Attachment 1

Design Geotechnical Data Report

GEOTECHNICAL DATA REPORT

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Closure of North, East, and West Ash Ponds
Bremo Power Station
Bremo Bluff, Virginia

Dominion

Submitted To: Mr. Mike Glagola
Dominion-Bremo Power Station
5000 Dominion Boulevard
Glen Allen, VA 23060
Phone: (804) 273-2362

Submitted By: Golder Associates Inc.
2108 West Laburnum Ave, Suite 200
Richmond, VA 23227 USA
Tel: (804) 358-7900

November 2015 1520347

Golder Associates

November 30, 2015 1520347

Mr. Mike Glagola
Dominion-Bremo Power Station
5000 Dominion Boulevard
Glen Allen, VA 23060
Phone: (804) 273-4547
Email: michael.a.glagola@dom.com

RE: DATA REPORT OF GEOTECHNICAL EXPLORATION
CLOSURE DESIGN FOR THE NORTH, EAST, AND WEST ASH PONDS
BREMO POWER STATION - BREMO BLUFF, VIRGINIA

Dear Mr. Glagola:

Golder Associates Inc. (Golder) is pleased to submit this report of geotechnical data collected during our exploration related to the feasibility study of options to close the North, East, and West Ash Ponds at Dominion's Bremo Power Station in Bremo Bluff, Virginia.

Additional geotechnical work in our scope of work, including completion of settlement and stability analyses, final interpretation and reporting of geotechnical engineering properties, and provision of construction recommendations are ongoing and will be provided under separate cover.

Golder appreciates the opportunity to assist you on this project. Please contact us at 770-496-1893 if you have any questions regarding this report or if we can be of any further service.

Sincerely,

GOLDER ASSOCIATES INC.

Pieter J. DePree
Senior Geotechnical Consultant

Gregory L. Hebeler
Senior Consultant and Associate

Ron DiFrancesco, P.E.
Principal and Senior Consultant

PJD/GLH/JGM/glh

EXECUTIVE SUMMARY

The following are salient observations resulting from our subsurface exploration of the three Coal Combustion Residuals (CCR) (ash) ponds at Dominion's Bremo Power Station in Bremo Bluff, Virginia. Please review the text, tables, figures, and attachments to this report for details.

1. CCR to remain in place within the East Ash Pond (EAP) and North Ash Pond (NAP) exhibits permeability values similar to fine sandy silts generally between $2.5*10^{-4}$ centimeter per second (cm/sec) and $1*10^{-5}$ cm/sec. The ash deposits are anticipated to allow for dewatering with conventional drainage trenches, rim ditches, and/or active dewatering points, noting that cuts in ash materials will likely generate seepage waters that will need to be handled both in the short and long term.

2. Unsubmerged ash areas should be trafficable to low ground pressure equipment relatively quickly upon drying when water levels are kept 3 or more feet below the surface. Trafficability by heavier equipment such as loaded dump trucks will likely take more significant dewatering in wet areas, and care should be taken to establish protocols for assessing and confirming trafficability and ground stability during re-grading and cover placement activities.

3. Ash compressibility and settlement upon new increased loadings and drying during closure are difficult to predict. The design closure condition has been designed to limit key surface water features over (and especially across) deep ash features with the intent to limit settlement in these key features.

4. Areas of CCR along perimeter areas to be sloped during closure at 4 Horizontal to 1 Vertical (4H:1V) or greater are recommended to be contained by a minimum of 10 horizontal feet of earthen material to provide protection against the potential for CCR exposure in the long term through surface erosion or other factors.

5. Ash in the EAP has similar density but generally higher consistency than ash in the NAP. We attribute this to the EAP ash having been placed there directly from the power station, while NAP ash was first placed in the West Ash Pond (WAP) and later moved, creating a disturbance of the weak cementation that forms over time that is never fully regained.

6. Ash weathering over the life of the various ponds appears to be minimal, and significant weathering is not expected to occur in the foreseeable future.

7. The buried dike in the western part of the EAP will act as a low settlement "hard-point" area, and this has been accounted for but not eliminated in the design and grading of closure elements near this feature.

8. Variability in ash composition, condition, and drainage characteristics makes accurate prediction of settlement and compensatory ditch slopes difficult to predict, and some grade reversals in local areas may still occur.

9. Geometries of five (5) borrow areas within the NAP were identified from construction drawings and were estimated from results of the March geotechnical investigation, but greater uncertainty in the depth of CCR in those areas remains. Similarly, the base of the EAP was estimated from a

combination of historical records and investigation data, but some level of uncertainty remains as no as-built bottom topography is known to exist.

10. Depositional patterns within the CCR were identified from the results of the geotechnical investigation. The NAP depositional spigot was typically placed in the northwest portion of the NAP. If typical depositional patterns hold, the CCR should be coarser near to the spigot and finer in areas farther away. Finer CCR is typically more compressible than coarse CCR; thus, settlement may be increased or trend towards the higher predictions in areas further from the depositional spigot locations. Coarser zones may settle faster than fine zones, causing variations in settlement rates and magnitudes across the NAP.

11. The residual profile beneath the NAP, particularly where borrow excavations removed the less permeable shallow residual soils and exposed more permeable saprolite, disintegrated rock, or fractured rock, appears to be allowing drainage of the overlying ash, as evidenced by lower head in pore pressure dissipation (PPD) tests and wells screened near this interface than in shallower PPD and wells.

12. Alluvial soils beneath the EAP and WAP are generally less permeable than the subsurface materials below the NAP, and the groundwater regimes are shallower and with less gradient in these ponds, such that seepage out of these ponds is likely to occur more slowly than at the NAP.

13. The EAP dikes, notably in the south and west, are not considered to meet containment needs for long term closure in their current state, and are recommended to be upgraded. The south dikes of the EAP are mostly tree covered, which is likely providing stabilization in the short term, but is unreliable in the long term and not in line with the standard practice to keep dam slopes free from trees. Recommendations to upgrade the dikes and remove trees from the slopes have been incorporated into the design package. Seepage from the EAP did not appear to be significant, but this may also be attributable to tree growth, as roots uptake seepage water.

14. The NAP dikes, which were nominally built at 2.5H:1V or flatter, are in good condition, without evidence of significant concerns. Seepage appears to be occurring through the NAP dike abutments, but this seepage does not appear to be creating significant concerns with dike stability.

15. The WAP dikes have nominal slopes of 2H:1V, but appear to have good maintenance and are performing well, without evidence of significant erosion or instability.

16. The WAP and EAP dikes are constructed of generally more clayey (alluvial) materials than the NAP dike, which is constructed of residual materials, expected to be of higher permeability. An attempt was made to construct the taller section of the NAP dike as a zoned (core and shell) dam, but the small range of permeability typical of residual profiles appears to have resulted in a nearly homogeneous structure.

17. Significant portions of the EAP dikes were probably constructed from materials borrowed from within the EAP footprint at times when ash was being stored elsewhere in the same footprint. Some inclusions of ash in the dike fills were noted, but are suggestive of incidental inclusions rather than deliberate construction of ash dikes. In contrast, the vertical expansion dikes in the upper fill on the eastern half of the EAP are generally comprised of compacted ash.

18. During filling of the EAP prior to construction of the NAP, ash was deposited a considerable distance up the valley currently occupied by the NAP. This ash appears to have been removed from the NAP dike footprint, though some EAP ash likely remains within the deepest portion of the NAP. Some seepage communication between the EAP and NAP may be occurring, either through an imperfectly performing cut-off beneath the NAP dike, or via preferential seepage paths in the rock and disintegrated rock along the north side of the EAP, similar to surficial seepage noted in the NAP dike abutments.

19. More detailed geotechnical engineering data and analyses (such as final stability and settlement analyses) to support the closure design will be submitted under separate cover.

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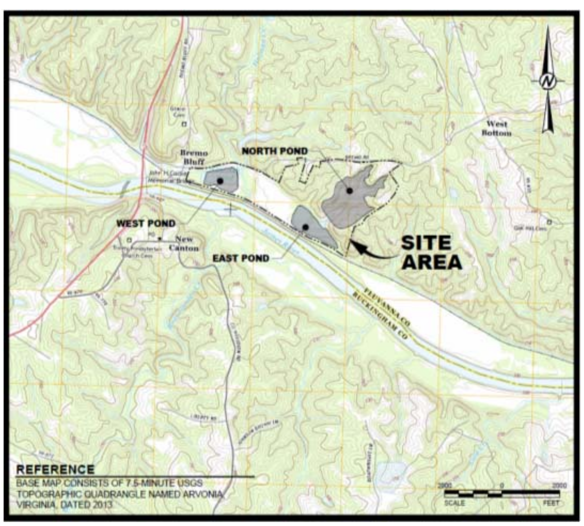
1.0 INTRODUCTION

Dominion plans to close the existing Coal Combustion Residual (CCR; ash) ponds at the Bremo Power Station in Bremo Bluff, Virginia. Golder has conducted a geotechnical subsurface exploration in support of this effort to assess the subsurface conditions within the ponds and containment dikes. This report presents the data collected as well as baseline engineering interpretations. Geotechnical recommendations and analyses will be presented under separate cover.

2.0 SITE AND PROJECT DESCRIPTION

The Bremo Power Station is constructed on an alluvial terrace along the north side of the James River, about 50 miles west of Richmond. The terrace is relatively level at about 212 feet elevation (NGVD, a local datum of approximately NGVD less approximately 122 feet is used in most historical documents). The River flows from WNW to ESE, but to simplify descriptions, we refer to the river orientation as W-E and perpendicular to the river as N-S. Along the north edge of the alluvial terrace, the ground rises moderately to steeply into rolling hills with well-developed dendritic drainage valleys, typical of the Piedmont Physiographic Province in which the site lies. Drainage from these valleys flows or flowed by natural meandering streams and/or man-made ditches and channels across the terrace to the river.

The Bremo Power Station has three inactive ash ponds: the North, West, and East Ash Ponds (NAP, WAP, and EAP). From startup in the 1930's until about 1972, the Bremo Station did not capture fly ash, so only bottom ash was placed in the ponds. From about 1972 until recently, the Station used fly ash capture techniques, and considerably more ash, mostly fine-grained fly ash, was placed in the ponds. The Bremo Station has converted to natural gas such that no additional ash production and storage are anticipated. Further description of the ponds and vicinity, based on site reconnaissance and document review, is included in the sections below.



Bremo Power Station Site Location Map

2.1 Site and Area Geology

The site is located in the Piedmont Physiographic Province. The Piedmont Province in Virginia is defined by the contact with the Coastal Plain to the east, which occurs at the head of navigation of most rivers, generally along a line from Washington, DC through Richmond to Raleigh, NC. To the west, the Piedmont transitions into the similar Blue Ridge Province. The Piedmont consists of metamorphic and igneous rocks including schist, slate, granite, and gneiss. These rocks were altered from their parent material (generally sedimentary rock) under intense heat and pressure caused by tectonic movements, as well as later igneous intrusions (the source of local granite zones), and are extensively folded with fracturing and jointing. Published geologic mapping and previous work at the site indicate that the underlying rock at the site consists of granite and biotite gneiss.

Piedmont soils are formed by the in-place chemical and physical weathering of the parent crystalline rock and are thus referred to as residual soils. Weathering is generally most advanced near the surface and decreases with depth. This results in a subsurface profile that consists of finer grained soils at the surface, where weathering is more advanced, underlain by sandy silts and silty sands. Surficial soils tend to be featureless and of uniform color, typically reddish brown. With depth, soils often retain recognizable relic structure of the parent rock, producing banding or mottling in a wide range of colors, and are called "saprolites."

If the parent rock was fairly uniform, the transition from finer to coarser soils can be gradual, though if parent rock contained seams of varying mineralogy, changes may be more abrupt and the general trend of finer to coarser with depth may not apply. Seams of resistant rock types, notably crystalline quartz, often remain in the weathered profile. Like coarseness, soil consistency generally increases with depth, and the boundary between soil and rock is often poorly defined. A transitional zone of weathered rock locally termed "disintegrated rock" is frequently found overlying bedrock. Disintegrated or partially weathered rock can be defined as residual material that can be penetrated by soil drilling techniques, but has a standard penetration resistance (N_{60}) exceeding 100 blows per foot (bpf). Due to folding and variable weathering along fractures, joints, and seams of less resistant materials, the profiles of soil, saprolite, disintegrated rock, and intact, unweathered rock can be irregular and erratic, with significant changes in depth over short horizontal distances. Seams, lenses, and boulders of hard rock and zones of disintegrated rock may to be present within the soil mantle above the general rock level.

2.2 Document Review

A variety of documents were reviewed, and inform our understanding of the site conditions. Salient documents and information include:

2.2.1 General Site

1. Published topographic mapping and aerial photographs from public sources (Google and USGS). An electronic version of USGS Topography dating from about 1980 was used as a base map for the assumed original contours of the NAP. To the extent that it matches recent topographic survey data on apparently undisturbed areas of the site generally within a few feet, it appears to depict the original grades in the bottom of the NAP with reasonable accuracy, at least for purposes of the proposed closure. Historic aerial imagery, dating back to 1994, allowed some inference as to activities in the various ponds and surrounding area.

2. A recent, Lidar Topographic survey of the site commissioned by Dominion and used to represent current topography.

3. A well installation report dated January 2013 by Groundwater & Environmental Services, Inc. (GES) documenting 13 groundwater monitoring wells (which are extant) around the site, including geotechnical logs with standard penetration test (SPT) data and groundwater level data, and a spreadsheet showing water level readings over time.

4. Haley & Aldrich - Partial report of groundwater monitoring well installation logs from installations in early 2015. Logs were only provided for wells MW-16 to MW-18, missing MW-14 to MW-15.

2.2.2 North Ash Pond

1. Design drawings for the initial dike construction dated May 21, 1982, by J.K. Timmons and Associates, Inc. These include detailed topographic drawings of the dam and vicinity as well as boring locations and cross sections of borings conducted prior to the dam construction.

2. An “Engineering Design Summary Report” pertaining to the NAP Dike dated September 1, 1982, by Schnabel Engineering Associates, P.C. (Schnabel), including boring logs, laboratory data, and design calculations and recommendations.

3. Photographs apparently dating from the time of construction of the NAP Dike.

4. An internal Dominion document showing “Estimated Phreatic Surface” of groundwater in the NAP Dike based on piezometer readings from August 1989 to October 2009. Missing were detailed logs of the piezometers installed in the NAP Dike.

5. Recent bathymetry of the south open water areas of the NAP provided by Dominion.

2.2.3 East Ash Pond

1. Drawings from 1956-1958 by Stone and Webster Engineering Corporation showing the original ash pond in the eastern portion of what is now the EAP, and proposed expansions to the east.

2. Drawings from 1981 by D’Appolonia showing general conditions and a proposed vertical expansion over the western portion of the EAP.

3. An “Addendum Letter Report – Supplementary Ash Waste Disposal Concepts” dated April 1981 by D’Appolonia.

4. A “Report – Short Term Ash Waste Disposal Facility” dated July 1981 by D’Appolonia.

5. A “Report – Modification Plan Short-Term Ash Waste Disposal Facility” dated January 1982 by D’Appolonia. The letter and two reports address the vertical expansion and other modifications to the EAP in the early 1980’s, and include various boring and test pit logs, laboratory testing, and drawings of conditions at that time.

2.2.4 West Ash Pond

1. Apparently internal (Virginia Power) design drawings of the WAP dating from 1976.

2. “Stability Evaluation of West Ash Pond Dikes” by Schnabel Engineering, LLC, dated February 5, 2010. This document includes drawings, boring logs, and descriptions of the WAP.

3. “Topographical Survey of West Ash Pond” dated October 28, 2010, by Dominion.

4. Recent bathymetry of the open water areas of the WAP provided by Dominion.

2.3 General Ash Pond Descriptions

The following are descriptions of our understanding of each of the ponds based on our reconnaissance, document review, discussions with Dominion personnel, and subsurface exploration. Subsurface aspects are addressed in greater detail in the following report sections.

2.3.1 East Ash Pond

The EAP covers about 22 acres on the alluvial terrace east of the plant and former coal pile. It is bounded to the south by railroad main track, spurs, and a related drainage ditch, on the north by rising natural ground and the NAP, and on the west by the former coal pile. the EAP is roughly triangular in shape and defined by an earthen dike that begins at a steep left or east abutment and extends about 1,900 feet to the west before turning north about 700 feet to meet the rising ground in the right or northwest abutment.

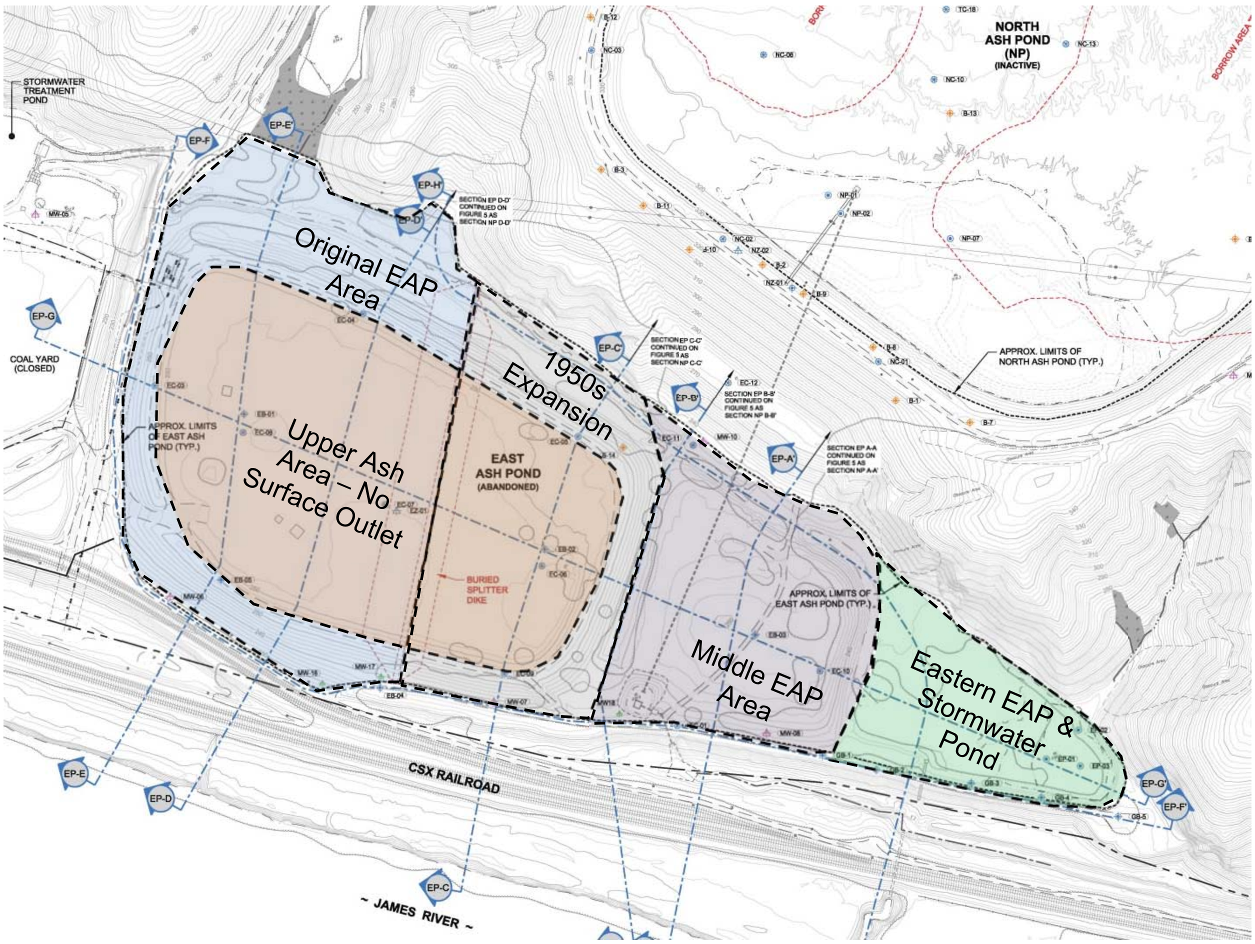
Aerial Image of East Ash Pond

2.3.1.1 East Ash Pond History

The original EAP in service from the 1930's to about 1956 consisted of a borrow pit excavated into the alluvial terrace, with the excavated material used to construct the west dike and western portion of the existing south dike. There was apparently not an east dike at that time, so the ash storage was generally in the excavated borrow pit. The natural terrace elevation was about 211 feet and the pit was excavated about 15 feet to an elevation of about 196 feet. The eastern limit of the pond up to that time was controlled by the property line, which was roughly 600 feet east of the existing west dike.

