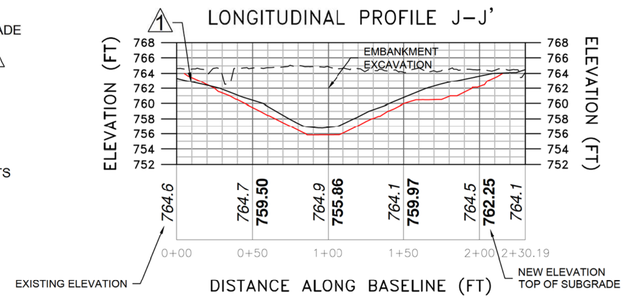
N:\City of Independence\Independence Power & Light\Projects\27215142.00 - Ash Pond Closure Design\Solar Panel Assistence\D9-D12-CrossSections.dwg May 25, 2018 - 2:53pm Layout Name: 12 Cross Sections 4 - South Impoundments By: 4470d_w

LEGEND

- EXISTING GRADE
- DESIGN TOP OF SUB-GRADE
- AS-BUILT FINAL GRADE ⚠

NOTES:

1. IMPOUNDMENT BOUNDARIES ARE APPROXIMATE.
2. FINAL COVER EXTENDS TO LIMITS OF ASH WHERE CAP TIES INTO EXISTING CLAY EMBANKMENT.



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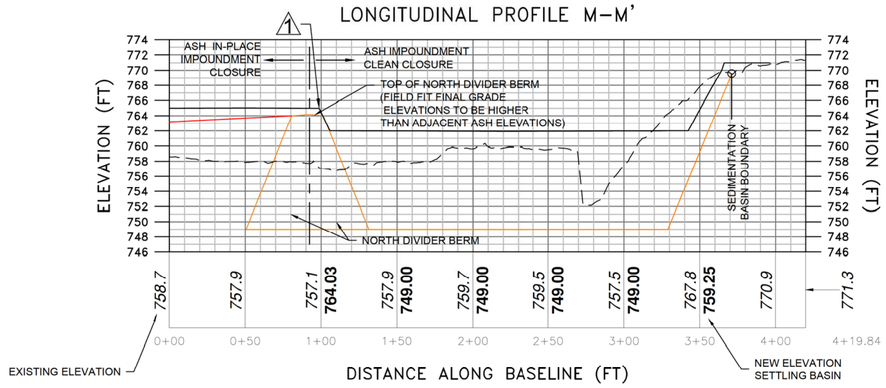

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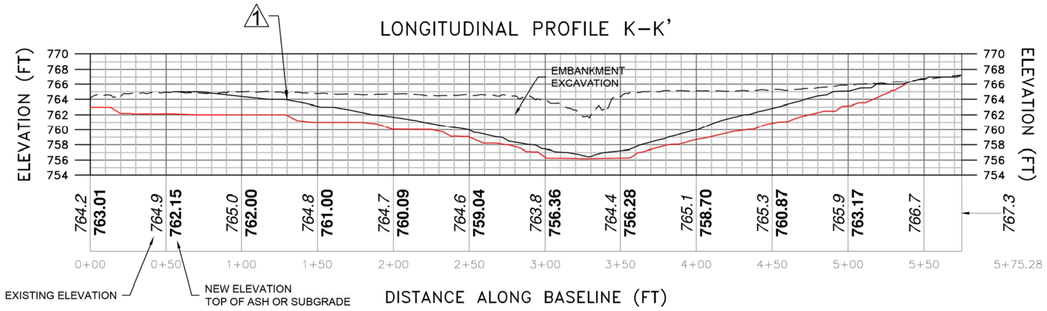

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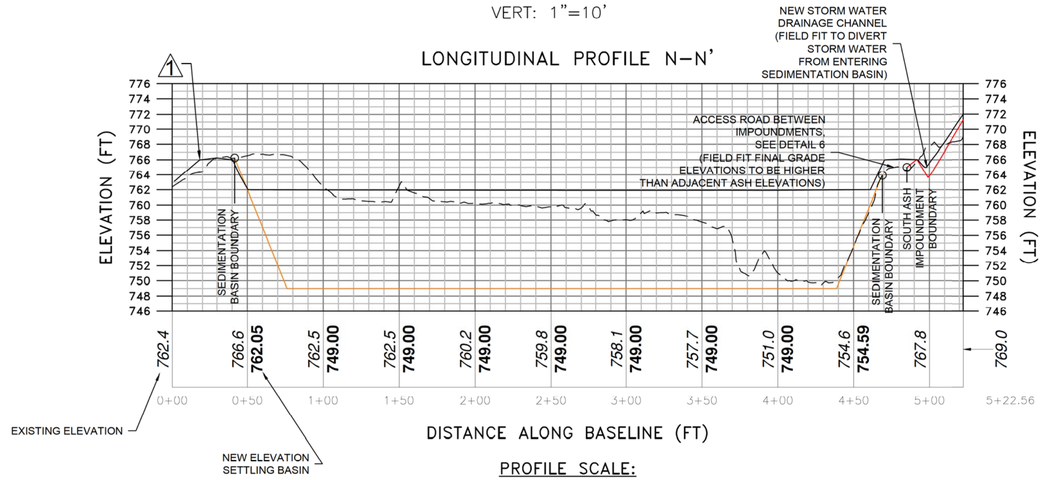

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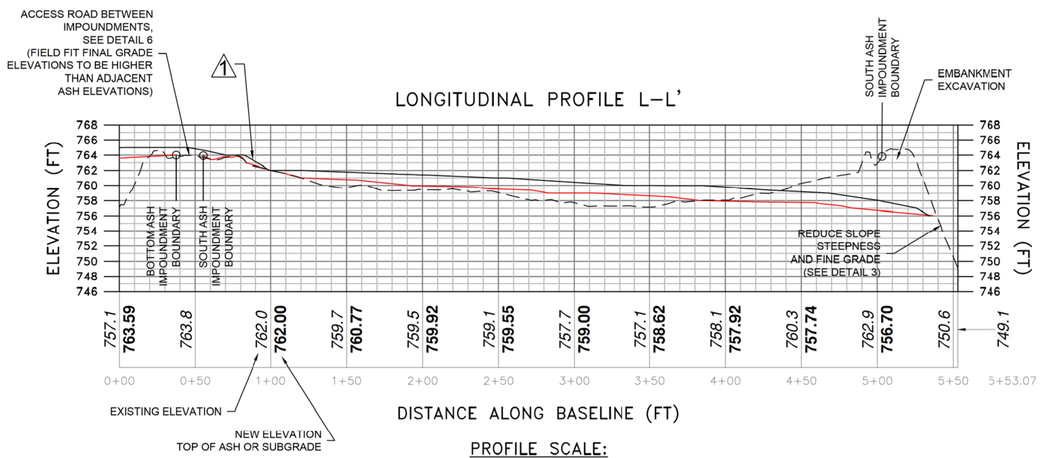

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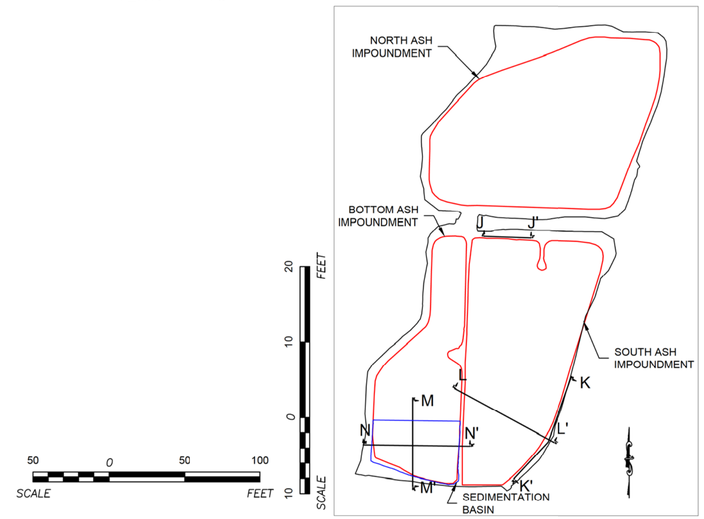

REV.	DATE	CK. BY
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1	–	–
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4	–	–
5	2/2016	PMG

CRIGINAL SUBMITTAL

SHEET TITLE
CROSS SECTIONS 4 - SOUTH IMPOUNDMENTS

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
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PROJ. NO.	27215142.00	DWN. BY:	RDT
DSN. BY:	RDT	CHK. BY:	PMG
		Q/A R/W BY:	PMG
		PROJ. MGR	PMG

CADD FILE:
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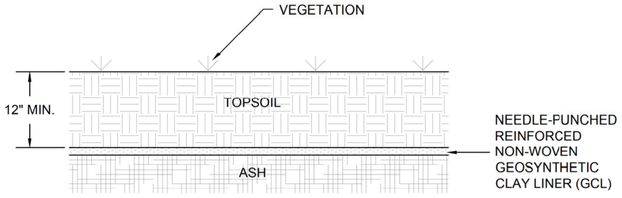
DATE:
5/25/18

DRAWING NO.
12 of **15**

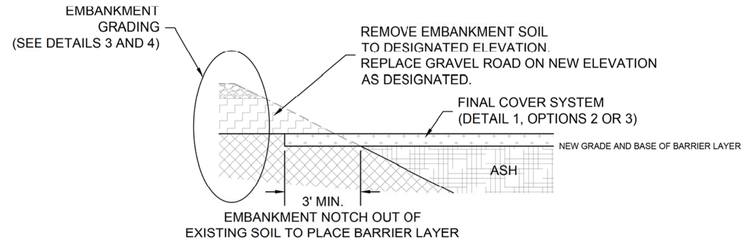
1



1 (7-8, 13,14 | 13) FINAL COVER DETAIL 1

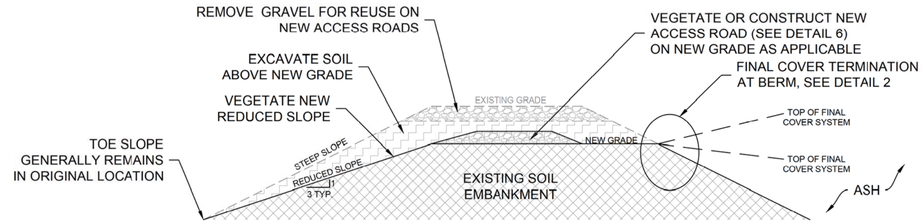
Not to Scale

1



2 (13 | 13) TYPICAL FINAL COVER TERMINATION AT BERM 1

Not to Scale

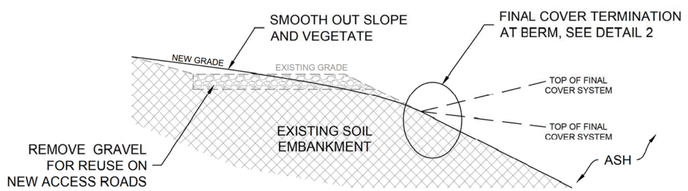


3 (7-9, 11-13 | 13) TYPICAL EMBANKMENT GRADING WITH SLOPE REDUCTION

Not to Scale

NOTES:
1. REDUCED SLOPE IS TO BE A MAXIMUM OF 3:1 WHERE PRACTICAL. IT IS ACCEPTABLE FOR AREAS TO HAVE A STEEPER WHERE NOT FEASIBLE TO CONSTRUCT 3:1 WITHOUT ADJUSTING THE TOE OF SLOPE.

1



4 (13) TYPICAL EMBANKMENT GRADING WITH SLOPE SMOOTHING

Not to Scale

1 This drawing has been revised to reflect as built conditions

This document was originally sealed by Patrick M. Goeke, P.E.; Kansas license number E-19041 on 2/3/2016 with Revision 1 on 2/5/2016. An original sealed copy is stored at SCS Engineers, Overland Park, Kansas.

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1	2/2016	PMG

ORIGINAL SUBMITTAL

SHEET TITLE
DETAILS 1 - FINAL COVER

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
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PROJ. NO: 27215142.00
DSN. BY: RDT
DWN. BY: RDT
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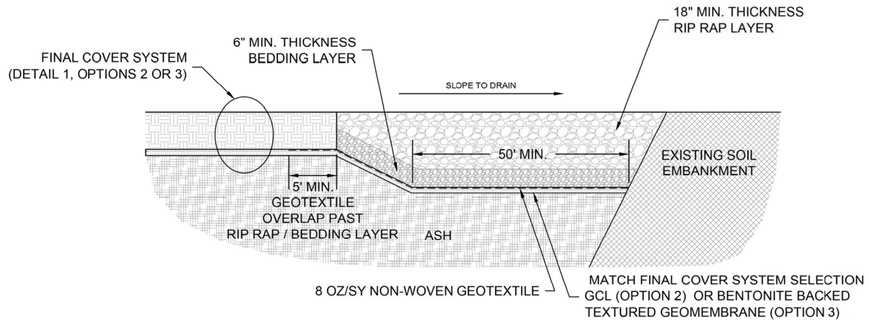
PROJ. MGR: PMG

CADD FILE: D13-D15 DETAILS.DWG

DATE: 5/25/18

DRAWING NO.
13 of **15**

1

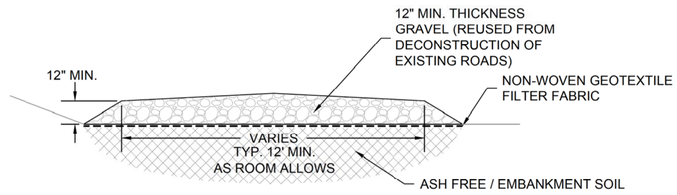


5 (6-8 | 14) RIP RAP LINED DISCHARGE STRUCTURE

Not to Scale

1

NOTES:
1. RIP RAP AND BEDDING LAYER GRADATION IS SPECIFIED IN SPECIFICATIONS.
2. DETAIL REVISED, SEE APPENDIX A2 OF THE "ASH IMPOUNDMENT CLOSURE REPORT" DATED APRIL 2018

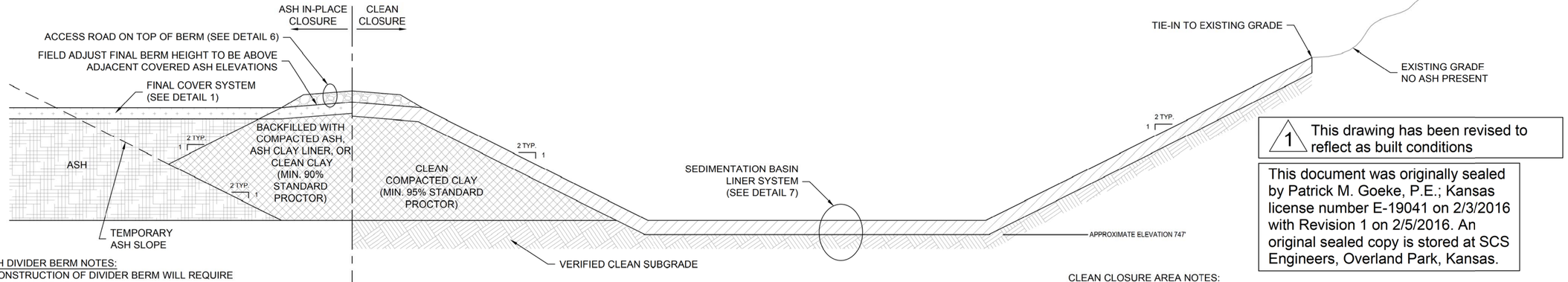


6 (6-8 | 12-14 | 14) TYPICAL ACCESS ROAD

Not to Scale

7 (14 | 14) SEDIMENTATION BASIN LINER SYSTEM

Not to Scale



NORTH DIVIDER BERM NOTES:
1. CONSTRUCTION OF DIVIDER BERM WILL REQUIRE REMOVAL OF ASH.
2. NEW SEDIMENTATION BASIN CLEAN COMPACTED CLAY IN CLEAN CLOSURE AREA TO BE CONSTRUCTED OF OFF SITE CLAY OR CLEAN CLAY FROM EXISTING BERMS.
3. BERM IN ASH IN PLACE CLOSURE AREA CAN BE CONSTRUCTED USING COMPACTED ASH, CLAY LINER FROM CLEAN CLOSURE AREA, CLAY FROM EMBANKMENTS, OR OFF SITE SOURCES.

8 (6,8,11 | 14) SEDIMENTATION BASIN

Not to Scale

CLEAN CLOSURE AREA NOTES:
1. REMOVE ASH AND EXISTING ASH IMPOUNDMENT LINER, IF PRESENT, TO BASE OF ASH OR LINER, WHICHEVER IS LOWER.
2. IF REQUIRED, EXCAVATE NATIVE CLAYS TO NEW DESIGN GRADES.
3. NEW 12" BASIN LINER CAN BE CONSTRUCTED USING NATIVE CLAYS OR CLEAN EMBANKMENT CLAYS IF CAN ACHIEVE COMPACTION TO REQUIRED K ≤ 1X10^{-7} CM/SEC.

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ORIGINAL SUBMITTAL

SHEET TITLE
DETAILS 2 - ROAD, DISCHARGE STRUCTURE, SETTLING BASIN

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

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DSN. BY: RDT
DWN. BY: RDT
CHK. BY: PMG
Q/A R/W BY: PMG
PROJ. MGR. PMG