In about 1956-58, additional property was acquired to the east, and terrace material was borrowed from a new pit, originally about 400 feet square and also about 15 feet deep to the east of the former pond, but eventually apparently expanding across most of the pond footprint to the east. This borrow was used to create a dike along the east side of the former pit and extend the south dike to connect to the east abutment, essentially the current dike configuration, with a crest elevation of about 234 feet or about 22 feet above the original terrace. The original east dike of the older part of the EAP is now essentially a splitter dike and has been buried (see following schematic). A concrete vertical intake structure and 24-inch reinforced concrete pipe spillway through the dike were installed about 400 feet from the east abutment. The dike had no other apparent spillway.

In the early 1970's, the plant began to capture fly ash, so the ash volumes increased significantly and most of the ash placed in the pond was the finer grained fly ash. In the later 1970's, the EAP was filling rapidly, so the older, western portion of the pond, generally west of the splitter dike, was dredged using a crane and clamshell. The material (mostly older bottom ash) was stacked on the central portion of the EAP to drain, then it was trucked to the northeast of the NAP, to fill the area now occupied by the microwave tower. The resulting volume was then available for additional ash placement of the then current ash stream consisting mostly of fly ash with limited bottom ash. In the course of filling the EAP, during this period, ash was also deposited up to about the EAP dike elevation along the natural rising ground along the north side of the EAP, filling the various drainage features with ash. In the drainage feature that would eventually become the NAP, ash was deposited extending under the future NAP dike footprint and beyond.



General Layout of Historical East Ash Pond Deposition Areas

By about 1982, the entire EAP (total of about 22 acres) was largely filled to the dike elevation, and ash was mounded several feet above the dike elevation with a thin soil cap in the western part, though a segment of the eastern part still had some standing water. At that time, a vertical expansion covering about 10 acres was constructed, apparently using ash to create an inner upper level perimeter dike stepped in from the west and south dike and with a crest elevation of about 252 feet. This allowed additional ash storage volume until the NAP was ready to receive ash. The eastern portion of the EAP was dredged to about elevation 229 feet, or about 5 feet below the dam crest, for stormwater storage. A second "splitter" dike was installed over the ash about 600 feet from the east end, dividing the area east of the vertical expansion into ash storage on the west and stormwater on the east. An outlet structure from the vertical expansion to the east was located in the southeast portion of the vertical expansion dike.

The NAP principal spillway, a 24-inch iron pipe (see photograph below), empties into a concrete-armored basin within the EAP, a short distance west of the EAP's own spillway, and then out via a vertical box and another pipe to the ditch along the railroad, eventually through a stone arch culvert under the railway (see photograph below).

24-Inch North Pond Primary Spillway Pipe

Stone Arch Culvert Under Railway

Within a few years of the EAP's vertical expansion, with the NAP in service, the EAP was "closed." By that time, the vertical expansion was partly filled, but still several feet below the vertical expansion dike crest elevation. The former vertical expansion outlet structure has apparently been covered, so there is no surface water outlet to the vertical expansion area. The central portion to the eastern splitter dike had been filled to slightly above the dike crest elevation and capped with soil. The eastern portion remained wet, with the ash surface at a relatively shallow depth, allowing swampy vegetation to grow.

In 2012, a 26-inch-diameter gas line was horizontally bored from south of the river to a distribution structure located near the north end of the west dike, and is understood to underlie the west dike of the EAP. The horizontal bore would have dipped well beneath the river, so is likely rising at a significant angle toward the structure and generally fairly deep below the dike and pond.

2.3.1.2 East Ash Pond Current Conditions

The EAP's current condition is apparently little changed from the time of "closure" in the mid-1980's. Trees have grown on the perimeter dike, which also shows signs of erosion. Trees have also grown on the ash. A ditch of shallow gradient connects the wet area in the east and a culvert that passes beneath the road along the dam crest in the west, which leads to the "frog pond." This ditch roughly coincides with the toe of the NAP Dike and/or the interface of ash and the rising natural ground along the north side of the EAP. Ash in the EAP is generally a mixture of fly and bottom ash, though remnants of the older bottom ash left after dredging may be present in the lower part of the western portion.

The eastern portion of the south dike, for a distance of about 1,300 feet from the left or south abutment, is thickly wooded and locally steep [nominally 1.5 horizontal to 1 vertical (1H:1V)]. Tree boles are curved, indicating the slope is likely creeping. Moderate erosion is evident at several locations.

Toward the western end of the south dike is an approximately 175-foot-long line of timber piles, driven immediately adjacent to each other and parallel to the dike crest. An apparent tension crack and minor seepage was noted in the slope above the piles during Golder's 2015 geotechnical exploration. The piles were reportedly driven in the 1990's in response to stability concerns with the dike in that area.

Section of Timber Piling at SW Corner of East Ash Pond

The west dike of the EAP appears in similar condition to the wooded portions of the south dike. A steep section at the toe may have been cut during closure and capping of the former coal pile, located immediately at the toe. Some curving of tree boles was noted.

The boundary of the ash in the EAP was generally defined by the dike to the south and west sides of the triangle and by the rising natural ground along the north/northeast side. During operation of the pond prior to construction of the NAP, ash had flowed north into valleys in the rising ground. An apparently limited amount of ash may have been intermingled with dike fills on the eastern portion of the south dike, which was constructed after ash had been placed in the pond so that incidental amounts of ash may have intermingled with soils being borrowed from within the pond footprint.

2.3.2 North Ash Pond

The NAP covers about 54 acres, northeast of the plant and immediately north of the EAP. Unlike the EAP and WAP, which were constructed over the relatively level alluvial terrace, the NAP was constructed by damming a steeper drainage feature in the rising natural hillside.

Aerial Image of Bremo North Ash Pond

2.3.2.1 North Ash Pond Dike

Borrow soil for the NAP dike was obtained from within the planned NAP flooded footprint, excavating into the natural ground. Again, in contrast to the EAP and WAP, the natural soils in the hillside area consist of a typical Piedmont residual profile, formed from in-place weathering of rock, which was generally coarser than the materials used in the EAP and WAP dikes, consisting of silty sand with occasional gravel and little or no clay.

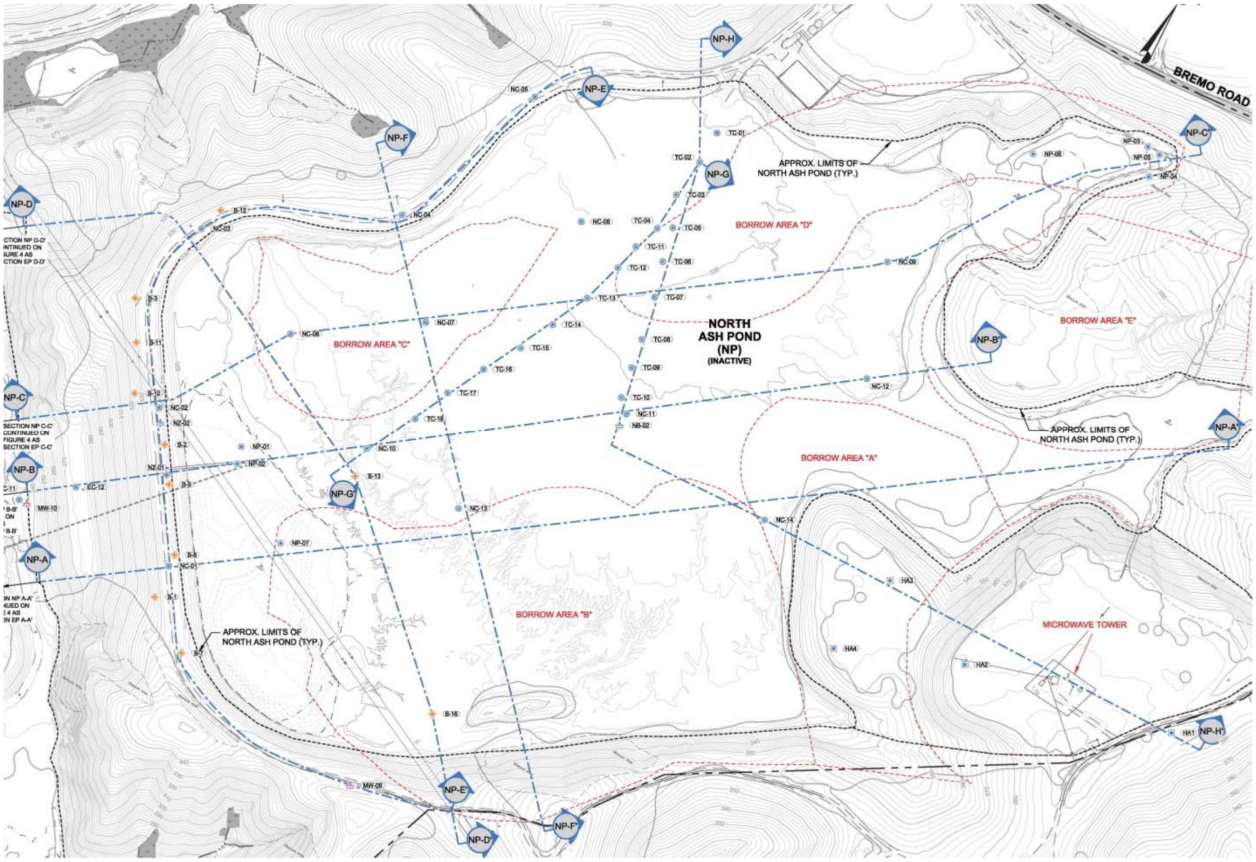
The dike was designed as a zoned embankment with a core of theoretically less permeable material, and upstream and downstream shells consisting of theoretically more permeable materials. However, as borrow materials from the residual Piedmont soils were used for both the core and shell, and in spite of an attempt to segregate based on fines content, the difference in permeability achieved appears to be relatively small based on the water surface in the dam, which is nearly consistent with that expected for a homogeneous embankment. Experience shows that zoned embankments are difficult to construct using Piedmont soils, which generally lack massive zones of either clayey soils or clean sands, but rather consist of sandy silts and silty sands with high spatial variability and a narrow range of permeability.

The main segment of the dike is over 100 feet high with slopes of 2.5H:1V and benches on the upstream and downstream side. The dike crest is about 334 feet in elevation. As noted above, the NAP was constructed over a valley that had filled with ash from the EAP, which had filled the lower part of the dam footprint to an elevation of about 235 feet. However, construction records indicate that at the time of dam construction, ash was excavated to about 210 feet in elevation, and a cut-off trench was excavated deeper, down to the disintegrated rock slightly below that.

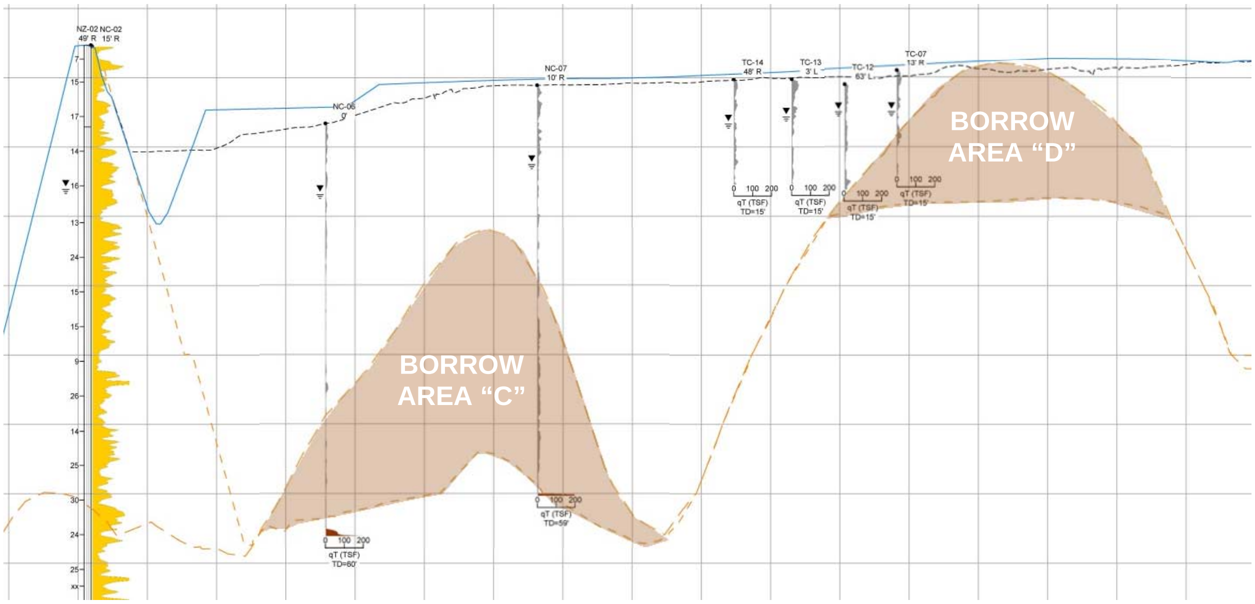
North Ash Pond Main Dike Areas

The main dike segment abuts steep natural slopes on either side of the valley outlet to the floodplain. Additional dike segments wrap around the west side and fill in some minor declivities in the ridgeline, but appear generally 20 feet or less in height.

Drawings showing the planned borrow areas are extant, but do not show the as-built bottom elevations of the pits. We assume most of the borrow was used for constructing the dikes, and based on that, limited subsurface information, and assumptions that the pit bottoms would have been sloped to maintain drainage, we developed an approximation of the pit bottom topography. The volume derived from the pits based on this exercise appears to be in reasonable agreement with the total volume of the dike, but uncertainty remains regarding the depth and breadth of any specific borrow pit.



North Pond Existing Conditions and Geotechnical Exploration Plan

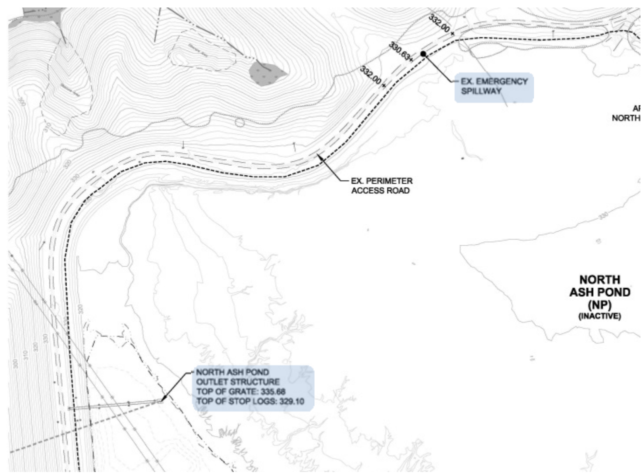


Portion of Subsurface Section NAP C-C' – Shaded Areas Denote Approximate Soil Borrow Areas

2.3.2.2 North Ash Pond Spillways

The primary spillway for the NAP is a 24-inch-diameter pipe connected to a concrete riser structure near the highest section of the main dike segment. This pipe extends to the concrete-armored basin described in the EAP section, above. An emergency spillway is located on the west side of the NAP and would allow flow into the valley to the west, through a small pond (the “stump pond”) and then into the ditch along the north side of the EAP, and either to the west into the main plant stormwater pond or east toward the open water portion of the EAP. It is not clear that the emergency spillway has ever activated, and activation would be expected to be rare given the available storage capacity of the NAP relative to the size of the drainage basin.

NAP Primary Spillway Intake Tower



NAP Primary and Emergency Spillway Locations

2.3.2.3 Ash Deposits

Ash has reportedly been deposited in the NAP primarily using wet methods, pumping from the WAP. However, some dry placement of ash has also been conducted. The wet outfall has generally been in the west-central portion of the NAP via piping coming up through the natural valley below the emergency spillway.

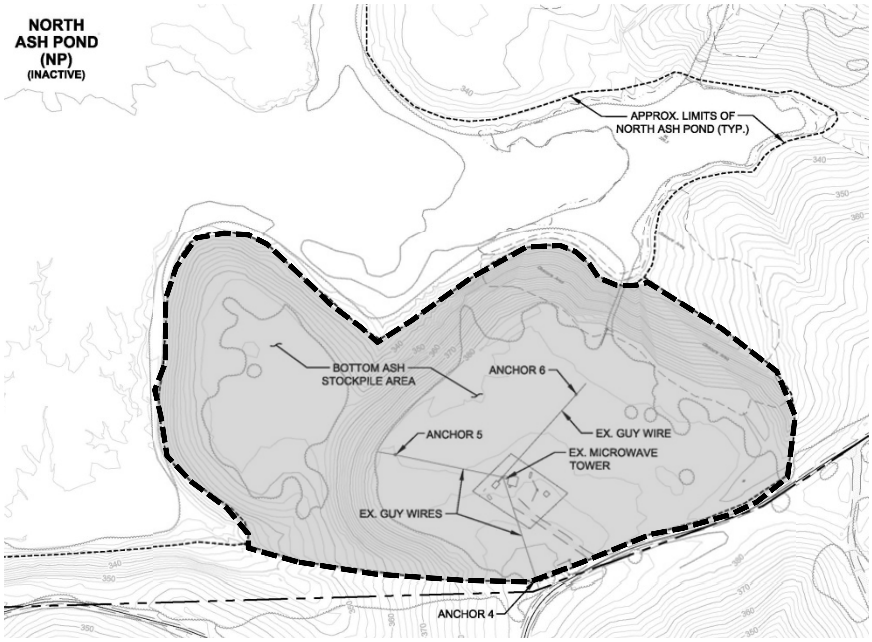
Hydraulic deposition of the mix of bottom and fly ash from the WAP would be expected to allow segregation of the coarser, generally bottom ash near the outfall and along drainage channels that would develop, and deposition of the finer, generally fly ash farther from the outfall. Since ash generally contains little very fine (clay-sized) material, little deposition of ash would be expected at points far from the outfall. Therefore, the upper arms of the NAP, at a distance from the outfall, contain thinner ash thickness, and less ash deposition has occurred along the east side of the NAP and near the dike, as indicated by generally lower ash elevations and standing water in those areas.

Aerial Perspective of the North Pond Ash Deposition

The boundary of the ash is well defined by the dike to the south and southwest, and evident cut slopes to the east. Ponded ash may be more or less contiguous with ash placed in the dry areas to the northeast (including the microwave tower hill), and with the northern shore of the pond fingers having relatively thin ash thickness. We anticipate limited amounts of ash outside the NAP (except to the northeast, see below), and clearing of the areas around the pond during grading for closure should generally reveal ash that may extend into gullies or ravines extending outside the main pond area.

2.3.3 Areas Northeast of North Ash Pond

Areas northeast of the NAP proper, that is, above the general water level, also appear to contain ash. Two relatively level terraces at the northeast portion of the pond, including one where a guyed microwave tower is located at about elevation 380 feet and one immediately south at about 350 feet elevation, reportedly received dry-placed ash, expected to have consisted mostly of bottom ash, in the early 1980’s. Other areas around the NAP appear to have been excavated for borrow and are not thought to contain CCR in significant quantities. Several hand augers were attempted in these areas, but were unable to penetrate the gravelly cover soils that appear to have been placed to a depth of 1 to 2 feet or more. Further ash delineation studies are planned in a forthcoming follow-up effort. The boundaries of these areas adjacent to the NAP are defined by the shoreline. The landside boundaries to the north and east can be inferred from site grades, and appear to roughly coincide with the unpaved road, but should be confirmed by means of shallow test pits.



Closed and Capped Bottom Ash Stockpiles to NE of North Ash Pond

2.3.4 West Ash Pond

The WAP covers about 15 acres in an area roughly bounded by the railroad to the south, Virginia secondary road 656 to the north, Spring Garden Creek and then the Bremo Power Station to the east, and a "metals cleaning pond" and undeveloped wooded land to the west. The WAP lies entirely on the alluvial terrace; the rising hillside is generally north of the road. The alluvial terrace was apparently sloping from about an elevation of 220 feet near the road to about 215 feet south of the WAP. The WAP dike crest elevation is about 234 feet, so the dike is about 14 to 19 feet high. Dike slopes are about 2H:1V. No significant indications of instability or significant erosion issues with the WAP dikes were noted.

No borings or probes were conducted to penetrate the pond bottom, but documents indicate the dike was constructed of material excavated from the alluvial terrace within the WAP, reportedly from a depth of about 6 feet below existing grade, so the pond bottom elevation is likely in the range of 209 to 214 feet in elevation.

The WAP was constructed in the late 1970's. The power station has typically used the WAP to store a mixture of bottom and fly ash for periods of a few years, and then the ash is dredged and hydraulically conveyed to the NAP. Detailed documentation of dredging was not available. Dredging operations may have left ash in the WAP and/or removed some natural bottom materials, so some older ash may be present and the bottom may be deeper than and more irregular than indicated on drawings. Dredging of ash from the WAP to the NAP is currently underway in preparation of the clean closure of the WAP prior to its re-purposing as a lined water treatment pond.

Aerial Image of West Ash Pond

A “metals cleaning pond” abuts and shares the west dike of the WAP. The metals pond is much smaller (about 1 acre) that the WAP, defined by similar dikes, and is not addressed in this exploration. Drawings indicate an ash pond expansion of about 4 acres was planned west of the metals cleaning pond in the early 1980’s, suggesting this was a possible alternative to the vertical expansion of EAP at that time. No evidence of dikes or excavation was apparent, suggesting that this expansion was never constructed.