CADD FILE: D13-D15 DETAILS.DWG

DATE: 5/25/18

DRAWING NO. **14** of **15**

1 This drawing has been revised to reflect as built conditions

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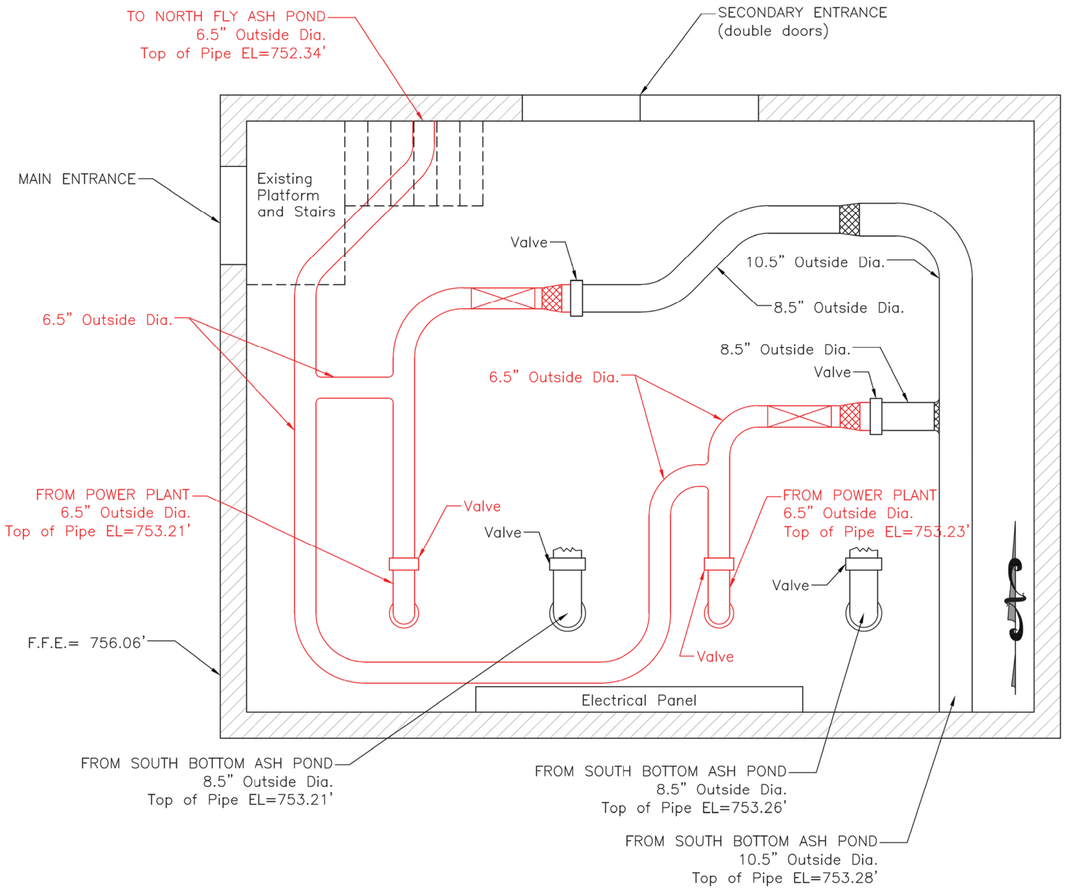


9 PUMP HOUSE PIPING DECOMMISIONING
6-8 15

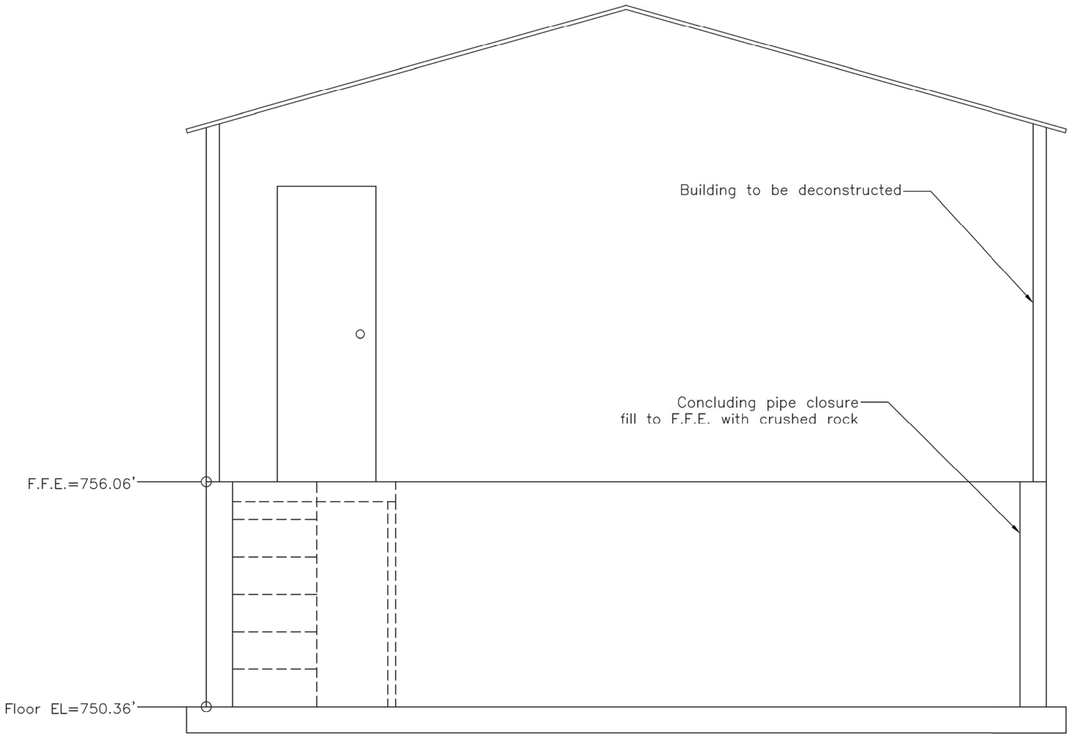
Not to Scale

Pipe Dia. Transition

Pump Location (to be removed)

Pipes to be removed after bottom ash pond is dewatered and the pipes outside building to be grouted

Pipes/valves to be removed, valves to be returned to Independence Power & Light



10 PUMP HOUSE DECOMMISIONING
6-8 15

Not to Scale

DETAIL 9 AND 10 NOTES:

1. INDEPENDENCE POWER & LIGHT TO REMOVE ELECTRICAL PUMPS AND CONTROLS.
2. AFTER WATER IS REMOVED FROM BOTTOM ASH POND, VALVES AND PIPING TO BE REMOVED.
3. VALVES WILL BE RETURNED TO INDEPENDENCE POWER & LIGHT.
4. THREE PIPES FROM BOTTOM ASH POND TO BE GROUTED CLOSED.
5. CONTRACTOR TO REMOVE BUILDING AND FILL CONCRETE FOUNDATION WITH CRUSHED ROCK.

REV.	DATE	CK. BY
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4	2/5/16	PMG

PIPING/VALVE NOTES
ORIGINAL SUBMITTAL

SHEET TITLE
DETAILS 3 - PUMP HOUSE AND PIPING

PROJECT TITLE
ASH IMPOUNDMENT CLOSURE CONSTRUCTION PLANS

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO. 27215142.00
DSN. BY: RDT
DWN. BY: RDT
CHK. BY: PMG
Q/A RVW BY: PMG
PROJ. MGR PMG

CADD FILE:
D13~D15 DETAILS.DWG

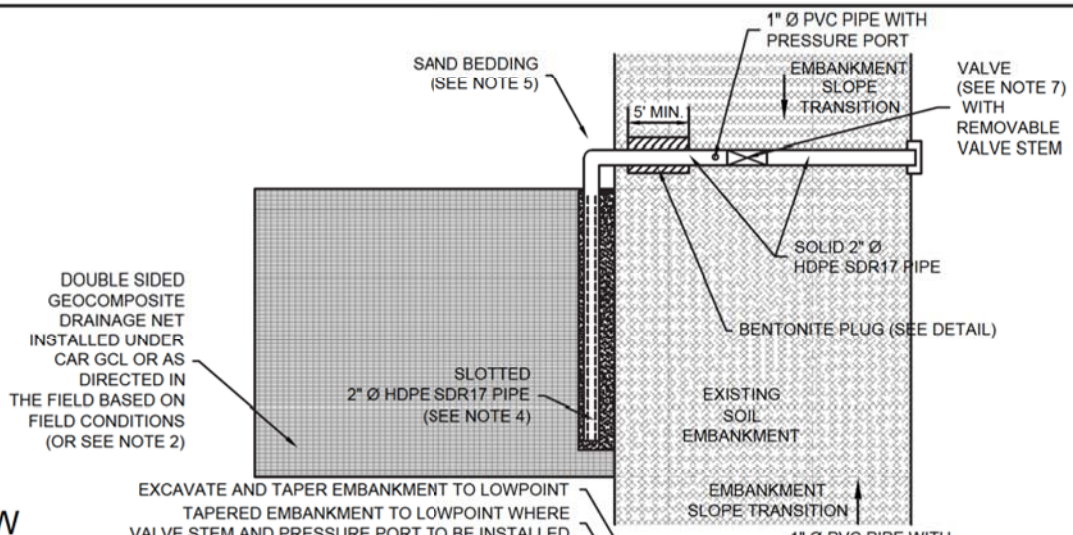
DATE:
2/5/16

DRAWING NO.
15 of **15**

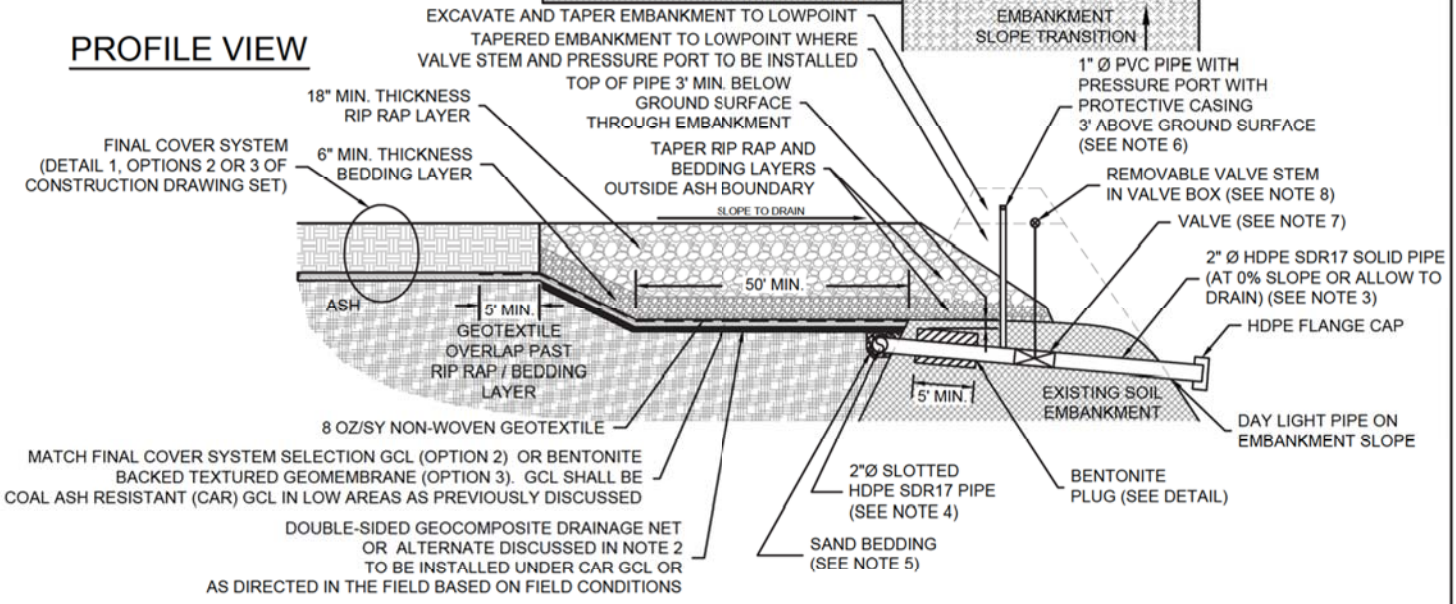
N:\City of Independence\Independence Power & Light\Projects\27215142.00 - Ash Pond Closure Design\AutoCAD\D13-D15 Details.dwg Feb 05, 2016 - 11:11am Layout Name: 15 Details 3 - Pump House and Piping By: 3789rdt

A2: Pressure Relief System

PLAN VIEW



PROFILE VIEW

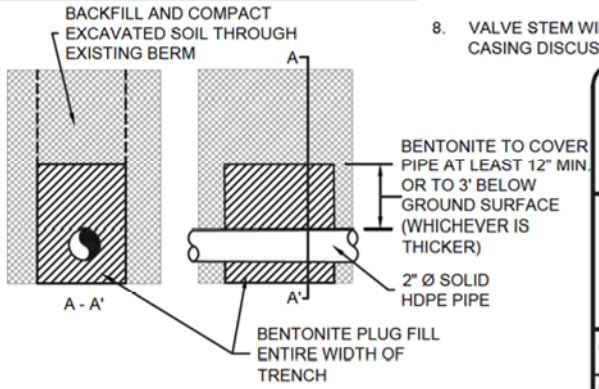


NOTES:

1. RIP RAP AND BEDDING LAYER GRADATION IS SPECIFIED IN THE TECHNICAL SPECIFICATIONS.
2. IN LIEU OF DOUBLE SIDED GEOCOMPOSITE DRAINAGE NET, MAY USE A SAND DRAINAGE LAYER ALSO TO BE INSTALLED ON TOP OF THE ASH AND UNDER THE CAR GC OR AS DIRECTED IN THE FIELD BASED ON FIELD CONDITIONS. SAND DRAINAGE LAYER IS SHOWN BELOW:

3. SOLID HDPE DRAIN PIPE TO BE TRENCHED INTO EMBANKMENT. BACKFILL WITH EMBANKMENT SOILS. PLACE BENTONITE PLUG AROUND PIPE, MINIMUM 5' LENGTH AND 12" ABOVE PIPE OR TO 3' BELOW GROUND SURFACE, WHICHEVER IS THICKER. SEE BENTONITE PLUG DETAIL TO THE LEFT.
4. SLOTTED PIPE IN SAND BEDDING TO BE SLOTTED WITH 0.010" SLOTS.
5. SAND TO BE A MEDIUM TO COARSE, WELL GRADED, WASHED SAND WITH MINIMUM 5% FINES.
6. THE PVC PIPE WITH PRESSURE PORT WILL BE ENCASED IN A 4"X4" PROTECTIVE STEEL CASING. THE CASING WILL BE EMBEDDED IN A CONCRETE PAD 18" Ø AND 3" DEEP. CASING WILL BE PAINTED YELLOW. LOCATED TO BE OUT OF THE WAY OF TRAFFIC AND WITH DISCUSSION WITH ENGINEER.
7. VALVE WILL BE A CLOW 2" F-6102 RESILIENT WEDGE WATER VALVE OR EQUIVALENT.
8. VALVE STEM WILL TERMINATE IN AN AT GRADE VALVE BOX EMBEDDED IN THE CONCRETE PAD OF THE STEEL CASING DISCUSSED IN NOTE 6.

BENTONITE PLUG DETAIL



SCS ENGINEERS

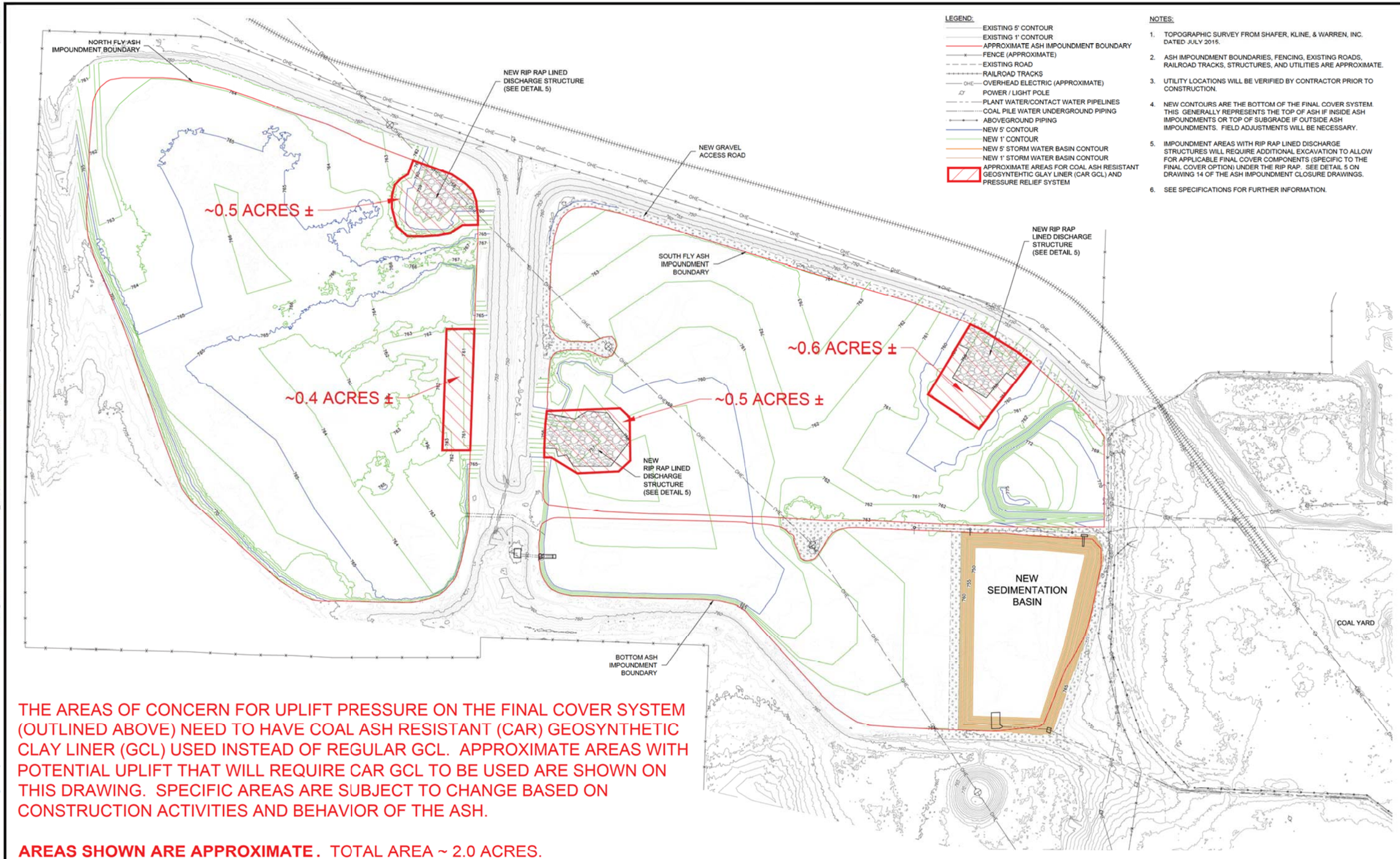
7311 W. 130th St, Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

DETAIL: PRESSURE RELIEF SYSTEM FOR RIPRAP LINED DISCHARGE STRUCTURE

IMPENDENCE POWER & LIGHT, BLUE VALLEY POWER STATION

ASH IMPOUNDMENT CLOSURE

CHK. BY: PMG	DWN. BY: RDT	DSN. BY: RDT/PMG	PROJ. NO. 27215142.00
PROJ. MGR: PMG	DATE: 1/26/17	CADD FILE: 2017-01-26 F1_ DETAILS PRESSURE RELIEF SYSTEM.DWG	DRAWING NO. 1



THE AREAS OF CONCERN FOR UPLIFT PRESSURE ON THE FINAL COVER SYSTEM (OUTLINED ABOVE) NEED TO HAVE COAL ASH RESISTANT (CAR) GEOSYNTHETIC CLAY LINER (GCL) USED INSTEAD OF REGULAR GCL. APPROXIMATE AREAS WITH POTENTIAL UPLIFT THAT WILL REQUIRE CAR GCL TO BE USED ARE SHOWN ON THIS DRAWING. SPECIFIC AREAS ARE SUBJECT TO CHANGE BASED ON CONSTRUCTION ACTIVITIES AND BEHAVIOR OF THE ASH.