3.0 GEOTECHNICAL EXPLORATION

Our assessment of subsurface conditions was based on review of extant data from previous investigations, site reconnaissance, and intrusive subsurface explorations. Table 1 presents a summary of the geotechnical data used in this evaluation.

3.1 Data Collection and Review

A substantial amount of data, including survey, geotechnical, and hydrogeologic data, has been developed at the Bremo Station in the past. Information from those sources made available to Golder was reviewed and incorporated into subsurface cross sections and in developing our understanding of the geotechnical site conditions.

3.1.1 Overlay and Development of Existing Condition Drawings

Golder overlaid existing topography (January 2015 Lidar and recent bathymetry) with past topographic information from various sources. Although such overlay is subject to some error due to a variety of matching and scaling issues, as well as the precision of the data, it does allow a reasonable idea of the depth or thickness of excavation and fill placement (including CCR) at specific locations, and a rough idea of volumes over defined areas. Borrow areas that are not well documented, but which have since been filled with ash, present uncertainty. Detailed maps showing Golder's interpretation of the bottom of ash contours will be presented in the geotechnical engineering report.

3.1.2 Boring, Well, and Soil Laboratory Testing Records

A significant amount of subsurface drilling has been conducted in and around the Bremo ash ponds over the past 50 years. Records or logs from some of these drilling efforts are available (see Attachment 1). We note that exploratory boring and well logs typically include visual-manual soil classifications, which are relatively subjective as to details of soil grain size distribution, plasticity, etc., with generally infrequent or no laboratory testing to provide a more objective and reliable confirmation of the classification. Sampling is often intermittent, commonly at 5-foot intervals, so interfaces between samples are uncertain. Wells are often surveyed and/or remain in service, so locations and elevations are reliable, but exploratory boring locations and elevations are often approximated rather than surveyed, a source of usually minor error. However, key information, such as presence and approximate thickness of ash and water levels in wells, can be gleaned from these data.

3.2 Site Walk Reconnaissance

In the course of our field work, a site reconnaissance of the ponds and surrounding areas was conducted to assess the approximate limits of ash placement, the condition of the various dikes, and the presence of rock outcrops, seeps, and other features of geotechnical significance. Attachment 2 presents aerial images and photographs of key features for each ash pond area.

3.3 Geotechnical Exploration

Subsurface exploration was scoped to confirm and expand on the extant data in the various dikes and to assess general ash conditions as they relate to pond closure. The 2015 exploration included 12 auger and mud rotary borings, including three that were completed as wells; four hand augers borings; 10 jon boat sampling probes; and 48 Cone Penetration Test (CPT) probes, although 18 of the CPTs were shallow and conducted primarily to assess immediate access conditions in the NAP ash areas. An additional five mud rotary borings were completed by Golder during a 2014 investigation into the east portion of the EAP. Records of borings, probes, and CPT soundings are presented in Attachment 3.

Exploration was conducted using all-terrain vehicle (ATV) mounted drilling/pushing rigs and a specialized, low-pressure push rig for CPT over the ash (see photograph below). Access over ash areas was conducted only after investigation to confirm that a sufficient thickness of unsaturated ash was present to support the equipment without bearing failure. Areas of standing water were explored using a small boat with limited probing and sampling capability. Borings, probes, and soundings were field located with handheld GPS units (+/- 10 ft).

Low-pressure Push Rig for CPT over Ash

Prior to intrusive exploration, Golder coordinated with Dominion and the Virginia one-call service (Miss Utility) to locate underground structures and utilities to avoid damage. A detailed health and safety plan (HASP) was prepared and coordinated with Dominion's safety program, as well as Golder's safety requirements for drilling and other exploration, over-water work, etc. All Golder and subcontractor field personnel attended on-site Dominion safety training. Daily safety meetings were conducted.

3.3.1 Soil Drilling, In Situ Testing, Sampling, and Logging Procedures

Soil drilling was completed by Premier Drilling under subcontract to Golder using a CME-750X ATV rig equipped with an automatic hammer. A Golder geologist or engineer was present at the drill rig for the duration of the drilling program. Boreholes were drilled using hollow-stem augers or mud-rotary techniques with standard penetration tests (SPTs) conducted at a nominal interval of 5 feet and in general accordance with ASTM D1586 to auger refusal. Disturbed samples were collected with split spoon SPT samplers, and as appropriate, bulk disturbed samples were collected from auger cuttings. Thin-walled Shelby tube samples were collected either in offset boreholes or between SPT intervals in general accordance with ASTM D1587. Vane shear testing (VST) was conducted between SPT intervals in boreholes where CCR was present in general accordance with ASTM D2573. VST results are included on boring logs presented in Attachment 3.

Soils were field-classified using Golder's soil description procedure, which is based on the Unified Soil Classification System (USCS) and is in general accordance with concepts presented in ASTM D2487 and D2488. SPT samples were collected, characterized, bagged, and labeled in the field to allow future soil testing and characterization. Bulk samples were likewise characterized and stored in labeled 5-gallon buckets with a small, sealed plastic bag for moisture testing. Shelby tube samples were sealed with a combination of screw-caps, wax, and duct tape in the field. The samples were transported to Golder's soils laboratory in Atlanta, GA for testing.

3.3.2 Cone Penetration Testing (CPT)

Cone penetration tests (CPTs) were completed by Mid-Atlantic Drilling under the supervision of a Golder geotechnical engineer. CPT soundings were completed with a 100 MPa tip capacity, 10 cm^2 area (3.57-cm diameter) CPTu Hogentogler type piezocone manufactured by Vertek USA, using operating procedures in accordance with ASTM Standard D-5778. CPT soundings were advanced to refusal, defined as the depth at which downward pressure on the piezocone causes uplift of the drill rig with no piezocone penetration, or the depth at which the CPT operation must stop to avoid damaging or breaking the piezocone and/or CPT rods.

Cone Penetration Testing

3.3.3 Jon Boat Probing and Sampling

Open-water areas of the EAP and NAP were investigated by a Golder engineer using a jon boat with a moon hole to allow sampling through the boat center. Probing and sampling were completed using 10-foot-long metal tubing and 10-foot-long threaded polyvinyl chloride (PVC) pipe. Water depths were recorded, and disturbed samples were characterized, bagged, and labeled for future testing. The following photograph shows sampling from the jon boat in the NAP during the 2015 explorations.

Jon Boat Sampling in North Ash Pond Open Water Areas

3.3.4 Geotechnical Laboratory Testing

Golder scheduled laboratory tests on representative soil samples from the investigation boreholes to provide characterization for the range of encountered soils, to provide proofing of the field classifications, and to characterize the physical properties of the CCR materials, embankment fill soils, and *in situ* soils in the vicinity of the ash ponds. The samples were transported to Golder's geotechnical laboratory in Atlanta, GA for testing, where laboratory tests were conducted according to the standards indicated in the table below:

Laboratory Test	Standard
Moisture Content (Oven)	ASTM D2216
Atterberg Limits - Method A	ASTM D4318
Sieve Analysis w/ Hydrometer	ASTM D422
Sieve Analysis	ASTM D1140
Specific Gravity	ASTM D854
Soil Unit Weight	ASTM D2937
Standard Proctor	ASTM D698
Permeability	ASTM D5084
1D Consolidation	ASTM D2435
Direct Shear	ASTM D2435
Triaxial C/U (3 samples)	ASTM D4767

In situ moisture content values provide an effective and inexpensive means for indexing the consistency and behavior of fine-grained soils when compared to the associated Atterberg limits. Profiles of encountered *in situ* moisture contents and Atterberg limits were scheduled. Soil characterization and behavior are fundamentally dependent on soil particle size, and grain-size analysis tests were scheduled to proof the field estimates. Standard Proctor compaction tests on selected bulk disturbed samples from the borings were performed to determine the optimum moisture content (OMC) and standard Proctor maximum dry density (MDD). One-dimensional consolidation testing was conducted on five CCR samples to aid in the predictions of settlement during the life of the proposed closures. Consolidated Undrained (CU) triaxial and Direct Shear (DS) strength testing was completed on selected soil samples to supplement the CPT results in providing engineering strength properties. The geotechnical laboratory test results are summarized on Tables 2a through 2c, discussed by subsurface soil type in Section 4.0, and the raw data sheets are presented in Attachment 4.

4.0 SUBSURFACE CONDITIONS

Subsurface materials related to the ponds include: soil fills, CCR (ash), alluvial deposits, and a residual profile of soil, saprolite, disintegrated rock, and rock as discussed in the following sections. Geotechnical engineering properties for design and construction are not presented in detail in this report, and will be reported under separate cover.

4.1 Comments on Interpretation

Interpretation of subsurface conditions was based on a variety of field and laboratory test data as well as visual/manual classification of samples recovered. Some issues of note:

1. The SPT hammer used was an automatic hammer, which typically produces more energy and better consistency than the safety hammer and cathead system described in the ASTM D-1586 Procedure to develop N60. Therefore, SPT N-values (the sum of blows required to drive the sampler from 6 inches to 18 inches below the bottom of the borehole, in units of blows per foot or bpf) using the automatic hammer are typically 30-50 percent lower than N60 values, i.e. a blow count of 4 bpf with an automatic hammer might correlate to an N60 value of 5 or 6 bpf.

2. The dry density and void ratio, or porosity, of saturated soils, which are generally assumed to be any soils below the water table, can be derived from the moisture content and specific gravity of solids. Error due to loss of moisture in sampling or storage may occur, but SPT samples that are placed in watertight containers shortly after sampling typically limit such error. Wash boring typically does not affect moisture contents since the sampler is driven below the bottom of the borehole.

3. Auger borings remove material above the bottom of the borehole, and in saturated, non-cohesive soils, can allow the soils immediately below the bottom to soften slightly due to relief of porewater pressure and may result in reduced SPT N-values. Mud rotary techniques limit such effects.

4.2 Embankment and Other Soil Fills

Substantial grading of the site from initial conditions and prior to, during, or after placement of CCR has occurred. Soil fills occur primarily in the various embankment dikes, but also in road and railroad embankments and as soil cover over some of the CCR deposits.

4.2.1 North Ash Pond Soil Fills

Soil fills in and around the NAP are derived primarily from the Piedmont residual soils in the upland areas of the site, including borrow pits in and near the pond. As such, these soils are fairly typical of such a profile and include a mix of fine sandy silt (ML) and silty fine sand (SM), with small percentages of coarser materials. These coarser materials include coarser sands and angular gravel pieces derived from seams of resistant materials (mainly quartz), as well as the lower saprolites and upper disintegrated rock where borrow would likely have terminated due to excavation difficulty. Soil fills in the dikes appear to have been compacted, based on SPT N-values and moisture content testing, but detailed construction records were not available.

The following tables summarize the primary geotechnical laboratory results (first table) and basic CPT-based interpretations and secondary laboratory data (second table) from the NAP Dike laboratory soil tests and CPTs completed during the 2015 geotechnical exploration program.

Summary of Primary Geotechnical Testing Data
NAP Embankment Soil Fills

Property	No.Tests	Min.	Max.	Avg.	Median
Depth Range (ft)	-	9.5	114.5	63.6	62.1
Water Content (%)	10	14	29	22	22
Gravel (> 4.75 mm) (%)	10	0	8	3	2
Sand (%)	10	39	67	57	61
Fines (< 0.075 mm) (%)	10	30	59	40	37
Specific Gravity	0	-	-	-	-
Liquid Limit (LL) (%)	5	32	46	40	42
Plastic Limit (PL) (%)	5	26	35	30	28
Plasticity Index (PI)	5	3	16	10	11
Non-plastic Results	0	0 of 5			

Summary of Secondary Geotechnical Data
NAP Embankment Soil Fills

Property		No. of Points	Min.	Max.	Avg.	Median
Drilling	SPT N (bpf)	46	7	31	18.5	18
CPT Based	*Peak φ' (°)*	2538	20.7	47.5	34.0	34.1
	Su (tsf)		0.7	15.5	4.3	3.9
	SPT N_{60} (bpf)		5	100	29	27
	Norm. CPT Tip (Qtn)		1.9	521.7	58.1	31.6

As seen in the above results tables, the NAP Dikes generally consist of a mix of fine sandy silt (ML) and silty fine sand (SM) materials that show consistencies in line with a well compacted and competent fill material. The results do not show a wide spread of behavior, and generally indicate that the NAP Dike soils can generally be modeled as a single material for closure design purposes. A section along the NAP Embankment (Section NP E-E') is presented as Figure G-16 and should be referenced in relation to conditions within the NAP Embankment.

4.2.2 East Ash Pond Soil Fills

Embankment fills in the EAP dikes were generally observed to consist of low-plasticity fines (CL and ML) with increasing amounts of sand with fines (SM and SC) encountered in the eastern portion of the embankment (Borings GB-4 and GB-5 from the 2014 exploration program).

The following tables summarize the primary geotechnical laboratory results (first table) and basic CPT-based interpretations and secondary laboratory data (second table) from the EAP Dike laboratory soil tests and CPTs completed during the 2015 geotechnical exploration program.

Summary of Primary Geotechnical Testing Data
EAP Embankment Soil Fills

Property	No. Tests	Min.	Max.	Avg.	Median
Depth Range (ft)	-	9	49.6	22.3	17
Water Content (%)	8	12	30	24	24
Gravel (> 4.75 mm) (%)	5	0	6	1	0
Sand (%)	5	5	49	26	27
Fines (< 0.075 mm) (%)	6	51	95	74	75
Specific Gravity	2	2.71	2.76	2.74	2.74
Liquid Limit (LL) (%)	8	19	44	33	32
Plastic Limit (PL) (%)	8	15	33	22	22
Plasticity Index (PI)	8	4	18	11	11
Non-plastic Results	1	1 of 8			

Summary of Secondary Geotechnical Data EAP Embankment Soil Fills						
Property		**No. of Points**	**Min.**	**Max.**	**Avg.**	**Median**
Drilling	SPT N (bpf)	40	0	18	8	8
CPT Based	*Peak φ' (°)*	1539	23.1	47.1	33.8	33.5
	Su (tsf)		0.4	8.3	2.4	2.1
	SPT N_{60} (bpf)		2	69	18	15
	Norm. CPT Tip (Qtn)		3.2	481.4	48.2	27.8

Secondary Laboratory Testing Data			
Sample ID & Depth (ft)	**Sample Description**	**Effective Strength**	**Total Strength**
GB-2 UD-01 8-10 ft	Dike Fill, (CL) sandy SILTY CLAY	φ' = 28.3° c' = 1.7 psi	φ = 20.1° c = 2.0 psi
GB-3 UD-01 16-18 ft	Dike Fill, (CL-ML) SILTY CLAY to CLAYEY SILT and SAND	φ' = 26.4° c '= 0.6 psi	φ = 17.7° c = 1.0 psi

Uncorrected SPT blow-counts from drilling in the fill material ranged from 0 to 18 bpf, with an average of about 8 bpf. Significant layers within the EAP embankment fills exhibited blow counts less than 5 bpf. As detailed in Golder's November 2014 East Ash Pond Stability Report and confirmed with the extended 2015 exploration program, the EAP south embankment generally requires structural upgrading and/or reduction of loads and/or water levels prior to permanent closure. A section along the EAP Embankment (Section EP F-F') is presented on Figure G-10 and should be referenced in relation to conditions within the EAP Embankment.

Capping layers in the EAP, both above ash deposits and below the vertical expansion, were observed but were generally too thin for meaningful evaluation of compaction. The capping layer below the upper ash fill in the western portion of the EAP was observed to be clay-rich, and was acting to limit downward seepage out of this upper ash fill, as seen in the geotechnical section across the center of the EAP complex (Section EP G-G') presented on Figure G-10.

4.2.3 West Ash Pond Soil Fills

Embankment fills in the WAP dikes were generally observed to consist of materials similar to the EAP dikes, including low-plasticity fines (CL and ML) with increasing amounts of sand with fines (SM and SC). The WAP dikes were generally observed to contain well compacted materials with uncorrected SPT blow counts consistently over 10 bpf except in rare instances.

The following tables summarize the primary geotechnical laboratory results (first table) and basic CPT-based interpretations and secondary laboratory data (second table) from the WAP Dike laboratory soil tests and CPTs completed during the 2015 geotechnical exploration program.

Summary of Primary Geotechnical Testing Data WAP Embankment Soil Fills					
Property	**No. Tests**	**Min.**	**Max.**	**Avg.**	**Median**
Depth Range (ft)	-	9.5	34.5	22.3	22.9
Water Content (%)	6	22	26	24	23
Gravel (> 4.75 mm) (%)	2	0	0	0	0
Sand (%)	2	11	32	21	21
Fines (< 0.075 mm) (%)	4	59	90	75	75
Specific Gravity	1	2.72	2.72	2.72	2.72
Liquid Limit (LL) (%)	5	28	41	34	35
Plastic Limit (PL) (%)	5	19	25	22	23
Plasticity Index (PI)	5	8	17	11	11
Non-plastic Results	0	0 of 5			

Summary of Secondary Geotechnical Data WAP Embankment Soil Fills						
Property		**No. of Points**	**Min.**	**Max.**	**Avg.**	**Median**
Drilling	SPT N (bpf)	17	4	25	11	9
CPT Based	*Peak φ' (°)*	1213	26.0	47.5	34.8	34.3
	Su (tsf)		0.4	4.7	1.7	1.7
	SPT N_{60} (bpf)		3	23	10	10
	Norm. CPT Tip (Qtn)		5.8	520.0	58.3	33.1

Secondary Laboratory Testing Data			
Sample ID & Depth (ft)	**Sample Description**	**Effective Strength**	**Total Strength**
WB-01 UD-1 20.6-21.9 ft	Dike Fill, (ML) CLAYEY SILT	φ' = 28.3° c' = 0.7 psi	φ = 23.2° c = 0.0 psi

The structural integrity and water levels within the WAP embankment fills showed good compaction and behavior in line with the visual observations of good performance of the WAP embankments. A section along the WAP Embankment (Section WP D-D') is presented on Figure G-7 and should be referenced in relation to conditions within the southern, eastern, and western portions of the WAP embankment. Geotechnical sections WP A-A' to C-C' all contain data from one exploration location through the northern leg of the WAP Dike.

4.3 Alluvial Soils

In the alluvial terrace around the WAP and EAP, alluvial soils generally consisting of clayey silts were encountered, and appear to occur in thicknesses ranging up to about 20 feet where not removed from borrow pits. A few borings encountered rounded gravel in what was interpreted to be the bottom of the alluvial deposit. The gravel zones likely represent high velocity channel fills related to past periods of higher gradient flow in the area, and do not appear to be uniformly distributed over the site.

As noted, the WAP and EAP dikes were constructed of materials excavated from within the ponds, likely mostly alluvial soils. Borrow activities for the WAP and EAP may have thinned the clayey silts and/or locally exposed underlying gravel channels or residual materials. The clayey silts would generally be of relatively low permeability compared to other materials, especially zones of alluvial gravel, fractured rock, or disintegrated rock.

The following table summarizes the basic CPT-based interpretations from the alluvial materials tested during the 2015 geotechnical exploration program. Geotechnical sections WP D-D' and EP F-F' on Figures G-7 and G-10 show the typical alluvial soils below the WAP and EAP dikes.

Summary of Secondary Geotechnical Testing Data Alluvium Materials						
Property		**No. of Points**	**Min.**	**Max.**	**Avg.**	**Median**
CPT Based	*Peak φ' (°)*	1792	21.3	42.7	30.7	30.2
	Su (tsf)		0.3	5.7	1.5	1.4
	SPT N_{60} (bpf)		3.5	47.0	12.1	10.4
	Norm. CPT Tip (Qtn)		2.3	198.0	23.5	14.6

4.4 Residual Profile

Piedmont residual materials underlie the entire site, including the alluvial terrace. The materials are typical of a residual profile, generally a surficial layer of highly weathered residual soil, underlain by saprolites that retain the relic structure and markings of the parent rock, underlain by disintegrated or weathered rock, underlain by relatively sound, massive, and intact rock. The residual profile above rock is relatively thin beneath the alluvial terrace, potentially due to scouring of some materials during ancient river flood events. The profile is thicker, up to about 50 feet, and more fully developed beneath the uplands around the NAP.

The NAP dikes were constructed of generally residual materials borrowed from the residual profile, probably mostly saprolites and soils. We expect that little disintegrated rock would have been borrowed due to excavation difficulty, but locally some disintegrated rock may have been excavated, and/or intact rock, possibly with fractures, may have been exposed in the borrow pit bottoms.

In-place residual soils tend to have moderate to high strength and low compressibility. Permeability tends to be low to moderate in the most weathered soils near the surface, and increases with depth as saprolites and disintegrated rock tend to become increasingly coarser, with more sand and gravel. Intact rock is generally impermeable, but secondary features such as fractures and joints in the rock can allow significant water flows. Seeps observed in the groin and abutments of the NAP Dike likely represent preferential flow paths through the rock.

The following table summarizes the basic CPT-based interpretations from the residual and partially weathered "disintegrated" rock materials tested during the 2015 geotechnical exploration program. It should be noted that the CPT test data of the disintegrated rock profile are limited, and in general, that profile consists of material with SPT N values greater than 100, with the CPT data representing a thin section of the upper profile across a number of tests.

Summary of Secondary Geotechnical Testing Data Residual Soils and Weathered Rock						
Property		**No. of Points**	**Min.**	**Max.**	**Avg.**	**Median**
Residuum						
CPT Based	*Peak φ' (°)*	2267	16.2	43.6	34.8	35.0
	Su (tsf)		0.1	14.3	3.1	2.2
	SPT N_{60} (bpf)		2.2	74.4	20.4	17.4
	Norm. CPT Tip (Qtn)		0.8	317.9	59.3	45.9
Partially Weathered (Disintegrated) Rock						
CPT Based	*Peak φ' (°)*	110	-	43.5	36.8	37.1
	Su (tsf)		-	13.6	8.6	8.9
	SPT N_{60} (bpf)		-	80.6	47.7	49.7
	Norm. CPT Tip (Qtn)		-	228.8	83.0	66.4

A section along the NAP Embankment (Section NP E-E') presented on Figure G-16 shows both historical pre-embankment construction borings and current 2015 exploration locations, which provide significant data about the typical residual profile at the site.

4.5 CCR

CCR, and particularly fly ash, present complex behaviors with significant differences relative to most natural soils. The composition, consistency, and condition of CCR are affected by a variety of factors, ranging from the source of coal to the ultimate deposition and post-deposition weathering.

4.5.1 Types of CCR at Bremo

CCR typically include fly ash, bottom ash, and flue gas desulphurization (FGD) gypsum, with small amounts of boiler slag. Bremo has not deposited FGD gypsum into the ponds. Fly ash typically represents a large preponderance of the total ash, often 80 to 90 percent, with bottom ash comprising the remainder. Slag tends to occur in only small volumes, generally much less than 1 percent of the total, so slag has little impact on the behavior of large ash deposits. Fly ash is typically fine-grained, generally of a particle distribution similar to natural silts, though some agglomerations of silt-sized particles may produce a small proportion of generally fine sand. Bottom ash tends to be mostly sand-sized, with small amounts of silt-sized material.

At Bremo, only bottom ash and slag would have been collected for the first decades of operation. Only after about 1972 was fly ash capture initiated. Much of the bottom ash collected in the EAP prior to 1972 is thought to have been excavated and placed in dry ash stacks northeast of the NAP, notably the Microwave Tower Hill. Since that time, plant operations have typically mixed fly and bottom ash as it was placed in the EAP and later in the WAP, with subsequent dredging to the NAP. Fly ash appears to represent a significant majority of the material of interest in the NAP and EAP, with bottom ash distributed in relatively small percentages throughout and/or locally concentrated in relatively small pockets. Therefore, the expected behavior of the CCR in the ponds will be largely controlled by the fly ash.

4.5.2 North Ash Pond CCR Summary

The NAP consists of CCR generally hydraulically deposited from spigot discharge points following incremental dredging of the WAP. The following tables summarize the primary geotechnical laboratory results (first table) and basic CPT-based interpretations and secondary laboratory data (second table) from the NAP CCR tests and CPTs completed during the 2015 geotechnical exploration program.

Summary of Primary Geotechnical Testing Data
North Ash Pond CCR

Property	No. Tests	Min.	Max.	Avg.	Median
Depth Range (ft)	-	2.4	79.5	36.7	34.5
Water Content (%)	21	40	158	84	77
Gravel (> 4.75 mm) (%)	4	0	0	0	0
Sand (%)	4	7	52	24	19
Fines (< 0.075 mm) (%)	4	49	93	76	82
Specific Gravity	5	2.06	2.21	2.13	2.13
Liquid Limit (LL) (%)	4	NP			
Plastic Limit (PL) (%)	4				
Plasticity Index (PI)	4				
Non-plastic Results	4	4 of 4			

Geotechnical Sections NP A-A' to D-D' and F-F' to G-G' present much of the exploration data within the NAP CCR deposits. The southernmost deposits in the currently submerged areas adjacent to the NAP dike were not extensively investigated in the current study, with only shallow probing via jon boat conducted in those areas. In general, the consistency of the CCR in the NAP is soft with very little densification or change in behavior noted with depth below the upper crust materials.

Summary of Secondary Geotechnical Testing Data
North Ash Pond CCR

Property		No. of Points	Min.	Max.	Avg.	Median
CPT Based	*Peak φ' (°)*	12332	0.8	46.7	28.1	28.7
	Su (tsf)		0.0	2.4	0.4	0.4
	SPT N_{60} (bpf)		1	23	4	4
	Norm. CPT Tip (Qtn)		0.0	438.7	20.2	14.5

Laboratory Testing Data

Sample ID & Depth (ft)	Preconsolidation Stress (ksf)	Cc (Strain)	Cr (Strain)	Cv	Effective Strength	Total Strength
NB-02 UD-01 25.5-27.5 ft	3.7	0.049	0.015	3.98	-	
NB-02 UD-01 53.5-55.5 ft	5.8	0.326	0.022	2.67	φ' = 37.4° c' = 0.0 psi	φ = 26.9° c = 0.0 psi
NB-02 UD-03 68.5-70.5 ft	7.5	0.191	0.026	4.32	-	

4.5.3 East Ash Pond CCR Summary

The EAP consists of a range of CCR covering a good portion of the history of coal-fired power generation at the site, including zones of bottom ash, zones of mixed ash more similar to the WAP and NAP, and zones of compacted CCR used as internal and upper dike fills. The following tables summarize some of the geotechnical data of the EAP CCR.

Summary of Primary Geotechnical Testing Data East Ash Pond CCR					
Property	**No. Tests**	**Min.**	**Max.**	**Avg.**	**Median**
Depth Range (ft)	-	4	55	30	30
Water Content (%)	37	21	163	81	80
Gravel (> 4.75 mm) (%)	10	0	0	0	0
Sand (%)	10	3	50	25	23
Fines (< 0.075 mm) (%)	10	50	97	75	77
Specific Gravity	5	2.07	2.14	2.10	2.10
Liquid Limit (LL) (%)	1	NP			
Plastic Limit (PL) (%)	1				
Plasticity Index (PI)	1				
Non-plastic Results	1	1 of 1			

Summary of Secondary Geotechnical Testing Data East Ash Pond CCR						
Property		**No. of Points**	**Min.**	**Max.**	**Avg.**	**Median**
CCR- Uncompacted						
CPT Based	*Peak φ' (°)*	4934	20.5	46.5	29.3	28.7
	Su (tsf)		0.1	5.0	0.9	0.8
	SPT N_{60} (bpf)		1	41	8	7
	Norm. CPT Tip (Qtn)		1.8	420.2	18.1	11.6
CCR- Compacted						
CPT Based	*Peak φ' (°)*	960	33.3	46.9	42.4	43.1
	Su (tsf)		1.9	4.8	2.4	2.2
	SPT N_{60} (bpf)		9	67	35	36
	Norm. CPT Tip (Qtn)		26.7	460.8	209.1	207.7

Laboratory Testing Data (Uncompacted CCR)						
Sample ID & Depth (ft)	**Preconsolidation Stress (ksf)**	**Cc (Strain)**	**Cr (Strain)**	**Cv**	**Peak Strength**	**Post Peak Strength**
EB-02 UD-01 33-35 ft	3.6	0.13	0.027	2.64	φ = 34.7° c = 0.0 psi	φ = 31.8° c = 0.0 psi
EB-02 UD-02 43-45 ft	3.9	0.143	0.028	3.15	-	-

Geotechnical Sections EP A-A' to D-D' and G-G' on Figures G-8 to G-10 present much of the exploration data within the EAP CCR deposits. Section EP G-G', taken across the long axis of the EAP complex, shows the variability of materials and depositional areas that exist across the EAP.

4.5.4 West Ash Pond CCR Summary

The WAP generally consists of the youngest CCR deposits at the Station, as it was historically used as the initial deposition pond with material later incrementally dredged to the NAP for final storage. The following tables summarize some of the geotechnical data of the WAP CCR, noting that no explorations from within the WAP were performed, as the ash in this area is currently being removed via dredge to the NAP as part of the Bremo pond closure project.

Summary of Primary Geotechnical Testing Data
West Ash Pond CCR

Property	No. Tests	Min	Max	Avg	Med
Depth Range (ft)	-	1	1.8	1.3	1.3
Water Content (%)	3	42	111	68	50
Gravel (> 4.75 mm) (%)	1	0	0	0	0
Sand (%)	1	34	34	34	34
Fines (< 0.075 mm) (%)	1	4	4	4	4

4.5.5 Other CCR Testing Data

Limited ash chemistry and compaction data were collected on samples of ash from across the three ponds and are presented in the below table.

Summary of Other CCR Testing Data
All Bremo Ash Ponds

Property	No. Tests	Min.	Max.	Avg.	Med
pH	3	8.5	8.7	8.6	8.6
Resistivity (ohm-cm)	3	2400	5100	3570	3200
Depth Range (ft)	0 – 10 ft				
Max Dry Density (pcf)	4	53.2	82.4	66.6	65.4
Optimum Moisture (%)		28.6	50	41.7	44.1

4.5.6 Discussion of Other Factors Impacting CCR Behavior

4.5.6.1 Effects of Placement on Ash Properties and Behavior

Most of the ash at the Bremo Station Ponds was placed by hydraulic methods. In the EAP, ash would have been placed hydraulically directly from the plant. In the NAP, ash would have first been placed in the WAP and then, after a period generally of some years, intermittently dredged and placed in the NAP. Hydraulic placement at low solids contents (as contrasted with thickened or paste placement) would have allowed ash to segregate at the outfall. The coarser fraction (generally sand-sized bottom ash) would tend to settle near the outfall, with finer materials (generally fly ash) transported farther from the outfall in still water. Where the outfall was above the water level, the flow would tend to create channels in the previously placed ash, and the coarser material would deposit along the channels with fines transported to the end of the channels and distributed more widely in the open water.

As noted, fly ash fines behave somewhat like silt, which settles less rapidly than sand but much more rapidly than clay. Therefore, the finer ash does not spread widely beyond the deposition point, but tends to settle somewhat quickly. The ash slopes observed in the open water bathymetry areas provide an indication of how quickly ash settles. Ash is highly erodible, so surface flow or underwater currents may act over time to further transport the ash.

In addition to relative grain size, ash particles may comprise differing specific gravities, with, for example, heavier iron oxides compared to relatively lighter aluminosilicates. For a given particle size, the heavier particles would tend to settle more rapidly, with the effect of additional sorting. Floatation has been used to separate lighter carbon from the remaining ash, and this effect could occur in the ponds. Foaming of some of the ash may also impact deposition to a small degree, with foam material spreading over wider areas before sinking.

The effect of these placement mechanisms would be to create roughly conical piles of coarser materials below the outfall with flatter cones of finer materials around. Where flow concentrated into channels, sandy channel fills might cut through portions of the finer cones. Evidence of such depositional features was observed in the geotechnical exploration results.

4.5.6.2 Ash Cementation and Structure

Some coal fly ash contains significant lime and often contains some level of cementitious behavior. Fly ash containing more than 20 percent lime is considered “type C ash” and to have cementing properties. Ash with less than 20 percent lime is “type F ash” and generally considered to have pozzolanic, but not cementitious, properties. Note that the 20 percent figure is an arbitrary division, and ash with less than 20 percent lime may have lesser cementitious effects. Bremo ash is generally type F ash; however, the ash seems to form a relatively incompressible structure as indicated by low densities and relatively consistent CPT tip resistance throughout even deep deposits of fly ash in the NAP and EAP. In contrast, hydraulically placed inorganic silts or other uncemented natural soils would be expected to increase in density and tip resistance and decrease in void ratio with increasing depth, as the soils were consolidated by the increasing weight of the material above.

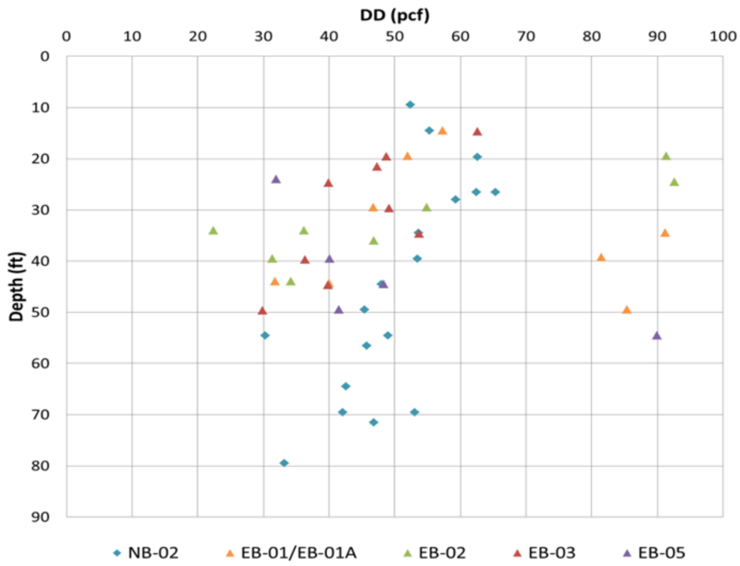
Over-consolidation ratios (OCR) of even some very low density/high void ratio ash samples from deep in the EAP and NAP are 2 or more, meaning that the ash is able to resist compression due to loads of about twice the current overburden load. In the EAP, this phenomenon may partly indicate past loading of some ash when bottom ash was stacked over it during the dredging and transportation of bottom ash from the

EAP to areas northeast of the NAP in the 1970's. However, it does not appear the ash within the NAP would have a loading/stress history that could explain the high over-consolidation ratios, suggesting that the ash is forming a structure and weak cementation.

Ash cementation may, like Portland cement, be related to hydration reactions. In such a case, ash reacts with water and is transformed to form a hydrated structure, like cement. Subsequent physical destruction of this structure should not reverse the chemical reactions. This may explain differences in ash in the EAP, which appears to have significantly higher consistency (based on CPT tip resistance) but similarly low densities to ash in the NAP. EAP ash was placed directly from the power station into the EAP, while NAP ash was first placed in the WAP and later dredged into the NAP. Therefore, structure and cementation formed in the WAP would have been largely disrupted. Nevertheless, ash in the NAP appears to have re-formed significant structure capable of substantially resisting consolidation pressures exerted by up to about 100 feet of overburden.

4.5.6.3 Ash Density

Ash densities were calculated from direct measurement in relatively undisturbed samples, and calculated densities were based on moisture content measurements from dry ash. Slight disturbance of samples may have created minor variations in these densities, but generally, the relative consistency of the data and our experience with CCR suggest that the data are reasonable. In addition, Standard Proctor (ASTM D698) tests were conducted on selected ash samples, which provide a remolded "standard proctor maximum dry density" (SPMDD) based on the standard compactive effort (greater compactive effort can produce greater densities, but standard effort is comparable to common earthwork compaction procedures). Table 2c outlines calculated densities based on moisture content, and Table 2b indicates measured ash densities. The graph below shows profiles of ash dry densities for several borings in the EAP and NAP. While some of the very low values, below 30 pounds per cubic foot (pcf), may be due to sample disturbance, both relatively undisturbed specimens and many density calculations based on moisture content and specific gravity of saturated samples show dry densities in the range of 30 to 50 pcf. Densities do not appear to increase with depth; rather, densities of some of the upper (crust or desiccated ash) are higher and approach the SPMDD, which range around 60 pcf. A few outliers on the high side, at 80 to 90 pcf, can likely be attributed to a significant proportion of bottom ash, which may have higher specific gravity and pack more densely than fly ash.



Dry Density of Saturated CCR from Water Content Measurements

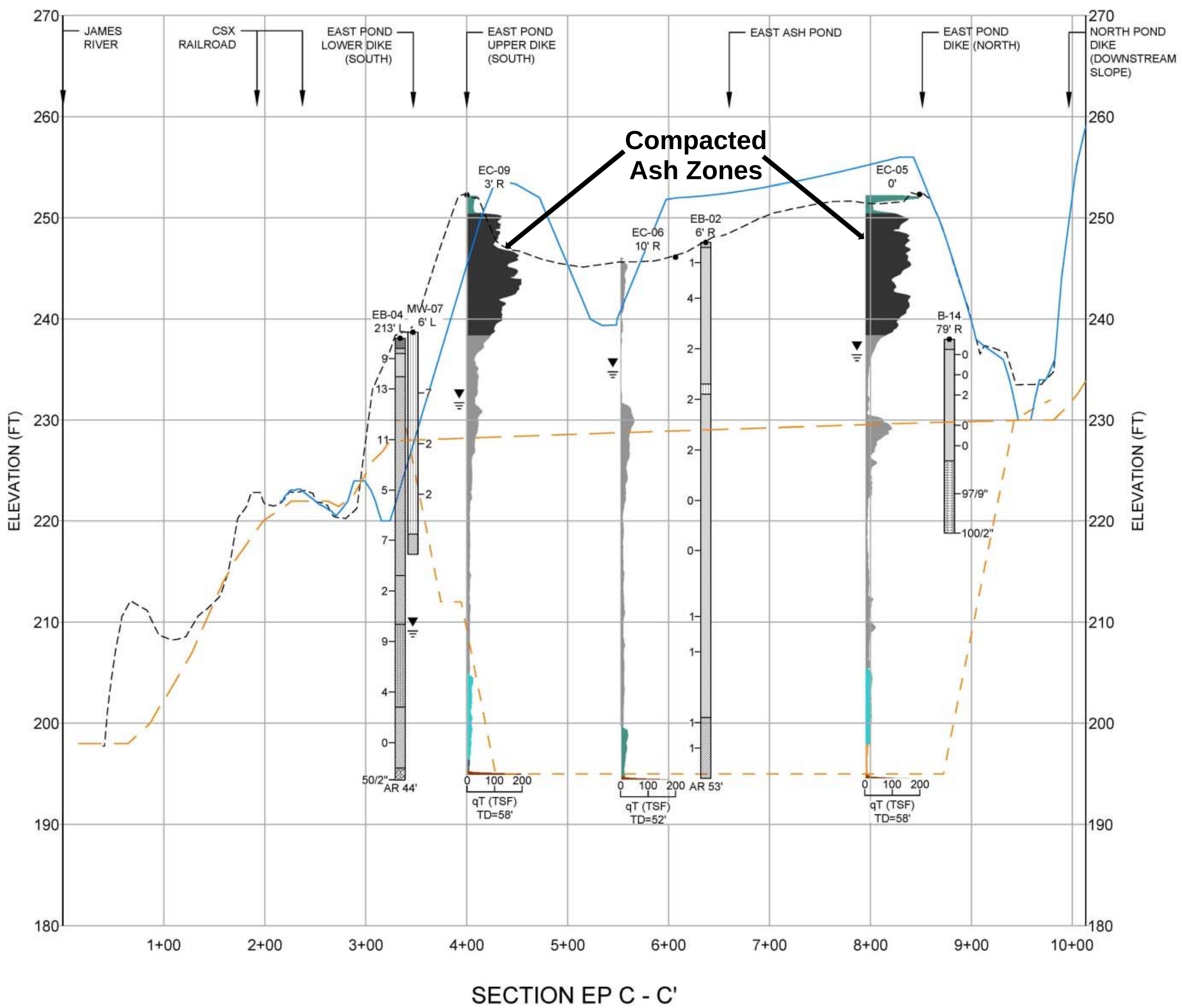
4.5.6.4 Ash Crust

In general, desiccated ash, that is, ash exposed at the surface of the pond for some time so that it dries, forms a "crust" of higher consistency (increased stiffness, CPT tip resistance, etc.). The increased crust consistency appears to persist after subsequent inundation, based on observations at the Bremo ponds (predominantly the NAP) during the 2015 Golder geotechnical exploration program. The ash in the vertical expansion of the EAP has substantially dried, which appears to have resulted in significantly higher consistency. The ash crust makes much of the NAP and all but the inundated portions of the EAP trafficable by low ground pressure equipment in its current state. The NAP crust was verified and monitored during exploration operations by use of the CPT at nominal 100-foot intervals, as seen in the CPT results and the photos below.

Photos showing Trafficability of North Ash Pond Crust

4.5.6.5 Compacted and Dry Placed Ash

Ash in the dikes forming the vertical expansion portion of the EAP appears to have been compacted, resulting in significantly higher consistency (CPT tip resistance and SPT N-values). Some ash crust in the NAP may be the result of recent dry placement of ash in that area. Dry-placed ash will typically achieve higher density and consistency than hydraulically placed ash that remains saturated. Significant compactive effort may be achieved by trafficking with equipment during dry placement operations, even if no deliberate compaction is conducted.