AREAS SHOWN ARE APPROXIMATE. TOTAL AREA ~ 2.0 ACRES.

ADDITIONALLY, IN THE AREAS WHERE THE CAR GCL IS TO BE USED, A PRESSURE RELIEF SYSTEM IS TO BE INSTALLED, PER THE PRESSURE RELIEF DETAIL SHOWN IN FIGURE 1 OF THIS SET.

100 0 100 200
SCALE FEET

REV.	DATE		CK. BY
0	–	–	–
1	–	–	–
2	–	–	–
3	1/25/17	DREW IN AUTOCAD, ADDED NOTES, REVISED AGREAGE	PMG
4	8/27/16	HAND DRAWN SUBMITTAL	PMG

SHEET TITLE
APPROXIMATE AREAS FOR UPLIFT CONCERN AND GCL CAR AREAS

PROJECT TITLE
SUPPLEMENTAL INFORMATION FOR ASH IMPOUNDMENT CLOSURE

CLIENT
INDEPENDENCE POWER & LIGHT
BLUE VALLEY POWER STATION
21500 E. TRUMAN RD, INDEPENDENCE, MISSOURI

SCS AQUATERRA
7311 W. 130th St. Ste. 100
Overland Park, Kansas 66213
PH. (913) 681-0030 FAX. (913) 681-0012

PROJ. NO.	DSN. BY:	DWN. BY:	CHK. BY:	QA'A RVW BY:	PROJ. MGR
27215142.00	RDT	RDT	PMG	PMG	PMG

CADD FILE:
2017-01-06 F2_ PROPOSED GCL CAR AND PRESSURE RELIEF SYSTEM.DWG

DATE:
1/26/17

FIGURE NO.
2 of **2**

Appendix B

Project Timeline

Ash Impoundment Closure Activity Summary

IP&L Blue Valley Power Station, Independence, Missouri

Activity	Location	Month and Year																	
		2016						2017											
		7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Excavate Trenches for Dewatering and Draining	NFA	x	x	x	x	x													
	SFA	x	x	x	x	x	x												
	BA	x				x	x	x											
Dewatering and Draining	NFA	x	x	x	x	x	x	x	x										
	SFA	x	x	x	x	x	x	x	x	x	x	x	x						
	BA		x	x	x	x	x	x					x	x	x	x	x		
Subgrade Preparation and CCR Grading	NFA		x	x	x	x	x		x	x	x	x							
	SFA										x	x	x	x	x	x			
	BA													x	x	x	x		
GCL Placement	NFA				x	x	x		x	x	x								
	SFA												x	x	x	x	x		
	BA															x	x		
Cover Soil	NFA				x	x	x		x	x	x		x						
	SFA												x	x	x	x	x		
	BA																x		
Mix Sand into Cover Soil to Create "Topsoil"	NFA													x	x				
	SFA															x	x		
	BA																x		
Topsoil Thickness Verification	NFA															x			
	SFA																	x	
	BA																	x	
Seeding	NFA															x	x		
	SFA																x	x	
	BA																x	x	
Pressure Relief System	NFA										x								
	SFA														x	x			
Berm and Outlet Breeches	NFA									x	x								
	SFA															x			
	BA															x			
Rip Rap at Outlets	NFA													x					
	SFA															x	x		
Clean Closure	BA							x	x	x									
Sedimentation Basin Construction	BA								x	x	x				x	x			
Road regrading																		x	
Side slope grading																		x	
Pump House Abandonment															x		x		
Project Complete																		x	

Notes

NFA = North Fly Ash Pond

SFA = Southeast Fly Ash Pond

BA = Southwest Bottom Ash Pond

Activity summary timeline and informaiton is approximate

Appendix C

Photographs

Figure 1: Excavating in north ash pond (facing east)

Figure 2: Ash movement in north ash pond (facing northeast)

Figure 3: Ash movement in north ash pond (facing southeast)

Figure 4: Temporary piping from north ash pond to bottom ash pond (facing south)

Figure 5: Temporary piping discharging into south ash pond

Figure 6: Looking inside Outfall 002 with discharge to LBVSD

Figure 1: Excavating in north ash pond (facing east)

Figure 2: Pump on middle berm; pumping water from southeast pond to southwest pond (facing south)

Figure 1: Excavators staged in the southeast fly ash pond (facing west)

Figure 2: Wet ash stockpiled to dry in the southeast pond (facing southeast)

Date Photos Taken: 8/11/2016
Photos Taken By: Whit Martin, SCS Engineers

Figure 3: Pumping water from constructed sump in southeast pond (facing southeast)

Figure 4: Pumping water from the north side to south side of the southwest pond (facing northwest)

Figure 5: Southwest pond standing water (facing southwest)

Figure 6: Pumping water from the southwest pond to the Little Blue Valley Sewer District Outfall (facing southwest)

Figure 7: Pumping water from the southwest pond to the Little Blue Valley Sewer District Outfall (facing north)

Figure 8: Sump installed in North ash pond (facing north)

Figure 9: Excavating and relocating saturated fly ash from the south end of the north pond (facing northeast)

Figure 10: Dozers grading to dry out the fly ash in the north pond (facing north)

Figure 1: Pumping water from the north pond to the southwest fly ash pond (facing east)

Figure 2: Well points and water extraction system installed in the north pond (facing west)

Figure 3: Griffin well pumping system in north pond with about 15 wells on each side (facing south)

Figure 4: Main vacuum engines located east of the well pumping system; pulling about 16 psi to extract water from the fly ash (facing south)

Figure 5: Water discharging from the well point extraction system towards the south berm of the north pond (facing south)

Figure 6: Flow and totalizer meter installed on the outlet pipe of the extraction system

Figure 7: Pumping water from the southeast to southwest pond towards the Little Blue Valley Sewer District Outfall (facing south)

Figure 8: Standing water being removed from the southeast ash pond (facing southeast)

Figure 9: North side of the north pond graded and little standing water observed (facing southeast)

Figure 10: Standing water remaining in the south side of the southwest pond (facing west)

Figure 1: Overlooking the southwest pond; sediment buildup near discharge to the LBVSD at Outfall #002; (facing north)

Figure 2: Standing water in southeastern edge of the southwest pond (facing north/northwest)

Date Photos Taken: 10/3/2016
Photos Taken By: Renee Trenshaw and Pat Goeke, SCS Engineers

Figure 3: Discharge pipe from the plan/coal yard with water exiting into southwest corner of southwest pond (facing south)

Figure 4: Minimal water in trench of southwestern area of the southwest pond (facing northeast)

Figure 5: Overlooking northern half of the southwestern pond; standing water present (facing south)

Figure 6: Overlooking the western edge of the north ash pond (facing east)

Figure 7: Overlooking the western edge of the north ash pond (facing north)

Figure 8: Western edge of the north ash pond, ash and embankment; subgrade preparation for GCL placement (facing north)

Figure 9: Northern central portion of the north ash pond; some standing water visible (facing southwest)

Figure 10: Northern central portion of the north ash pond (facing south)

Figure 11: Eastern edge of the north ash pond, bottom of trench appears soupy and some standing water (facing north)

Figure 12: Eastern edge of the north ash pond, bottom of trench appears soupy (facing south)

Figure 13: Southeastern low point of the north ash pond; sump and pump system to remove water in low area (facing north)

Figure 14: Southeastern low point of the north ash pond; sump and pump system to remove water in low area (facing east)

Figure 15: Trench with standing water near center of north ash pond (facing north)

Figure 16: Trench with standing water near center of north ash pond (facing west)

Figure 17: South central low point and trench of the north ash pond; sump and pump system to remove water in low area (facing north)

Figure 18: Northwest corner of the southeast ash pond (facing south)

Figure 19: Northwest portion of the southeast ash pond (facing east)

Figure 20: Trench located towards the northern end of western berm in southeast ash pond (facing southeast)

Figure 21: Northwest portion of the southeast ash pond (facing southwest)

Figure 22: Standing water in northern central area of the southeast ash pond (facing southeast)

Figure 23: Northeast portion of the southeast ash pond (facing east)

Figure 24: Southeast area of the southeast ash pond; area has standing water and appears wet and soupy (facing northwest)

Figure 25: Overlooking the southeast ash pond; standing water in trench cutting through ash (facing north)

Figure 26: Overlooking the southwest corner of the southeast ash pond with berm between the southwest and southeast ash ponds (facing northwest)

Figure 1: Low surface water in the southeast fly ash pond (facing south)