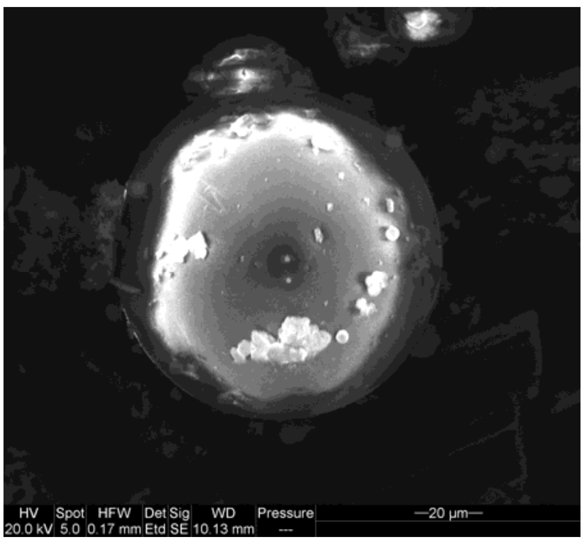


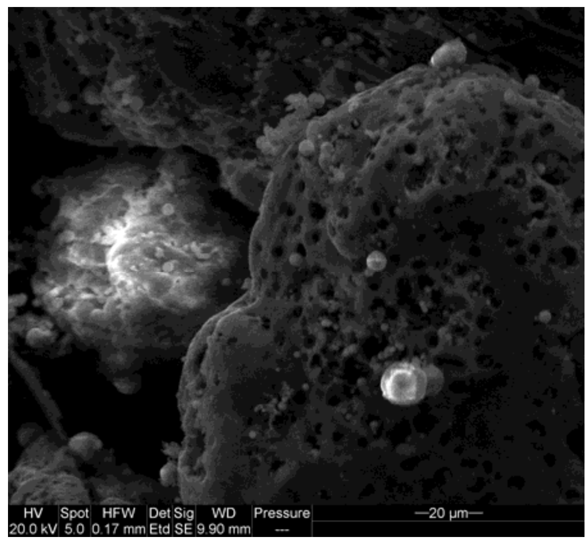
Significant Increase in Density / Consistency of Compacted Ash as Seen in Dark Upper Portions of CPT Tip Stress Profiles in East Ash Pond Section C-C'

4.5.6.6 Ash Weathering

Fly ash forms hollow spheres ("cenospheres") of very small size (generally about 10 to 100 microns) that are captured from the flue or stack gases. This feature is similar to some volcanic ash. Volcanic ash is known to weather or degrade over time into clayey soils, though the weathering process may take millennia to occur. Some published studies indicate that weathering of coal fly ash may occur more quickly, potentially in time frames of decades to centuries. Weathering or breakdown of the cenospheres into platy clay particles can occur due to pore water quality (notably pH), freeze-thaw cycles, and other physical, chemical, and potentially biological processes. These processes and interactions are complex, but we anticipate that, in general, weathering would occur most rapidly in zones of fluctuating groundwater and near the surface, and more rapidly in saturated conditions and more slowly in dry conditions.

Since ash weathering could have impacts on long term ash behavior, including strength, compressibility, and permeability, Golder conducted Scanning Electron Microscopy (SEM) on ash estimated to be of various ages based on location and depth. SEM allows visual assessment of the very fine ash particles. Weathering would be expected to consist of a breakdown of the ash cenospheres, which are relatively smooth and free of non-spherical debris for fresh fly ash, but would become pitted, broken, and ultimately reform into stacks or agglomerations of platy clay like particles in weathered ash.





SEM Images of Bremo Ash – Showing Fresh (Left) and Aged (Right) Ash Particles

Six samples were tested, including ash from near the surface in the WAP (thought to be youngest, only a few years old) and samples from deep in the EAP, likely dating from the 1970's, so about 40 years old. Interpretation of the weathering effects from SEM is necessarily somewhat subjective as only very small portions of the samples can be viewed. Varying mineralogy (iron or aluminosilicates) of the cenospheres can also affect their appearance. Interpretation was further complicated by the presence of bottom ash particles in the mixed ash. Overall, the SEM imagery (see Attachment 5) suggests relatively slight changes in the general condition of the fly ash cenospheres over the various samples, though the oldest samples did appear to have slightly more breakage and pitting of the cenospheres, possibly evidence of early weathering.

Other field and laboratory data were also considered with respect to weathering. Weathered ash should act more like clay than silt, so we would expect to see decreases in permeability and changes in CPT response. We were unable to detect such changes.

Based on the SEM and other data, it appears that ash in the Bremo ponds has not weathered significantly over the last 40 years, and breakdown of ash into clayey materials at current rates will likely take significant time, probably centuries.

4.5.6.7 Ash Compressibility

The compressibility of the ash is challenging to predict based on the light cementation and associated structure of the ash that may remain intact or become disturbed over time. Laboratory consolidation tests of the ash show variable compressibility, ranging from moderate to high and about what might be expected for natural silts of similar void ratio. However, over-consolidation ratios (OCR) are 2 or more, meaning the materials behave as though they were from twice the depth, and so are less compressible than normally consolidated (OCR of 1) soils would be. Some of the cementation and structure of the samples was almost certainly lost in the process of sampling and preparation for laboratory testing.

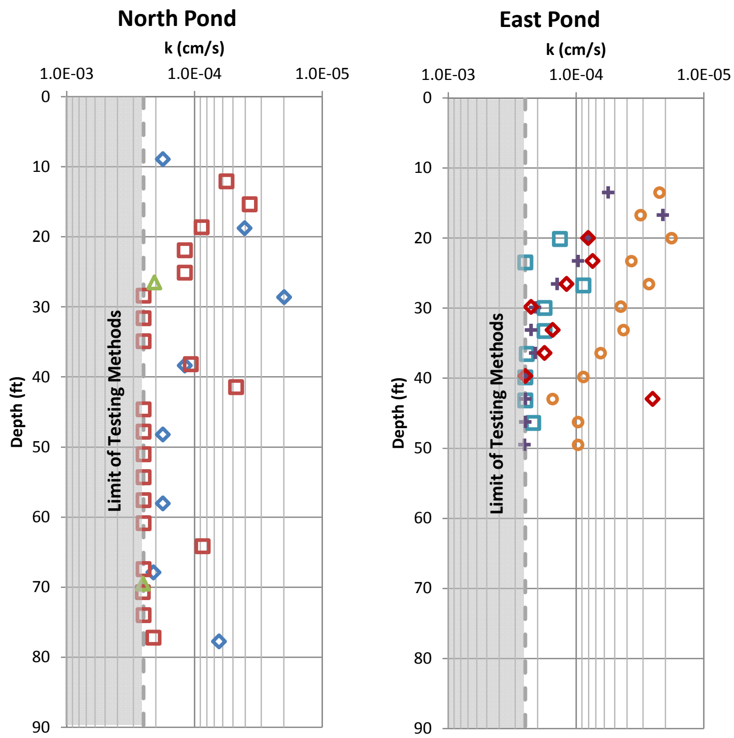
Field data, notably CPT tip resistance and density data, do not indicate an increasing trend in either with depth. This suggests that the cemented structure the ash has developed is able to withstand increasing overburden without considerable consolidation and compression, and that additional loading, to a point, would substantially resist significant consolidation settlements.

The time rate of compression is fairly rapid, as would be expected from the relatively high permeability values of the ash and the high void ratios. This observation is in line with a number of other case studies of ash ponds where ash consolidates significantly less than predictions based on traditional sampling or correlations to initial void ratio.

4.5.6.8 Ash Permeability

Pond-deposited ash appears to be highly anisotropic in permeability, with permeability along the successive layers of deposition (roughly horizontal) one to two orders of magnitude higher than permeability through the layers (roughly vertical). Horizontal permeability values measured from CPT pore pressure dissipations were observed to typically be above 10^{-4} cm/sec and were consistent with the limited laboratory vertical permeability testing completed (see Tables 3a and 3b).

The relatively high permeability of the ash can be explained by the high void ratio structure and the sorting, such that, at any point, the particle size of the ash is relatively uniform. Cones, channel fills, and layers of coarser bottom ash likely represent a small proportion of the overall ash, but may have increased permeability and significant impacts on drainage in the vicinity.



Partial Permeability Data from CPT Dissipations and Lab Testing (Green Triangles)

5.0 GEOTECHNICAL EXPLORATION SUMMARY COMMENTS

Salient conclusions from our exploration and interpretation are as follows:

1. CCR to remain in place within the EAP and NAP exhibits permeability values similar to fine sandy silts generally between $2.5*10^{-4}$ centimeter per second (cm/sec) and $1*10^{-5}$ cm/sec. The ash deposits are anticipated to allow for dewatering with conventional drainage trenches, rim ditches, and/or active dewatering points, noting that cuts in ash materials will likely generate seepage waters that will need to be handled both in the short and long term.

2. Unsubmerged ash areas should be trafficable to low ground pressure equipment relatively quickly upon drying when water levels are kept 3 or more feet below the surface. Trafficability by heavier equipment such as loaded dump trucks will likely take more significant dewatering in wet areas, and care should be taken to establish protocols for assessing and confirming trafficability and ground stability during re-grading and cover placement activities.

3. Ash compressibility and settlement upon new increased loadings and drying during closure are difficult to predict. The design closure condition has been designed to limit key surface water features over (and especially across) deep ash features with the intent to limit settlement in these key features.

4. Areas of CCR along perimeter areas to be sloped during closure at 4H:1V or greater are recommended to be contained by a minimum of 10 horizontal feet of earthen material to provide protection against the potential for CCR exposure in the long term through surface erosion or other factors.

5. Ash in the EAP has similar density but generally higher consistency than ash in the NAP. We attribute this to the EAP ash having been placed there directly from the power station, while NAP ash was first placed in the WAP and later moved, creating a disturbance of the weak cementation that forms over time that is never fully regained.

6. Ash weathering over the life of the various ponds appears to be minimal, and significant weathering is not expected to occur in the foreseeable future.

7. The buried dike in the western part of the EAP will act as a low settlement "hard-point" area, and this has been accounted for but not eliminated in the design and grading of closure elements near this feature.

8. Variability in ash composition, condition, and drainage characteristics makes accurate prediction of settlement and compensatory ditch slopes difficult to predict, and some grade reversals in local areas may still occur.

9. Geometries of five (5) borrow areas within the NAP were identified from construction drawings and were estimated from results of the March geotechnical investigation, but greater uncertainty in the depth of CCR in those areas remains. Similarly, the base of the EAP was estimated from a combination of historical records and investigation data, but some level of uncertainty remains as no as-built bottom topography is known to exist.

10. Depositional patterns within the CCR were identified from the results of the geotechnical investigation. The NAP depositional spigot was typically placed in the northwest portion of the NAP. If typical depositional patterns hold, the CCR should be coarser near to the spigot and finer in areas farther away. Finer CCR is typically more compressible than coarse CCR; thus, settlement may be increased or trend towards the higher predictions in areas further from the depositional spigot locations. Coarser zones may settle faster than fine zones, causing variations in settlement rates and magnitudes across the NAP.

11. The residual profile beneath the NAP, particularly where borrow excavations removed the less permeable shallow residual soils and exposed more permeable saprolite, disintegrated rock, or fractured rock, appears to be allowing drainage of the overlying ash, as evidenced by lower head in pore pressure dissipation (PPD) tests and wells screened near this interface than in shallower PPD and wells.

12. Alluvial soils beneath the EAP and WAP are generally less permeable than the subsurface materials below the NAP, and the groundwater regimes are shallower and with less gradient in these ponds, such that seepage out of these ponds is likely to occur more slowly than at the NAP.

13. The EAP dikes, notably in the south and west, are not considered to meet containment needs for long term closure in their current state, and are recommended to be upgraded. The south dikes of the EAP are mostly tree covered, which is likely providing stabilization in the short term, but is unreliable in the long term and not in line with the standard practice to keep dam slopes free from trees. Recommendations to upgrade the dikes and remove trees from the slopes have been incorporated into the design package. Seepage from the EAP did not appear to be significant, but this may also be attributable to tree growth, as roots uptake seepage water.

14. The NAP dikes, which were nominally built at 2.5H:1V or flatter, are in good condition, without evidence of significant concerns. Seepage appears to be occurring through the NAP dike abutments, but this seepage does not appear to be creating significant concerns with dike stability.

15. The WAP dikes have nominal slopes of 2H:1V, but appear to have good maintenance and are performing well, without evidence of significant erosion or instability.

16. The WAP and EAP dikes are constructed of generally more clayey (alluvial) materials than the NAP dike, which is constructed of residual materials, expected to be of higher permeability. An attempt was made to construct the taller section of the NAP dike as a zoned (core and shell) dam, but the small range of permeability typical of residual profiles appears to have resulted in a nearly homogeneous structure.

17. Significant portions of the EAP dikes were probably constructed from materials borrowed from within the EAP footprint at times when ash was being stored elsewhere in the same footprint. Some inclusions of ash in the dike fills were noted, but are suggestive of incidental inclusions rather than deliberate construction of ash dikes. In contrast, the vertical expansion dikes in the upper fill on the eastern half of the EAP are generally comprised of compacted ash.

18. During filling of the EAP prior to construction of the NAP, ash was deposited a considerable distance up the valley currently occupied by the NAP. This ash appears to have been removed from the NAP dike footprint, though some EAP ash likely remains within the deepest portion of the NAP. Some seepage communication between the EAP and NAP may be occurring, either through an imperfectly performing cut-off beneath the NAP dike, or via preferential seepage paths in the rock and disintegrated rock along the north side of the EAP, similar to surficial seepage noted in the NAP dike abutments.

19. More detailed geotechnical engineering data and analyses (such as final stability and settlement analyses) to support the closure design will be submitted under separate cover.

Figures

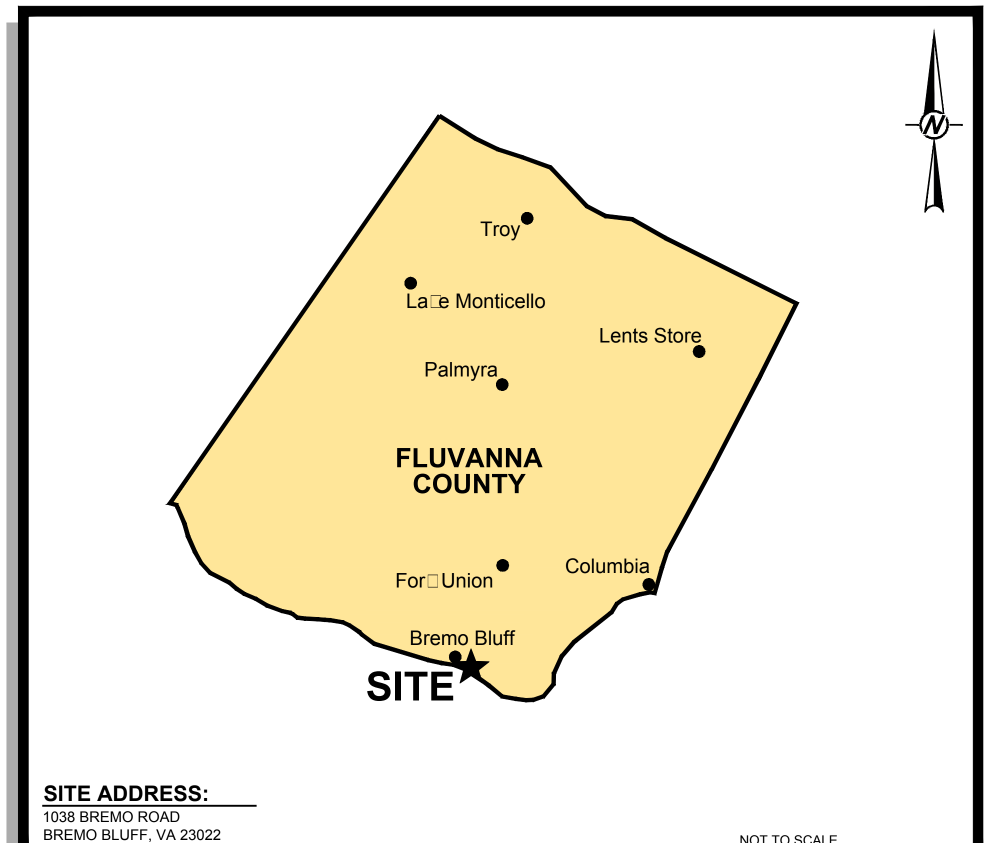
DOMINION

BREMO POWER STATION CCR IMPOUNDMENT CLOSURE GEOTECHNICAL EXPLORATION

FORK UNION MAGISTERIAL DISTRICT
FLUVANNA COUNTY, VIRGINIA
NOVEMBER 2015

DRAWING INDEX

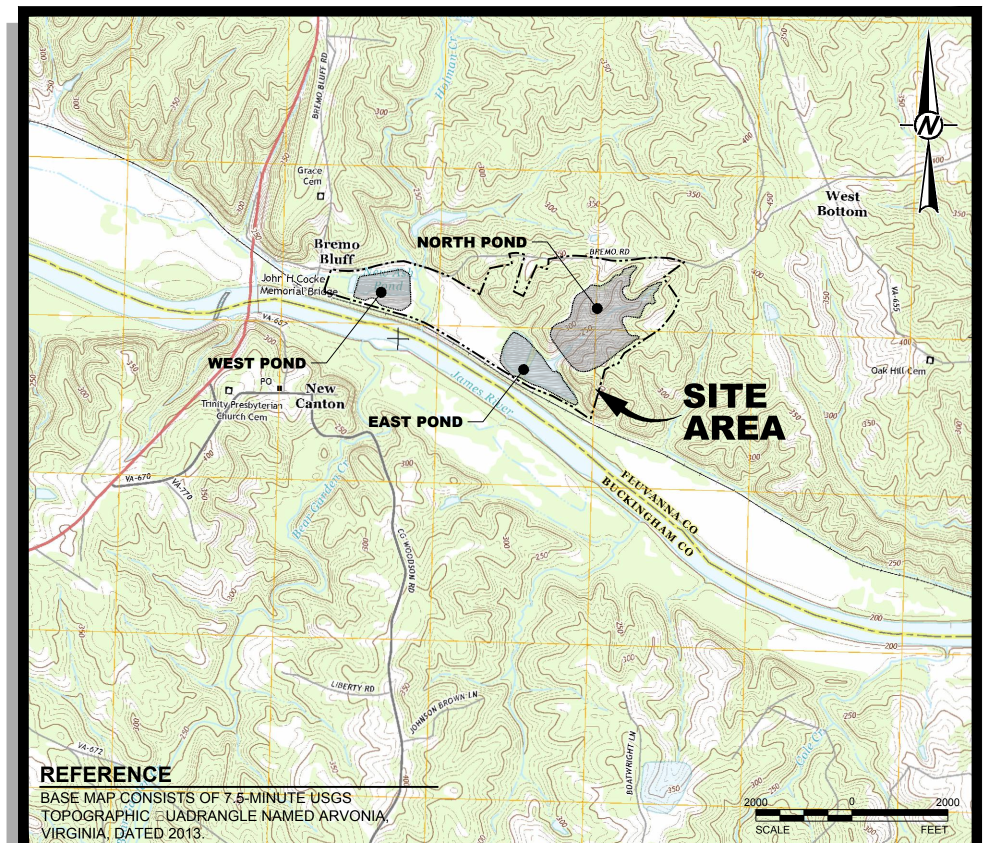
FIGURE NO.	DRAWING TITLE
1	GEOTECHNICAL EXPLORATION COVER SHEET
2	EXISTING CONDITIONS INDEX SHEET
3	EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (WEST POND)
4	EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (EAST POND)
5	EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (NORTH POND)
6	GEOTECHNICAL EXPLORATION SECTIONS (WEST POND 1 OF 2)
7	GEOTECHNICAL EXPLORATION SECTIONS (WEST POND 2 OF 2)
8	GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 1 OF 4)
9	GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 2 OF 4)
10	GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 3 OF 4)
11	GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 4 OF 4)
12	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 1 OF 7)
13	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 2 OF 7)
14	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 3 OF 7)
15	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 4 OF 7)
16	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 5 OF 7)
17	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 6 OF 7)
18	GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 7 OF 7)



SITE ADDRESS:
1038 BREMO ROAD
BREMO BLUFF, VA 23022

NOT TO SCALE

VICINITY MAP



REFERENCE
BASE MAP CONSISTS OF 7.5-MINUTE USGS TOPOGRAPHIC QUADRANGLE NAMED ARVONIA, VIRGINIA, DATED 2013.