Figure 2: Pumping water from the north pond to the southwest pond (facing north)

Figure 3: Water flowing in trench of north pond from northeast to southwest (facing east)

Figure 4: Area of the north pond graded and ready for GCL placement (facing north)

Figure 5: Excavating the trenches in the northeast side of the north pond (facing south)

Figure 6: Excavating trenches to release trapped water in the northeast side of the north pond (facing northwest)

Figure 7: Water flowing from the northeast to be pumped out towards the southwest pond (facing west)

Figure 8: Sediment excavated from the holding area next to the Little Blue Valley Sewer District Outfall (facing southwest)

Figure 1: 10-27-16 Deploying GCL panels along the west side of the north pond (facing north)

Figure 2: 10-27-16 Bentonite powder placed along the edges before overlapped (facing east)

Figure 3: 10-27-16 GCL panels placed along the west side over the graded fly ash in north pond (facing south)

Figure 4: 10-27-16 Haul trucks dumping soil over the GCL panels (facing north)

Figure 5: 10-27-16 Dozer placing soil 1 foot thick over the GCL panels in the north fly ash pond (facing southeast)

Figure 6: 10-27-16 Large trench excavated in the central/west side of the southeast pond to help dewater the fly ash(facing east)

Figure 7: 10-27-16 More sediment excavated out of the holding area near the Blue Valley Sewer Outfall (facing west)

Figure 8: 10-27-16 GCL deployed farther to the north and placing soil over panels; north ash pond (facing southwest)

Figure 9: 10-27-16 Deploying more GCL panels to the east of what was placed on 10/25/16 in north ash pond (facing north)

Figure 10: 10-27-16 Dozer placing soil 1-foot thick soil over the deployed GCL panels to the east; north ash pond (facing north)

Figure 11: 10-27-16 The edge of the GCL was rolled up and covered in with plastic to protect from the weather; north ash pond (facing northeast)

Figure 12: 10-28-16 GCL panels completely covered with 1-foot of soil in the north fly ash pond (facing south)

Figure 13: 10-28-16 Dozer placing soil to the east edge of the GCL;
north fly ash pond (facing southeast)

Figure 14: 10-28-16 Dried out fly ash along the south side of the north fly ash pond near edge of GCL placement (facing southeast)

Figure 1: Discharging water to the LBVSD outfall. Sediment removed earlier in the week (facing west)

Figure 2: Trench excavated in the middle of the southeast fly ash pond to help dewater fly ash (facing east)

Figure 3: Southwest pond where water is being pumped from the southeast pond (facing south)

Figure 4: Haul truck driving across the soil cover on the GCL to move fly ash (facing south)

Figure 5: Fly ash being graded out and fly ash stockpile being moved in the north fly ash pond (facing southeast)

Figure 6: Continuing to excavate saturated fly ash from the northeast side of the north fly ash pond (facing south)

Figure 7: Fly ash being relocated to the southwest side of the north pond to be graded (facing west)

Figure 8: Excavated trench to release trapped water in the southeast fly ash pond (facing west)

Figure 9: Southeast fly ash pond graded out on the south half (facing northwest)

Figure 10: Pumping standing water from the southwest pond to temporary sedimentation basin prior to discharge to the LBVSD outfall (facing northwest)

Figure 1: Installing new panels of GCL on the north side of the north pond (facing south)

Figure 2: Placing bentonite powder along the long ends of the panels under the overlap (facing south)

Figure 3: Dozer placing soil hauled from the borrow area over the GCL panels (facing southwest)

Figure 4: Ends of the GCL rolled over and covered with plastic to protect from weather (facing south)

Figure 5: Dozer placing soil over the GCL panels installed in the morning (facing southeast)

Figure 6: Excavating the saturated fly ash from the south side of the southwest fly ash pond down to the clay liner (facing west)

Figure 1: Overview of the southwest sediment pond (facing northwest)

Figure 2: Pumping water from the south sediment pond into the basin for the LBVSD Outfall (facing west)

Date Photos Taken: 1/12/2017
Photos Taken By: Whit Martin and Pat Goeke, SCS Engineers

Figure 3: Excavating fly ash from the south half of the sediment pond (facing west)

Figure 4: Clay soils encountered in test pit 2 in the northeast quadrant (facing northeast)

Date Photos Taken: 1/12/2017
Photos Taken By: Whit Martin and Pat Goeke, SCS Engineers

Figure 5: Clay soils encountered in test pit 4 in the northwest quadrant (facing north)

Figure 6: Excavating test pits to about 18 inches to get background soil samples (facing north)

Figure 7: Clay soil encountered for the background sample (facing east)

Figure 8: Overview of test pits in the southwest sediment pond (facing west)

Figure 9: Southwest ash pond water pumped down (facing southwest)

Figure 10: East berm graded down on the north fly ash pond (facing north)

Figure 1: Overview of the sediment pond (facing northwest)

Figure 2: Southeast corner of sedimentation pond (facing east)

Figure 3: TP-5, located in southwest corner of sedimentation pond. Looking at north wall.

Figure 4: Possible waste soil on top of native brown and gray mottle clay soil encountered in TP-6 in the northwest quadrant (north wall)

Figure 5: Gray clay soils overlying brown and gray clay in TP-7.

Date Photos Taken: 02/06/2017
Photos Taken By: Pat Goeke, SCS Engineers

Figure 1: Placing BentoLiner GCL panels on the northeast fly ash pond (facing northeast)

Figure 2: Dozer placing cover soil over the GCL panels in the north pond (facing northeast)

Figure 3: Extent of fly ash graded out on the northeast side of the north pond (facing south)

Figure 4: Fly ash graded out on the north pond (facing west)

Figure 5: Offsite northwest borrow area where haul trucks are getting clay from (facing south)

Figure 6: South area of the north fly ash pond still needing to be filled in and graded (facing west)

Figure 7: Water being pumped from the southeast fly ash pond to the southwest temporary sediment pond (facing east)

Figure 8: Large berm (northern half only of final berm) installed in the middle of the southwest sediment pond (facing northwest)

Figure 9: Deploying GCL rolls on the middle of the north fly ash pond (facing west)

Figure 10: Dozer placing clay to a minimum of 1 foot thickness over the GCL panels (facing south)

Figure 11: Placing bentonite powder between the long ends of the GCL panels (facing south)

Figure 12: GCL panels placed on the north end of the north fly ash pond (facing southwest)

Figure 13: Deploying GCL rolls on the middle-east side of the north fly ash pond (facing south)

Figure 1: Overview of bottom sedimentation pond before clay liner installation (facing east)

Figure 2: Excavating impacted soils from the southeast corner of the sedimentation pond (facing south)

Date Photos Taken: 2/24/2017, 2/28/2017, and 3/1/2017
Photos Taken By: Whit Martin, SCS Engineers

Figure 3: Impacted soils hauled to the north side of the north of the sedimentation pond berm in the bottom ash pond (facing northwest)

Figure 4: Dozer pushing clean brown clay to fill in excavated east area (facing southwest)

Figure 5: Placing clay to fill in the east trench of the north fly ash pond (facing north)

Figure 6: Hauling clay from the offsite borrow property to place compacted clay liner in bottom of sedimentation pond (facing northwest)

Figure 7: Compacting the clay liner lifts with a CAT 815B sheepsfoot compactor (facing southeast)

Figure 8: Krueger Technologies Inc. personnel running compaction tests on the clay liner (facing northeast)

Figure 9: Excavating impacted soil from the southwest slope of the sedimentation pond (facing north)

Figure 10: Southeast corner of the sedimentation pond where the Blue Valley Sewer District outfall is located (facing east)

Figure 11: Dozer placing a lift of clay liner on the west slope of the sedimentation pond (facing southwest)

Figure 12: Hauling clay from the offsite borrow property to build the south side of the north berm in the sedimentation pond (facing southwest)

Figure 13: Dozer placing the clay in lifts and compacting using a CAT 815B Sheepsfoot compactor for the south half of the north divider berm (facing east)

Figure 14: Overview of the clay liner on the bottom of the sedimentation pond (facing west)

Figure 15: Overview of the construction of the south half of the north soil berm in the sedimentation pond (facing northwest)

Figure 1: GCL panels deployed in eastern portion of north fly ash pond (facing southeast)

Figure 2: GCL panels placed in north fly ash pond with dozer spreading soil cover onto panels (facing north)

Figure 3: Haul truck dumping cover soil for dozer to spread over panels (facing west)

Figure 4: Deploying GCL panels in northeastern portion of north fly ash pond (facing south)

Figure 5: Northeast corner of north fly ash pond with GCL cover soil placed (facing west)

Figure 6: Deployed GCL panels in phases of bentonite seaming progress (facing south)

Figure 7: Cover soil on GCL panels prepped to spread (facing north)

Figure 8: Southwest corner of the north fly ash pond, where ash grading and stabilization is ongoing (facing east)

Figure 1: GCL panels deployed in southwestern portion of north fly ash pond (facing southeast)

Figure 2: Bentonite seal between GCL overlaps.

Date Photos Taken: 3/23/2017
Photos Taken By: Bryan Ross, SCS Engineers

Figure 3: Dozer placing 1 foot minimum clay over GCL (facing north)

Figure 4: Dozer and tractor with belly scraper placing clay over GCL (facing east)

Figure 5: Deploying additional GCL in North Pond and placing bentonite between panel overlaps (facing east)

Figure 1: Overlooking the standing water accumulating in the north pond (facing east)

Figure 2: Overview of the south side of the north fly ash pond (facing east)

Figure 3: Temporary soil and rock berms put in place to prevent ash/silt run-off (facing east)

Figure 4: Silt fencing in-place on the south side of the north fly ash pond (facing northwest)

Figure 5: Soil and rock berms installed in the southeast corner of the north ash pond (facing northeast)

Figure 6: Southwest bottom ash pond with accumulated standing water (facing south)

Figure 1: GCL panels being deployed in southwest corner of north fly ash pond (facing northwest)

Figure 2: Granular bentonite placement between GCL overlap

Dates Photos Taken: 4/11/2017 and 4/12/2017
Photos Taken By: Bryan Ross, SCS Engineers

Figure 3: GCL deployed in the southwest corner of the north ash pond and Dozer placing 1 foot minimum soil over GCL (facing northwest)

Figure 4: Repaired storm water berm and silt fencing (facing north)

Figure 5: Deploying additional GCL in North Pond up to the boundary of the CAR GCL (facing northeast)

Figure 6: Granular bentonite placed between GCL panel overlap.

Figure 7: Discharge pipe and manhole near the northeast corner of the sedimentation basin. (facing west – 4/11/2017)

Figure 8: Backfilled around manhole of sedimentation basin discharge pipe. (facing south – 4/12/2017)

Figure 1: Excavation of pressure relief pipe trench in the North Pond south discharge area. (facing east)

Figure 2: Slotted SDR 11 HDPE pipe installed on top of sand bedding in the North Pond south discharge area trench. (facing east)

Dates Photos Taken: 4/14/2017 and 4/18/2017
Photos Taken By: Bryan Ross, SCS Engineers

Figure 3: Slotted SDR 11 HDPE pipe.

Figure 4: Installing solid HDPE SDR pipe through the North Pond south berm. (facing south)

Figure 5: Bentonite plug at solid pipe transition. (facing south)

Figure 6: Valve located on solid pipe located near where the pipe daylights through the embankment 1" pressure release port located before valve. (facing north)

Figure 7: Flange location of solid pipe. (facing north)

Figure 8: Excavation of the North Pond's southeast discharge area pressure relief pipe trench. (facing northeast)

Figure 9: Placement of sand bedding in the North Pond's southeast discharge area pressure relief system pipe trench. (facing south)

Figure 10: North Pond's southeast discharge area, solid pipe trench extending through the east embankment. Fusion welding elbow to connect solid pipe to slotted pipe. (facing north)

Figure 11: Placement of sand bedding over the top of the slotted pipe. (facing northeast)

Figure 12: Slotted pipe trench backfilled with sand. (facing northeast)

Figure 13: Placement of bentonite plug near solid pipe transition. (facing east)

Figure 14: Solid pipe daylight location with valve and flange cap. (facing west)

Figure 15: Cracking of clay on the west berm of the sedimentation basin. (facing north – 4/14/2017)

Figure 16: View of south berm of the sedimentation basin. (facing southwest – 4/18/2017)

Figure 17: View of the south berm of the sedimentation basin. (facing west – 4/18/2017)

Figure 1: Deploying geocomposite over the North Pond's south pressure relief drainage area. (facing southeast)

Figure 2: Zip tied geonet on geocomposite panels and granular bentonite on overlap of CAR GCL overlap. (East)

Figure 3: Deployment of CAR GCL over geocomposite. (facing northeast)

Figure 4: Placement of soil over top of CAR GCL and geocomposite in south discharge area. (facing west)

Figure 5: Deploying CAR GCL over the north edge of the geocomposite. (facing south)

Figure 6: Deploying regular GCL to the west of the southeast discharge area (facing south).

Figure 7: Granular bentonite placed between overlaps of GCL. (facing south)

Figure 8: Placement of soil over GCL panels (facing northwest).

Figure 1: 6-19-17 GCL panels being deployed in the northeast corner of southeast fly ash pond (facing east)

Figure 2: 6-19-17 Erosion from surface rain water on the south slope of the north fly ash pond (facing north)

Figure 3: 6-19-17 Haul trucks began bringing soil to build the ramp into the southeast fly ash pond (facing north)

Figure 4: 6-19-17 Overview of the southeast fly ash pond graded out and ready for GCL covering (facing southwest)

Figure 5: 6-19-17 A D6 dozer pushing soil out over the GCL to build the ramp into the pond (facing east)

Figure 6: 6-22-17 A D6 dozer placing the soil over the deployed regular GCL (facing south)

Figure 7: 6-22-17 Panels of regular GCL deployed in the northeast corner of the southeast fly ash pond (facing southeast)

Figure 8: 6-22-17 Pumping water from the southwest fly ash pond to the sediment pond (facing south)

Figure 9: 6-22-17 South slope of the north pond regraded to fix the washed out areas (facing east)

Figure 10: 6-22-17 Soil was placed up to grade at a foot thick and the same elevation as the access road on the east side of the southeast pond (facing north)

Figure 11: 6-23-17 Radmacher personnel deploying regular GCL panels on the middle section of the southeast fly ash pond (facing south)

Figure 12: 6-23-17 Placing bentonite powder between the overlapped sections of the GCL panels (facing southwest)

Figure 13: 6-23-17 Haul trucks dumping soil from the borrow source and a D6 dozer placing soil 1 foot thick over the GCL panels (facing north)

Figure 1: GCL installed in the southeast corner of the North pond (facing southeast)

Figure 2: Overview of the southeast side of the north fly ash pond (facing southeast)

Figure 3: Cover soil placed over the GCL that was installed in the morning (facing northwest)

Figure 5: Dozer placing nearby soil over the GCL liner in the North fly ash pond (facing north)

Figure 6: Southeast corner of the north pond with vegetation removed and ready for drainage GCL and Geocomposite. (facing east)

Figure 1: Zip-tying Geonet panels of the Geocomposite together about every foot in the southeast corner of the North pond (facing west)

Figure 2: Sewing the Geotextile ends together using a sewing gun in southeast drainage area of the north pond (facing southeast)

Figure 3: Geotextile panels completely sewn together for the Geocomposite drainage layer (facing northwest)

Figure 4: Deploying CAR GCL liner over the Geocomposite panels in the North fly ash pond (facing northwest)

Figure 5: Deploying Geotextile panels over the CAR GCL placing in the drainage area of the North fly ash pond (facing northeast)

Figure 6: Sewing together the Geotextile panels placed over the CAR GCL in the drainage area of the North fly ash pond (facing northeast)

Figure 1: The northeast side of the southeast fly ash pond covered with a foot of soil (facing northwest)

Figure 2: Deploying regular GCL panels on the northwest side of the southeast pond (facing northwest)

Figure 3: Haul trucks deposited soil from the borrow area as a D6 dozer placed it in 1 foot minimum thickness (facing northeast)

Figure 4: Deploying regular GCL and placing granular bentonite along each panel overlap in the southeast fly ash pond (facing north)

Figure 5: North drainage area of the southwest fly ash pond (facing south)

Figure 6: Outer building shell removed from the pump valve house (facing northwest)

Figure 7: Drainage rip-rap rock placed over the Geocomposite and CAR GCL layers in the north fly ash pond (facing north)

Figure 8: Close-up view of the rip-rap rock placed in the southeast drainage area of the north fly ash pond (facing southeast)

Figure 9: Placing regular GCL in the middle of the southeast fly ash pond (facing southwest)

Figure 10: D6 dozer placing soil from the borrow area over the GCL panels (facing north)

Figure 1: 7/17/2017 Deploying regular GCL panels in the southeast corner of the southeast fly ash pond (facing northeast)

Figure 2: 7/17/2017 A D6 dozer placing soil from the borrow area over the GCL placed in the southeast corner of the southeast pond (facing northwest)

Figure 3: 7/17/2017 Soil had been placed completely over the GCL on the north half of the southeast fly ash pond (facing northwest)

Figure 4: 7/17/2017 Regular GCL panels placed over the mounded area of the southeast fly ash pond (facing east)

Figure 5: 7/17/2017 The D6 dozer placed soil 1 foot minimum to completely cover the GCL panels deployed in the morning (facing east)

Figure 6: 7/19/2017 Soil completely covering the mounded area of the southeast fly ash pond (facing west)

Figure 7: 7/19/2017 A D6 dozer placing soil from the borrow area to cover the regular GCL panels placed in the morning in the southeast fly ash pond (facing southeast)

Figure 8: 7/19/2017 Overview of the standing water in the northwest corner of the southeast fly ash pond (facing southwest)

Figure 9: 7/19/2017 Overview of the soil covering the GCL placed in the southeast corner of the southeast fly ash pond (facing northeast)

Figure 1: Placing sand over clay in the north fly ash pond with John Deere tractor and scraper.

Figure 2: Using a spring tooth harrow on tractor to mix in the sand with clay across the north fly ash pond.