SITE LOCATION MAP

GENERAL NOTES

1. EXISTING CONDITIONS COMPILED FROM:
   a. AERIAL TOPOGRAPHIC SURVEY PREPARED BY McKENZIE SNYDER, INC., DATE OF AERIAL PHOTO: 1/16/15 (CONTROL PREPARED BY H&B SURVEYING & MAPPING (H&B))
   b. BOUNDARY SURVEY PREPARED BY H&B SURVEYING AND MAPPING, LLC DATED 04/27/15.
   c. BATHYMETRIC SURVEYS PREPARED BY H&B, SURVEYS PERFORMED IN FEBRUARY 2015
   d. HISTORICAL DATA FOR THE DEVELOPMENT OF THE WEST POND, EAST POND AND NORTH POND
   e. USGS QUADRANGLE TOPOGRAPHY FROM 1967.
2. SITE DATUM: NAD83 / NAVD88
3. GOLDER GEOTECHNICAL EXPLORATIONS FROM AUGUST 2014 (GB-1 TO GB-5) AND MARCH 2015.
4. EXPLORATION DATA BY OTHERS WAS REVIEWED AND ARE SHOWN WHEN APPLICABLE:
   a. D'APPLONIA CONSULTING ENGINEERS, INC (1981) / SHORT-TERM WASTE DISPOSAL FACILITY REPORT.
   b. SCHNABEL (1982) / NORTH ASH POND DAM DESIGN REPORT.
   c. SCHNABEL (2010) / STABILITY EVALUATION OF WEST ASH POND DIKES.
   d. GROUNDWATER AND ENVIRONMENTAL SERVICES, INC. (GES) (2013) / MONITORING WELL INSTALLATION REPORT.
   e. HALEY & ALDRICH, INC. (2015) / MONITORING WELL INSTALLATION REPORT.

CONTACT INFORMATION

ENGINEER:
GOLDER ASSOCIATES, INC.
MAIN CONTACT: RON DiFRANCESCO, PE
2108 W. LABURNUM AVE., SUITE 200
RICHMOND, VIRGINIA 23227
PHONE: (804) 358-7900
FAX: (804) 358-2900
EMAIL: RON_DIFRANCESCO@GOLDER.COM

OWNER / DEVELOPER:
DOMINION-BREMO POWER STATION
MAIN CONTACT: MIKE GLAGOLA
5000 DOMINION BLVD,
GLEN ALLEN, VA 23060
PHONE: (804) 273-4547
EMAIL: MICHAEL.A.GLAGOLA@DOM.COM

PREPARED BY: Golder Associates

PREPARED FOR: Dominion

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION COVER SHEET

PROJECT No.		15-20347	FILE No.	1520347AG01
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15	FIGURE G-1	
REVIEW	GLH	11/30/15		

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
0						

PROJECT

DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE

EXISTING CONDITIONS INDEX SHEET

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG02-05
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15		

FIGURE G-2

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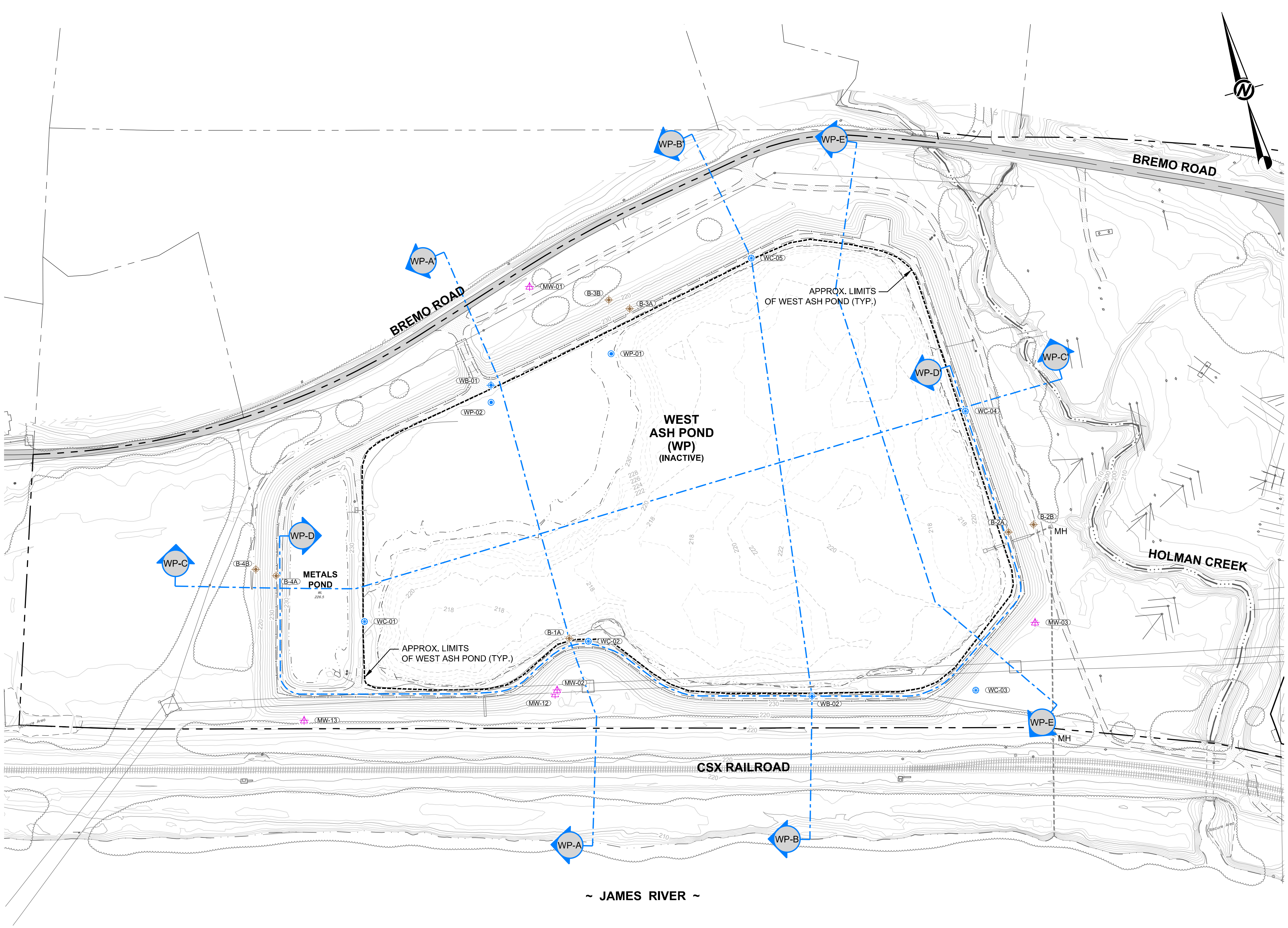

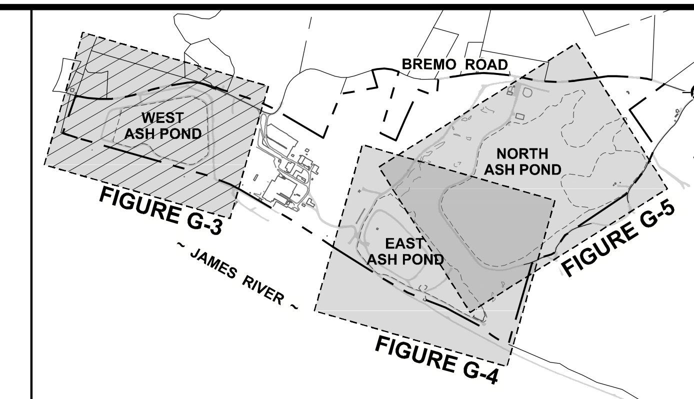

SITE KEY

NOT TO SCALE

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF EXISTING ASH PONDS
- LIMITS OF BATHYMETRIC SURVEYS
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- EXISTING BATHYMETRIC SURFACE CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- CREEK CENTERLINE
- APPROXIMATE EDGE OF SURFACE WATER
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC LINE
- MH EXISTING MANHOLE
- DENOTES AREAS OF TOPOGRAPHY THAT DO NOT MEET MINIMUM ACCURACY STANDARDS FOR AERIAL SURVEYING
- SCHNABEL BORING (1982)
- SCHNABEL BORING (2010)
- GES MONITORING WELL (2013)
- HALEY AND ALDRICH BORING (2015)
- GOLDER BORING (2014 / 2015)
- GOLDER PIEZOMETER (2015)
- GOLDER CONE PENETRATION TEST (CPT)(2015)
- GOLDER PROBE HOLE (2015)
- GOLDER HAND AUGER (2015)

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
△	10/15/15	UPDATED SECTION LOCATIONS	-	SEP	JGM	GLH

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (WEST POND)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG02-05
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15	FIGURE G-3	
REVIEW	GLH	11/30/15		

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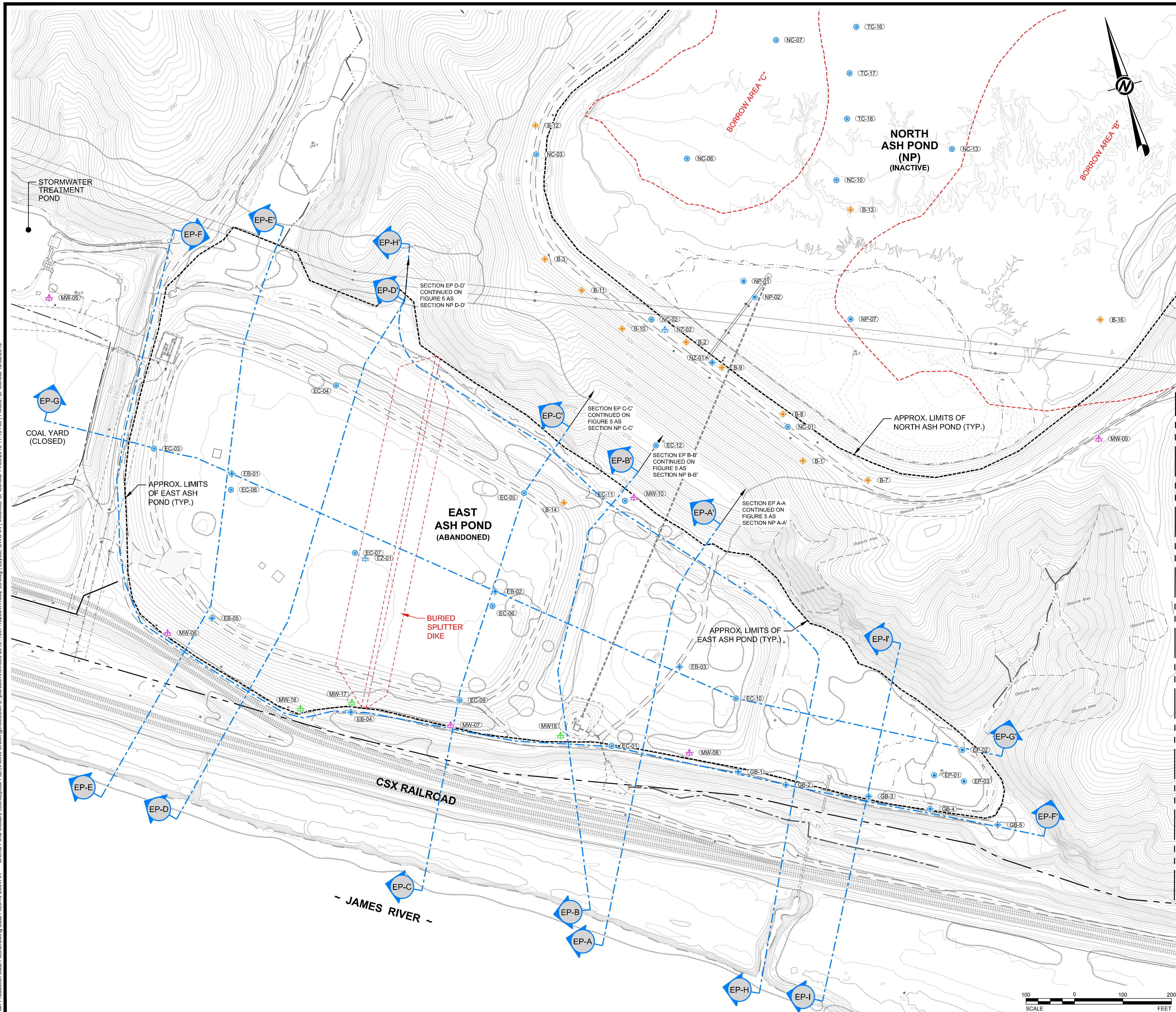

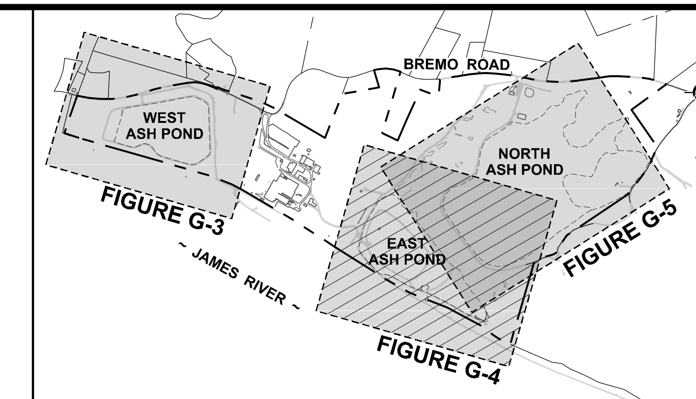

SITE KEY NOT TO SCALE

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF EXISTING ASH PONDS
- LIMITS OF BATHYMETRIC SURVEYS
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- EXISTING BATHYMETRIC SURFACE CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- CREEK CENTERLINE
- APPROXIMATE EDGE OF SURFACE WATER
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC LINE
- MH EXISTING MANHOLE
- DENOTES AREAS OF TOPOGRAPHY THAT DO NOT MEET MINIMUM ACCURACY STANDARDS FOR AERIAL SURVEYING
- SCHNABEL BORING (1982)
- SCHNABEL BORING (2010)
- GES MONITORING WELL (2013)
- HALEY AND ALDRICH BORING (2015)
- GOLDER BORING (2014 / 2015)
- GOLDER PIEZOMETER (2015)
- GOLDER CONE PENETRATION TEST (CPT)(2015)
- GOLDER PROBE HOLE (2015)
- GOLDER HAND AUGER (2015)

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
	10/15/15	UPDATED SECTION LOCATIONS	-	SEP	JGM	GLH

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (EAST POND)

PROJECT No.		15-20347	FILE No.	1520347AG02-05
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15	**FIGURE G-4**	
REVIEW	GLH	11/30/15		

Golder Associates

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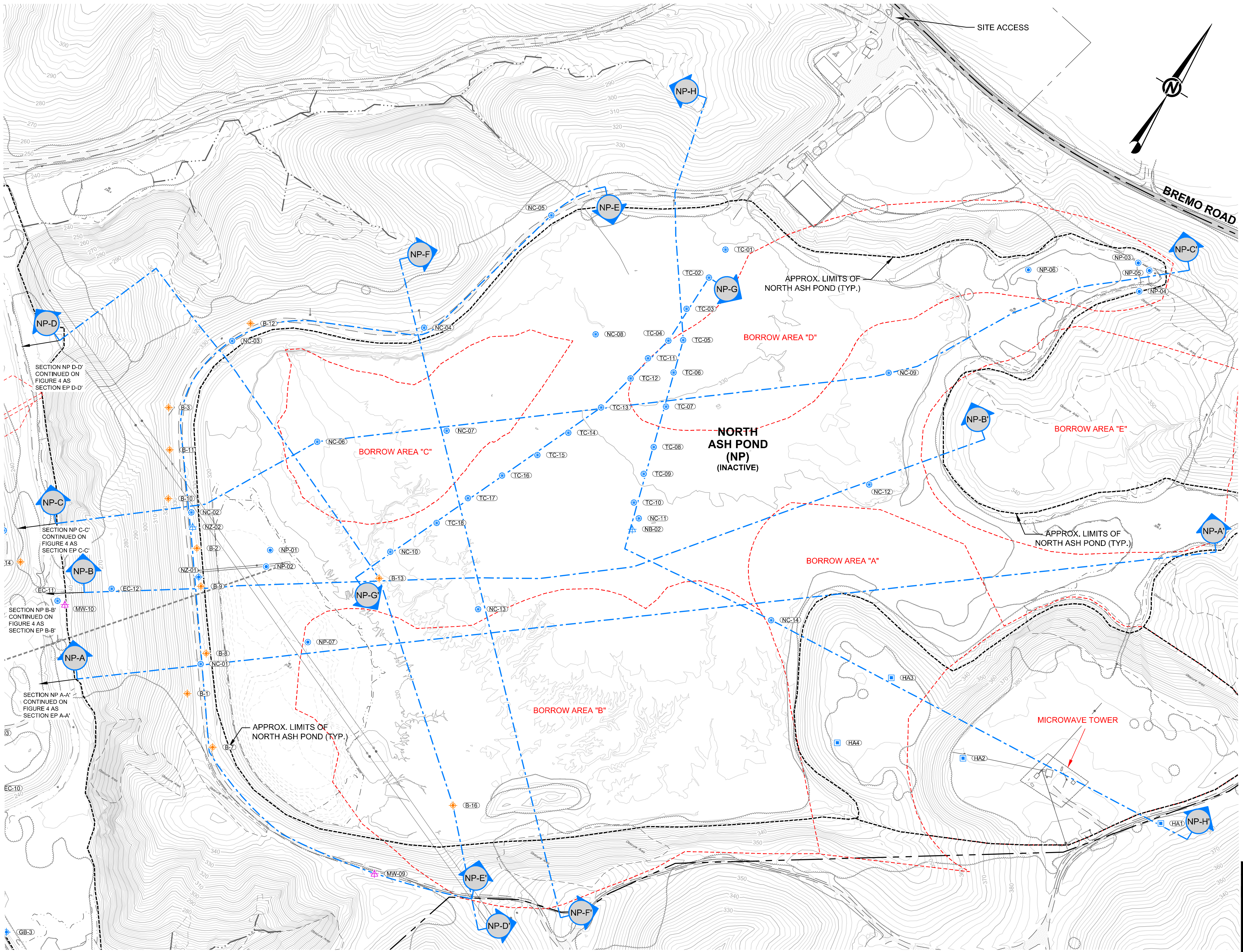

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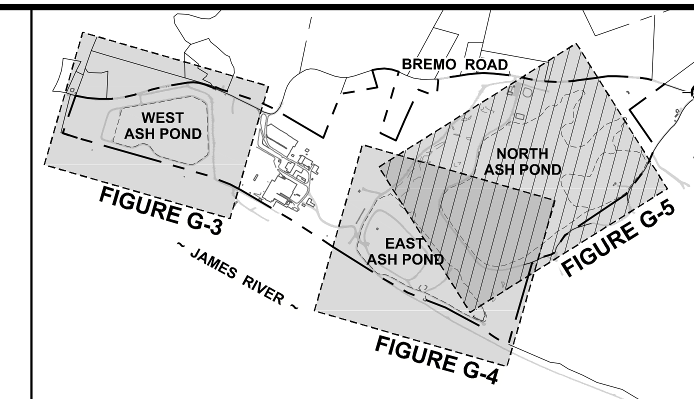

NOT TO SCALE

LEGEND

- DOMINION PROPERTY BOUNDARY
- ADJACENT PROPERTY BOUNDARY
- APPROXIMATE LIMITS OF EXISTING ASH PONDS
- LIMITS OF BATHYMETRIC SURVEYS
- EXISTING TOPOGRAPHIC CONTOURS (2' INTERVALS)
- EXISTING BATHYMETRIC SURFACE CONTOURS (2' INTERVALS)
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING RAILROAD
- CREEK CENTERLINE
- APPROXIMATE EDGE OF SURFACE WATER
- EXISTING TREE LINE
- EXISTING FENCE
- EXISTING OVERHEAD ELECTRIC LINE
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- DENOTES AREAS OF TOPOGRAPHY THAT DO NOT MEET MINIMUM ACCURACY STANDARDS FOR AERIAL SURVEYING
- SCHNABEL BORING (1982)
- SCHNABEL BORING (2010)
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- GOLDER BORING (2014 / 2015)
- GOLDER PIEZOMETER (2015)
- GOLDER CONE PENETRATION TEST (CPT)(2015)
- GOLDER PROBE HOLE (2015)
- GOLDER HAND AUGER (2015)

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW
1	10/15/15	UPDATED SECTION LOCATIONS	-	SEP	JGM	GLH

PROJECT

DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE

EXISTING CONDITIONS GEOTECHNICAL EXPLORATION PLAN (NORTH POND)

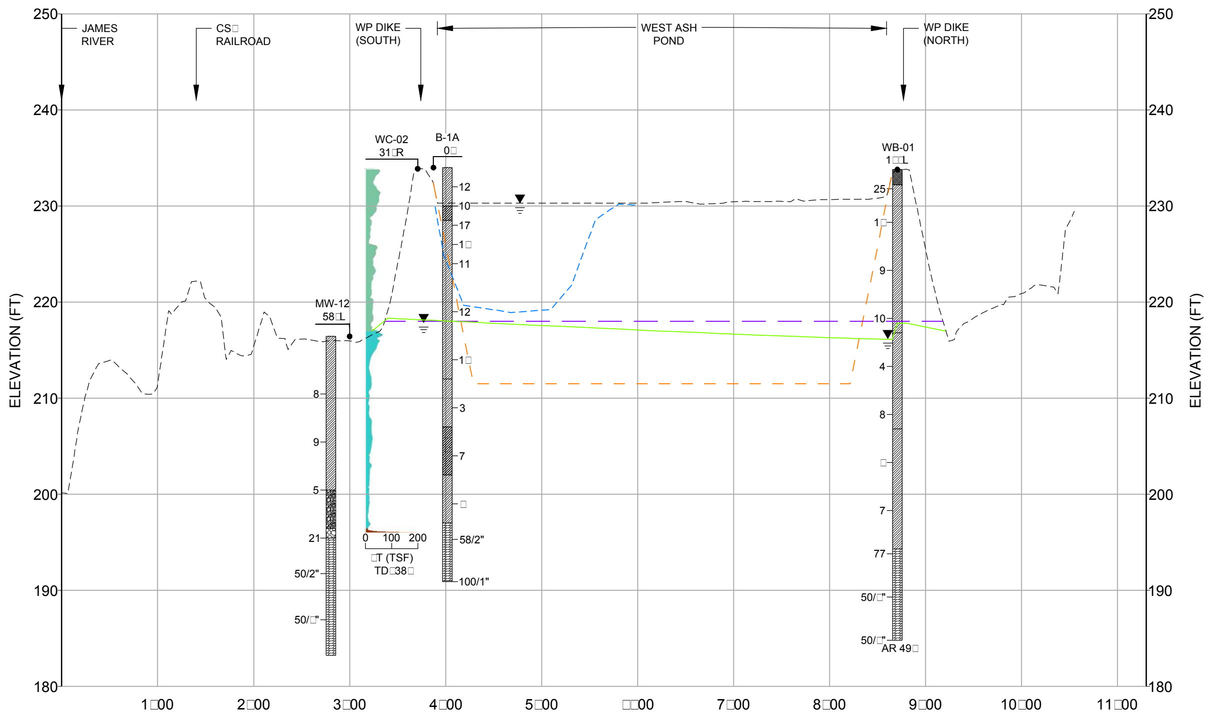
PROJECT No.	15-20347		
DESIGN	-	-	
CADD	CCP	11/30/15	
CHECK	JGM	11/30/15	
REVIEW	GLH	11/30/15	

FILE No. 1520347AG02-05

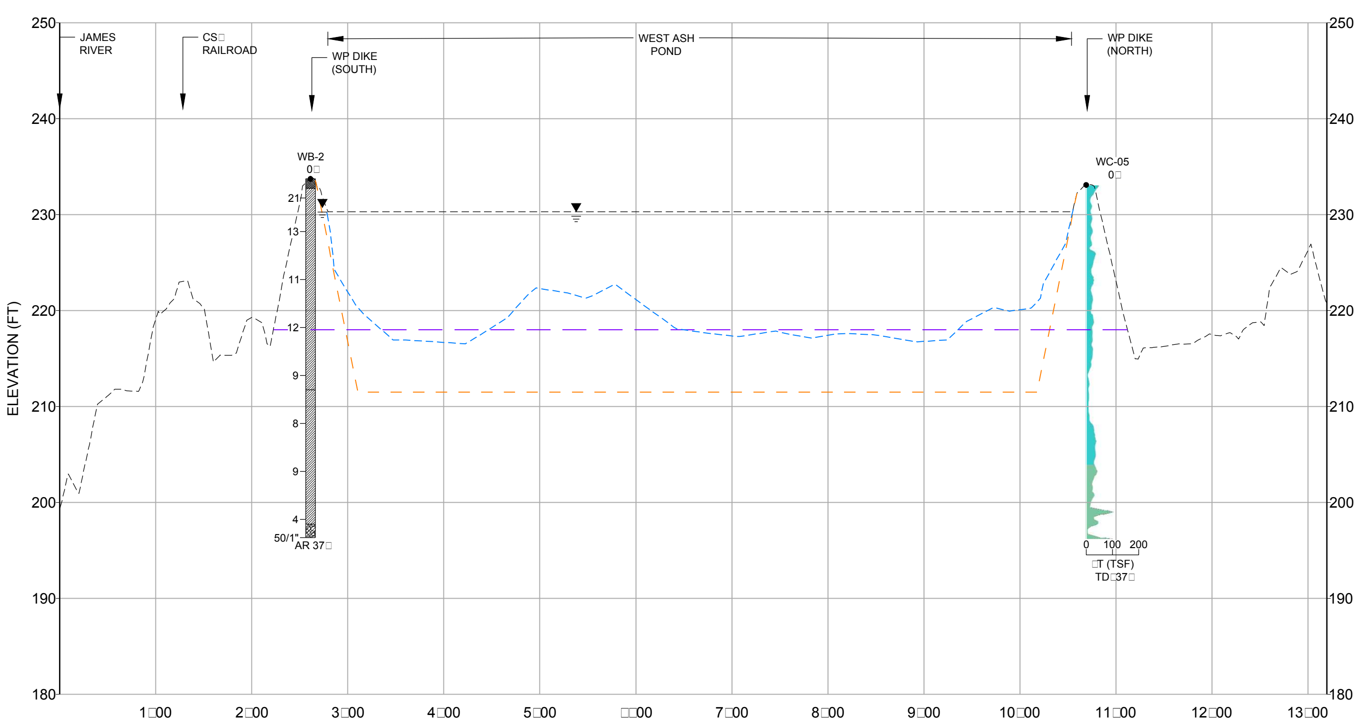
SCALE AS SHOWN

Golder Associates

FIGURE G-5



SECTION WP A - A□



SECTION WP B - B□

BOREHOLE LOGS LEGEND

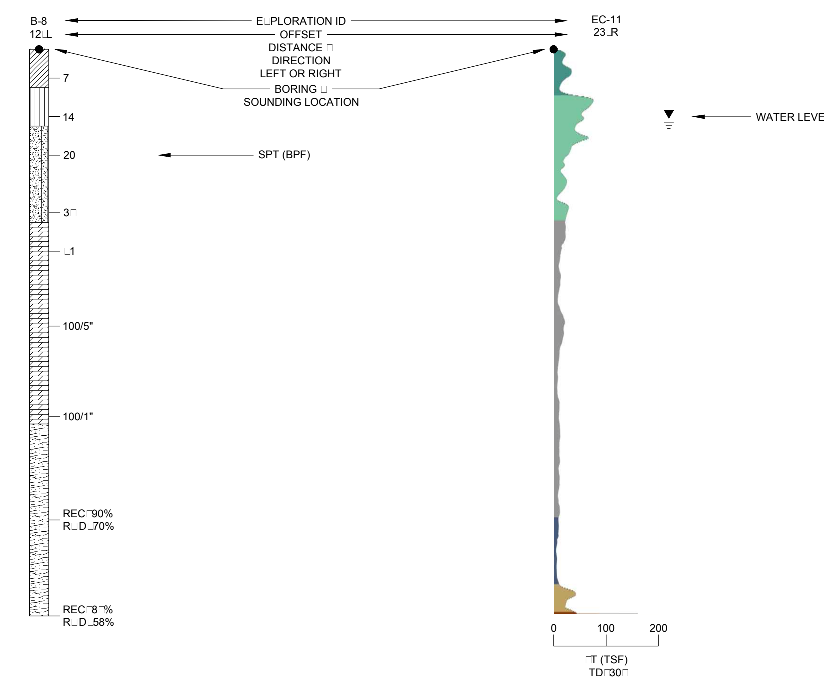
- SM - SAND AND GRAVEL
- SC - CLAYEY SAND
- ML - SILT AND CLAYEY SILT
- CL - SILTY CLAY
- SP-SM - POORLY-GRADED SAND WITH SILT
- SM - SILTY SAND
- DISINTEGRATED ROCK
- CL-ML - SILTY CLAY-CLAYEY SILT
- BOULDERS AND COBBLES
- GC - CLAYEY GRAVEL
- CH - CLAY
- FILL
- BEDROCK
- COAL COMBUSTION RESIDUALS (CCR)
- WATER

CPT LEGEND

- SANDY SILTY CLAY
- SANDY SILT / SILTY SAND
- SANDY SILT
- SILTY SAND
- CLAY
- CCR / CLAY MI□
- CCR
- COMPACTED CCR
- PWR / GRAVEL ALLUVIUM
- ALLUVIUM, SILTY SAND
- ALLUVIUM, SILT

ABBREVIATION LEGEND

qT	CPT TIP STRESS
TC	TEST CPT
REC	RECOVERY
R□D	ROCK □UALITY DESIGNATION
TD	TERMINATION DEPTH
AR	AUGER REFUSAL
TSF	TONS PER S□UARE FOOT
CPT	CONE PENETRATION TEST
SPT	STANDARD PENETRATION TEST
BPF	BLOWS PER FOOT
B	BORING
E	EAST ASH POND
W	WEST ASH POND
N	NORTH ASH POND
C	CPT
HA	HAND AUGER
G	GOLDER
P	PROBE HOLE



LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-□ FOR LEGEND INFORMATION.

SCALE 100 0 100 FEET
10□ VERTICALLY E□AGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (WEST POND 1 OF 2)

PROJECT No.		15-20347	FILE No. 1520347AG0□-18
DESIGN	-	-	SCALE AS SHOWN
CADD	CCP	11/30/15	
CHECK	JGM	11/30/15	
REVIEW	GLH	11/30/15	

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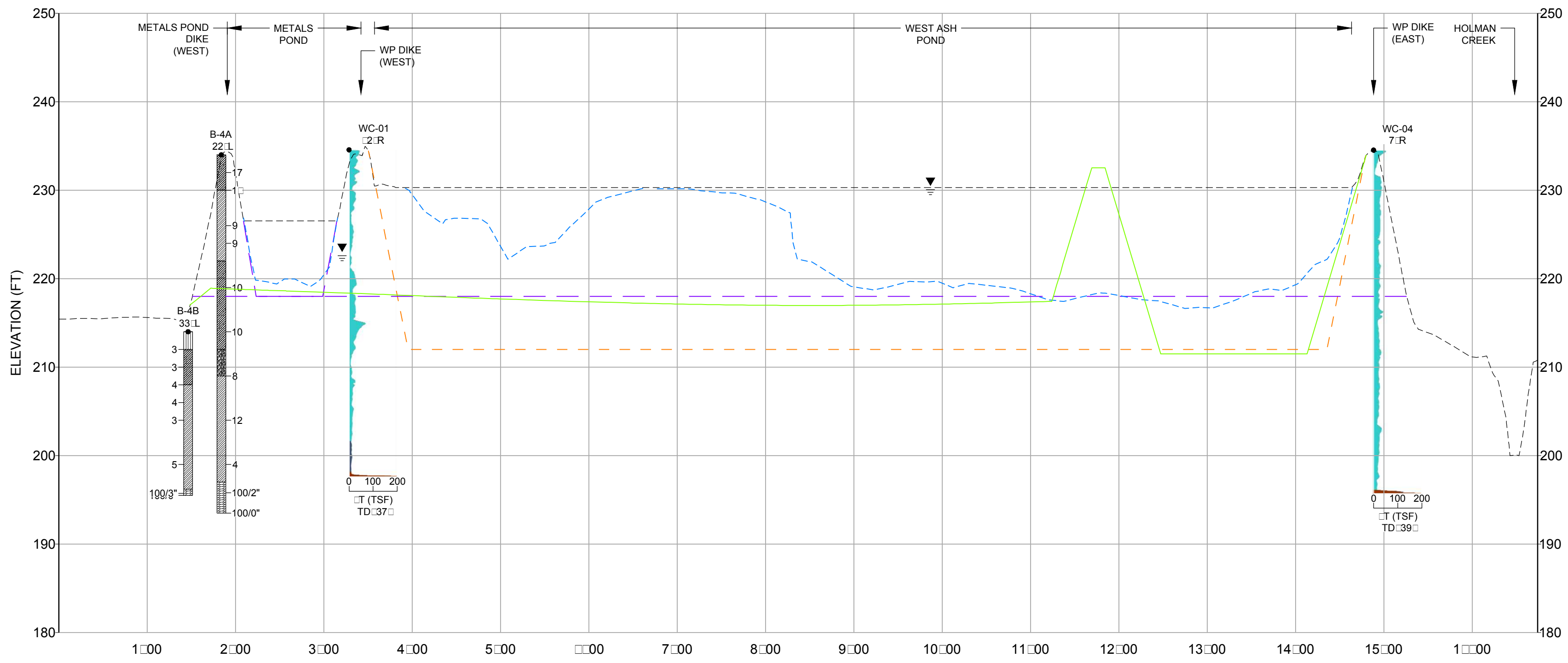
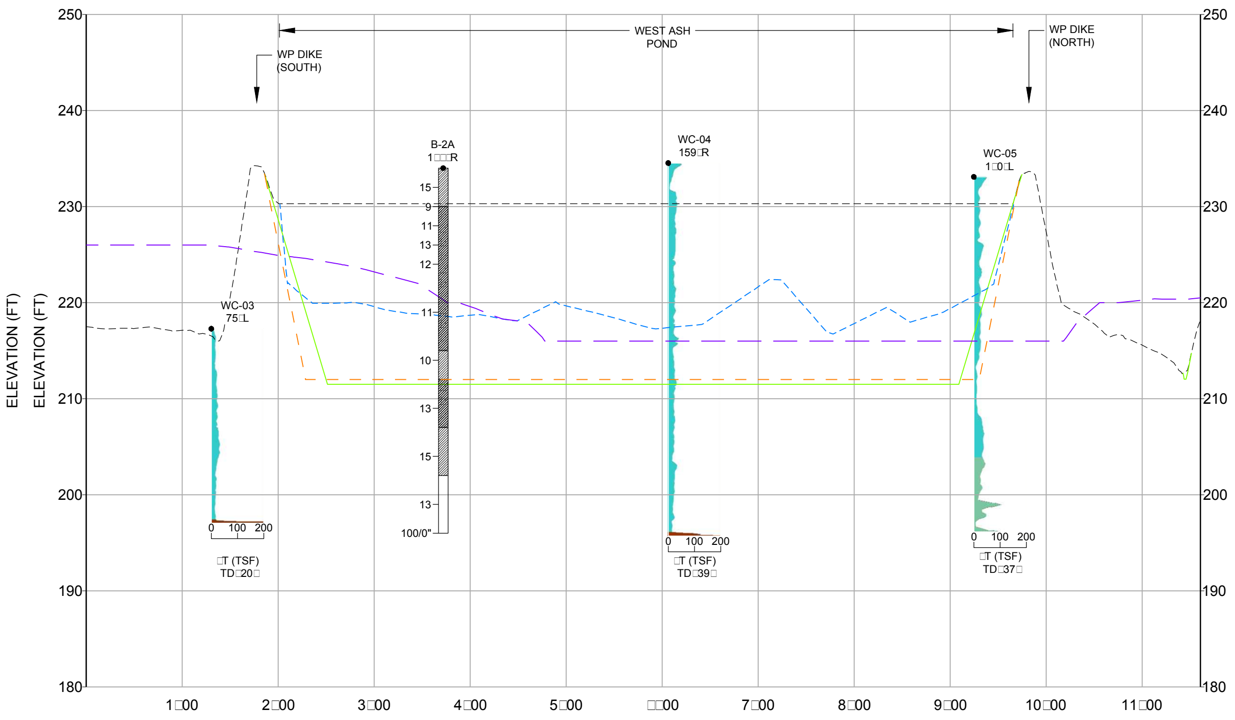
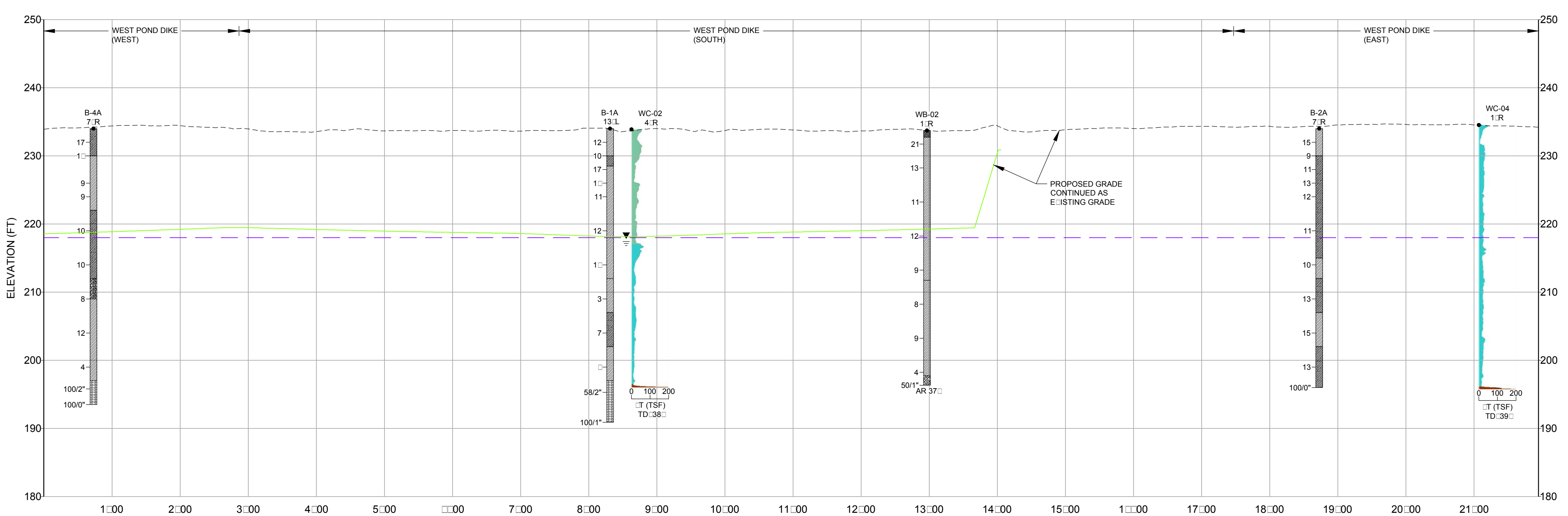
FIGURE G-6



SECTION WP C - C'



SECTION WP E - E'



SECTION WP D - D'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-3 FOR LEGEND INFORMATION.