Figure 1: Collection pipe trench located on the southeast discharge location of the SEFAP (facing north)

Figure 2: Solid pipe discharge trench located on the north end of the southeast discharge location of the SEFAP. (facing east)

Figure 3: Solid discharge pipe extending through the east berm of the SEFAP. Discharge and pressure relief valves are installed. (facing west)

Figure 4: Bentonite plug around solid discharge pipe of the southeast discharge location. (facing east)

Figure 5: Radmacher placing sand over the slotted pipe in the southeast discharge location trench. (facing south)

Figure 6: Placing sand pipe bedding in the north discharge location pipe trench of the SEFAP. (facing east)

Figure 7: Solid discharge pipe trench through the north berm. (facing north)

Figure 8: Bentonite plug around the solid discharge pipe. (facing southeast)

Figure 9: North collection trench backfilled with sand.
(facing west)

Figure 10: Solid discharge pipe with valves installed extending through the north berm
(facing south)

Figure 1: Measuring mixed topsoil on the north fly ash pond.

Figure 2: Measuring mixed topsoil and clay on the north fly ash pond.

Figure 1: 9/11/2017 Deploying geocomposite over pipe trench of the southeast discharge location of the SEFAP (facing east)

Figure 2: 9/11/2017 Zip tying geocomposite panels together. (facing southwest)

Figure 3: 9/11/2017 Sewing geocomposite panels together. (facing north)

Figure 4: 9/11/2017 Deploying CAR GCL over gecomposite in southeast discharge location. (facing south)

Figure 5: 9/11/2017 Placing bentonite between the GCL overlaps.

Figure 6: 9/11/2017 Deploying geotextile over CAR GCL. (facing south)

Figure 7: 9/11/2017 Sewing geotextile panels together. (facing west)

Figure 8: 9/12/2017 Placement of rip-rap over bedding on the southeast discharge location. (facing north)

Figure 9: 9/12/2017 View of southeast discharge location of the SEFAP. (facing northeast)

Figure 10: 9/12/2017 Pressure Relief System valves risers. (facing east)

Figure 11: 9/13/2017 Deploying geocomposite over north discharge location of the SEFAP. (facing west)

Figure 12: 9/13/2017 Geocomposite panels zip tied together.

Figure 13: 9/13/2017 Sewing geocomposite panels together. (facing west)

Figure 14: 9/13/2017 Deploying CAR GCL over the geocomposite. (facing west)

Figure 15: 9/13/2017 Bentonite placed on overlaps of CAR GCL.

Figure 16: 9/14/2017 Lowering of east road along the southeast discharge location of the SEFAP. (facing northwest)

Figure 17: 9/14/2017 View of the southeast discharge location with rip-rap. (facing north)

Figure 18: 9/14/2017 Placement of bedding material over geotextile of the north discharge location. (facing south)

Figure 19: 9/14/2017 Pine Valley using tractor with spring tooth harrow and chain harrow rake to mix in fertilizer with topsoil in preparation of seeding. (facing north)

Figure 20: 9/14/2017 Spring tooth harrow and chain harrow rake used to mix in fertilizer and prep the topsoil for the seed. (facing north)

Figure 21: 9/14/2017 Dry fertilizer applied to the surface of the topsoil across the NFAP.

Figure 22: 9/14/2017 Seed temporary staged for seeding of the NFAP. (facing west)

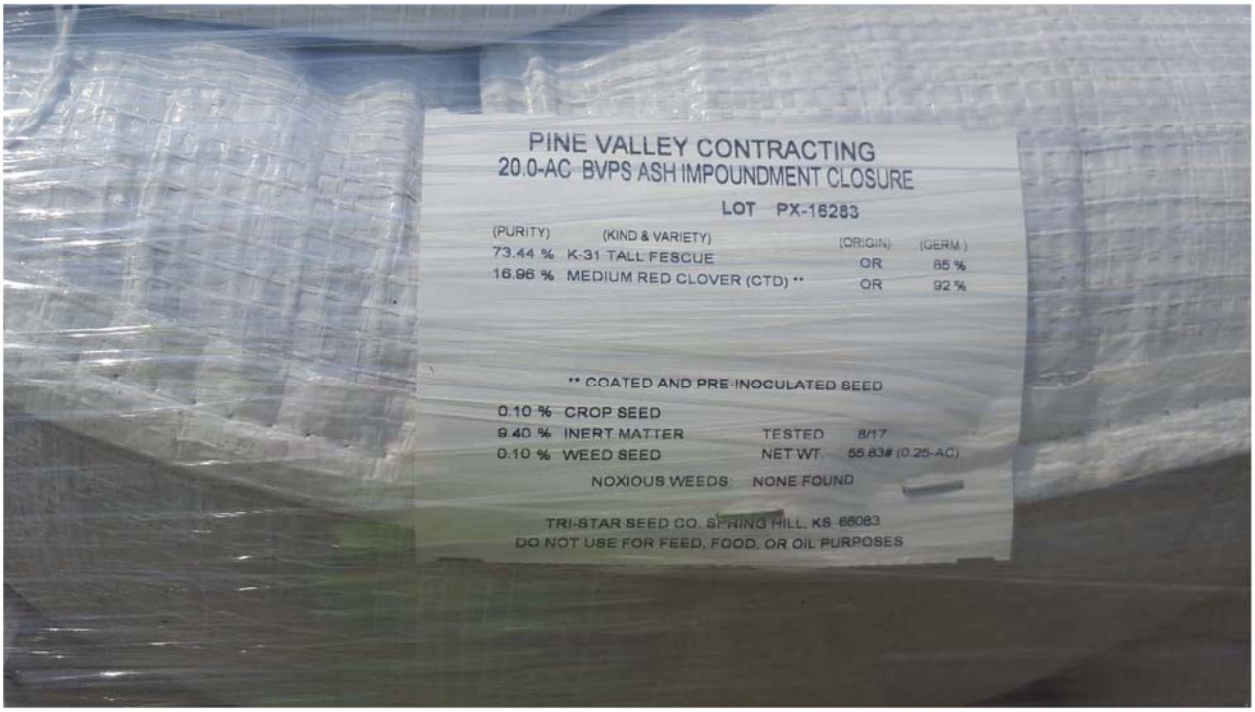


Figure 22: 9/14/2017 Seed bag label.

Figure 1: Using a spring tooth harrow on tractor to mix in the sand with clay in the southeast fly ash pond.

Figure 2: Scraper placing sand and soil being mixed through in the southeast fly ash pond.

Figure 3: North fly ash pond completely covered with hay after seeding and fertilizing was completed.

Figure 1: The seeding and fertilizer covered with hay over the topsoil on the north fly ash pond.

Figure 2: Coal-ash resistant GCL material and rip-rap rock placed on the southeast fly ash pond.

Figure 3: Rip-rap rock placed along the east access road of the southeast fly ash pond.

Figure 4: Pressure relief pipe end installed on south discharge of NFAP.

Figure 1: BentoLiner GCL installed on the south end of the bottom southwest fly ash pond.

Figure 2: Dozer pushing a minimum of 1 foot of soil over the GCL panels on the southwest fly ash pond.

Date Photos Taken: 9/25/2017
Photos Taken By: Bryan Ross, SCS Engineers

Figure 3: The west slope of the sediment pond was regraded by a dozer after the intercept trench was completed.

Figure 4: The south slope of the sediment pond was regraded by a dozer after the intercept trench was completed.

Figure 5: The southeast fly ash pond with tilled in topsoil mix prior to final discing.

Figure 6: Topsoil mixed in with the clay on the south end of the southeast fly ash pond.

Figure 1: Radmacher installing BentoLiner GCL panels in the middle of the bottom southwest fly ash pond.

Figure 2: Radmacher installing GCL panels around the power poles in southwest fly ash pond.

Figure 3: Haul trucks depositing clay and the dozer placing it a minimum of 1 foot thick over the GCL panels placed.

Figure 1: Haul trucks bringing in clay and dozer placing soil a minimum of 1 foot in the bottom southwest fly ash pond over installed GCL panels.

Figure 2: Radmacher personnel installing bentonite powder between the GCL panels in the north end of the southwest fly ash pond.

Date Photos Taken: 10/2/2017
Photos Taken By: Bryan Ross, SCS Engineers

Figure 3: The east edge of the bottom southwest fly ash pond with GCL panels placed.

Figure 4: Soil was placed over the GCL installed in the northwest corner of the southeast fly ash pond and around the rip-rap rock.

Figure 1: The bottom southwest fly ash pond with 1 foot of clay covering the installed GCL panels.

Figure 2: Clay was placed over the GCL panels up to the rip-rap rock in the northwest corner of the southeast fly ash pond.

Figure 3: Grass beginning to grow in the north fly ash pond topsoil.

Figure 4: Grass beginning to grow in the north fly ash pond topsoil.

Figure 1: Overview of grass growing in north fly ash pond.

Figure 2: Gravel was placed over the drainage area where the pump house was previously located to help filter out suspended solids during rain events.

Figure 3: Overview of the south fly ash ponds with topsoil placement completed and mixed in with clay layer.

Figure 4: One of the test pot holes to verify a minimum of one foot of topsoil.

Figure 5: Gravel was placed around the base of the power poles in both the bottom ash and southeast fly ash ponds.

Figure 6: Verifying a minimum of one foot of topsoil mixed in with the clay at one of the test pot hole locations.

Figure 7: Verifying clay layer thickness and a minimum of one foot of topsoil mixed in with the clay layer at one of the test pot hole locations.

Figure 8: Verifying the clay layer thickness and one foot minimum of topsoil mixed in with the clay layer at one of the test pot hole locations in the southeast fly ash pond.