100 0 100
SCALE FEET
10X VERTICALLY EXAGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (WEST POND 2 OF 2)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG003-18
DESIGN	-	-	SCALE	AS SHOWN
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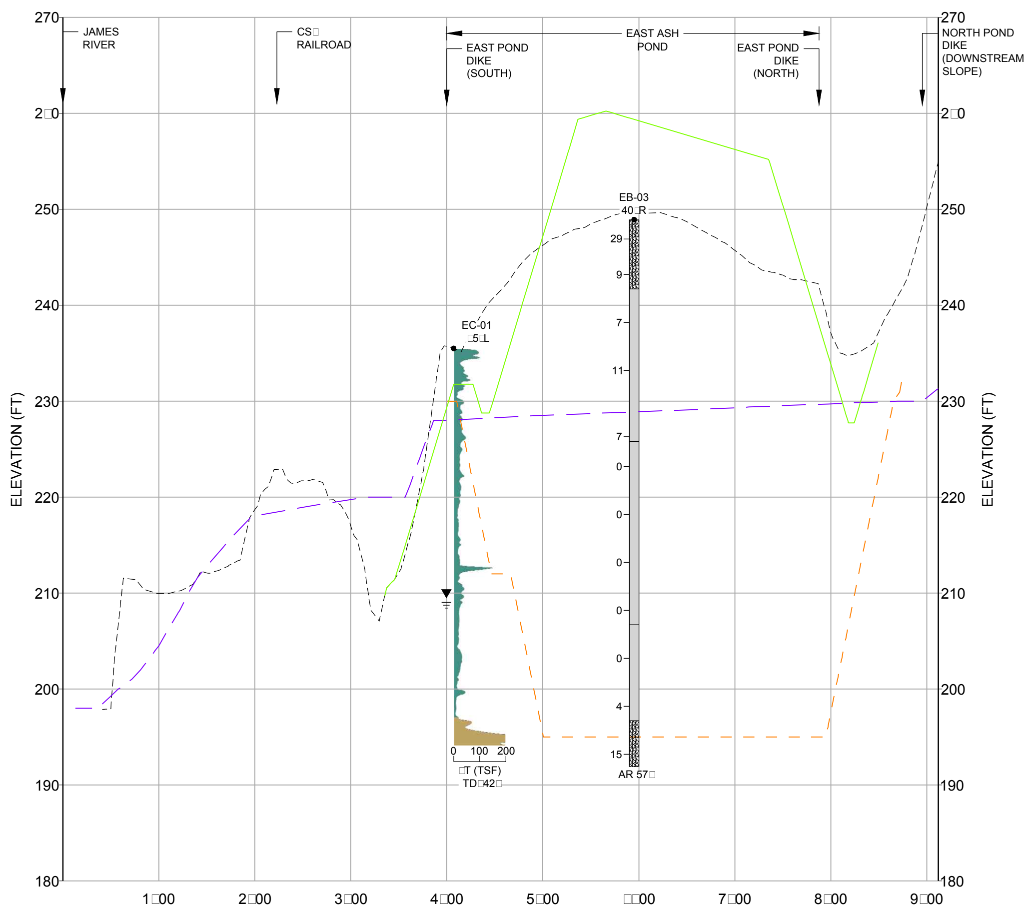
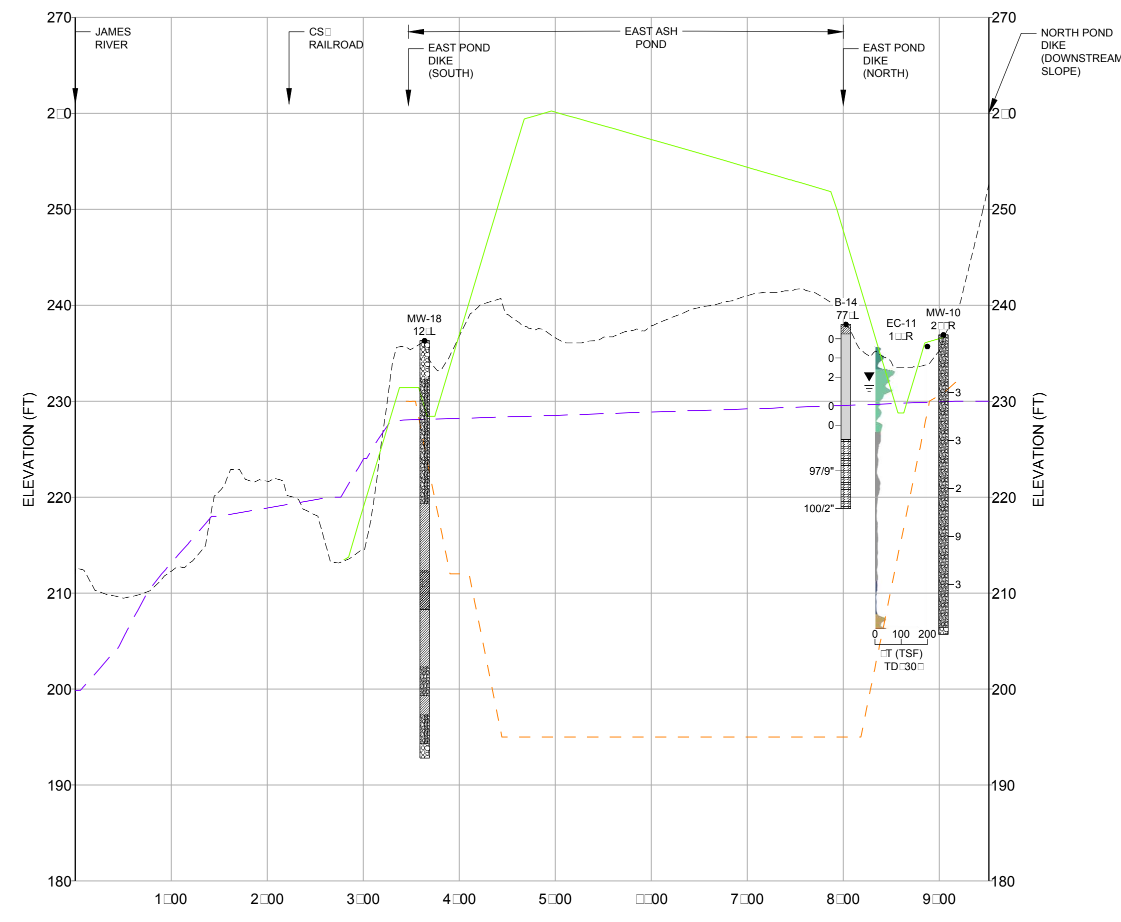
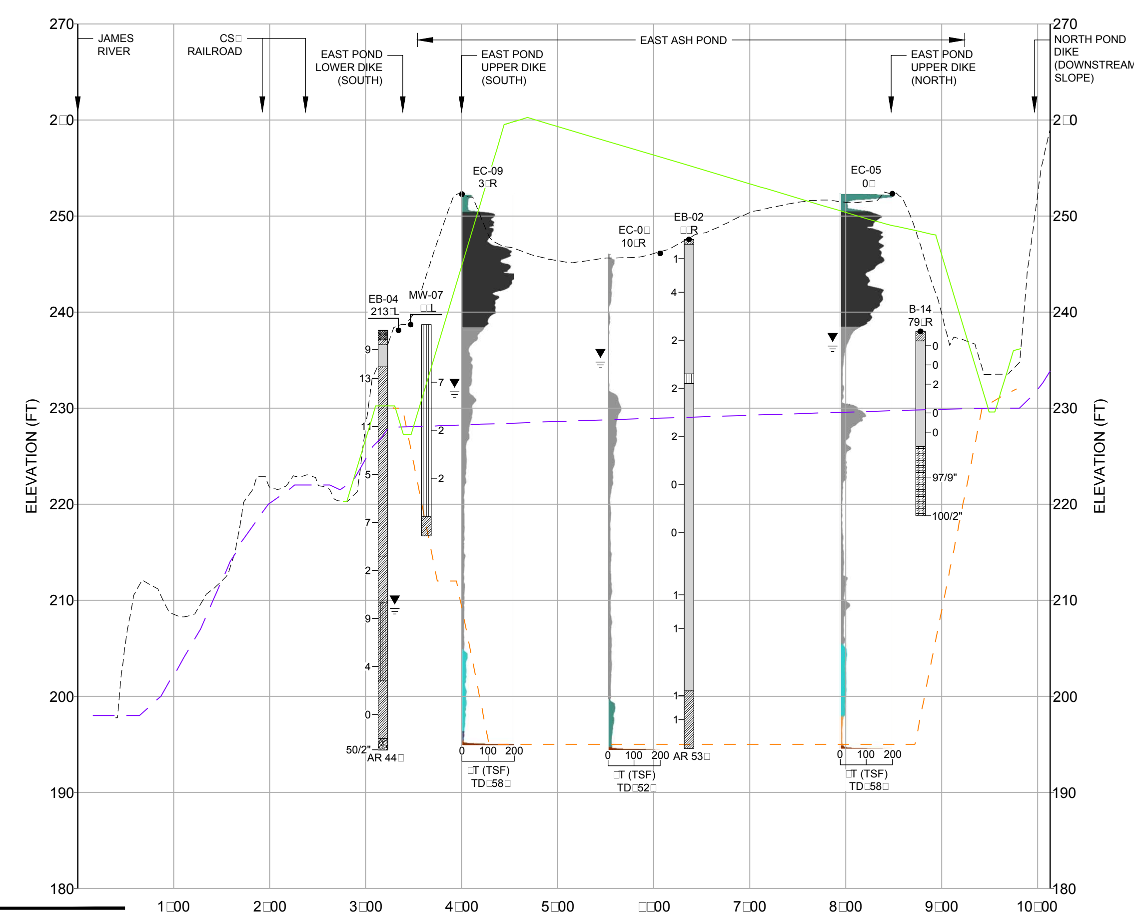
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15	FIGURE G-7	



SECTION EP A - A'



SECTION EP B - B'



SECTION EP C - C'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

SCALE 100 0 100 FEET
10X VERTICALLY EXAGGERATED

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-? FOR LEGEND INFORMATION.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 1 OF 4)

Golder Associates

PROJECT No.		15-20347	FILE No. 1520347AG0?-18
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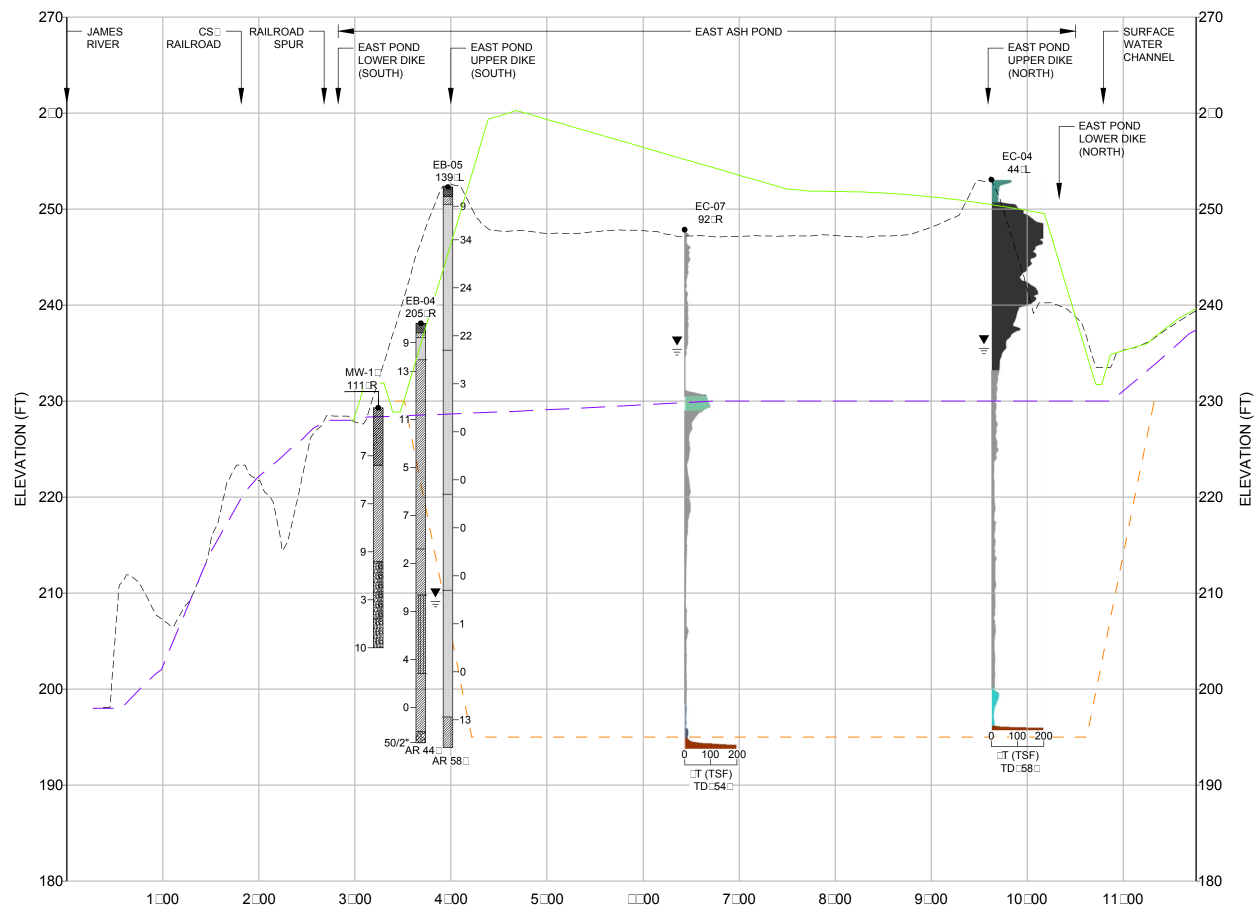
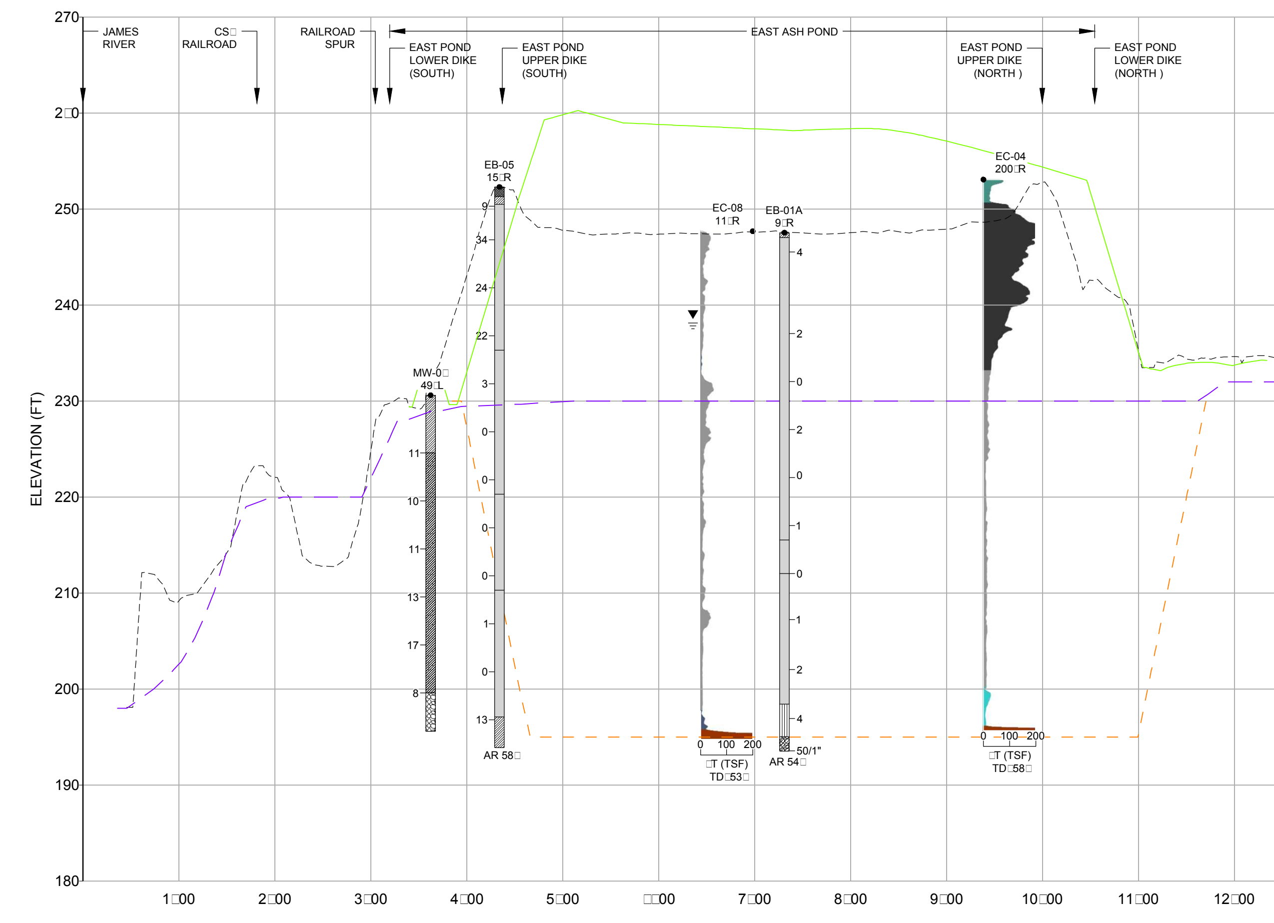
CHECK	JGM	11/30/15	
REVIEW	GLH	11/30/15	FIGURE G-8



SECTION EP D - D'



SECTION EP E - E'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

100 0 100
SCALE FEET
10X VERTICALLY EXAGGERATED

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-2 FOR LEGEND INFORMATION.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 2 OF 4)

Golder Associates

PROJECT No.	15-20347	FILE No.	1520347AG0?-18
DESIGN	-	-	SCALE: AS SHOWN
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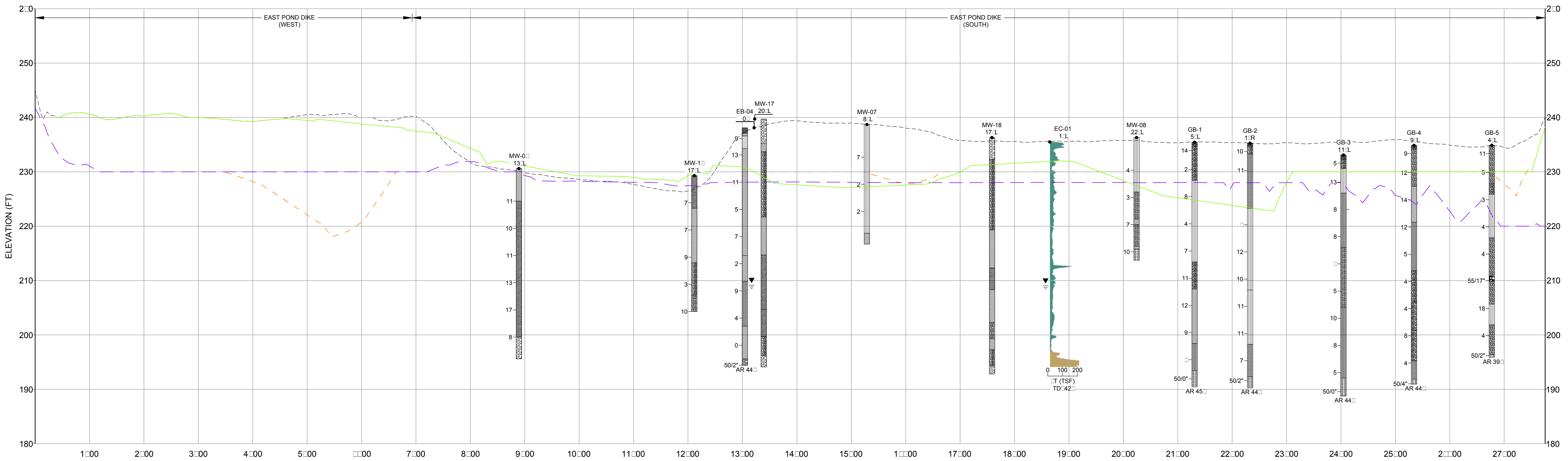
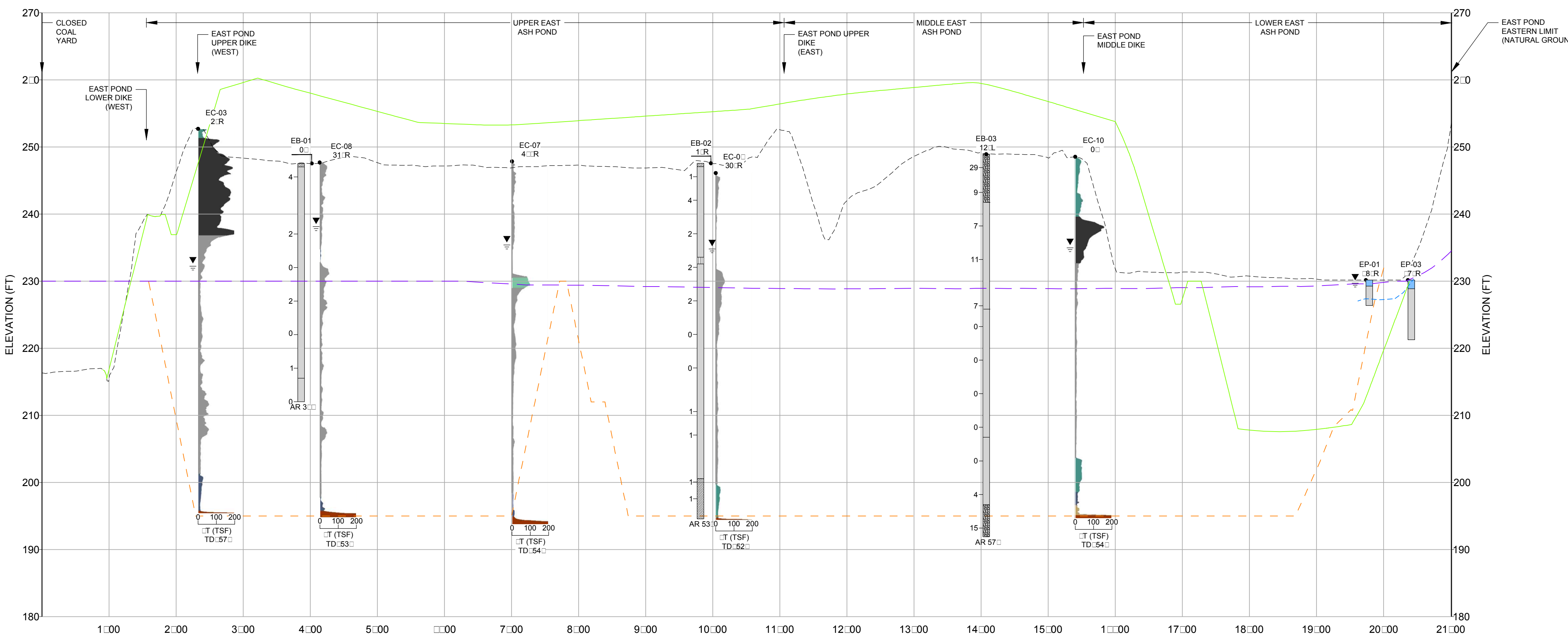
CHECK	JGM	11/30/15	
REVIEW	GLH	11/30/15	FIGURE G-9



SECTION EP F - F'



SECTION EP G - G'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-□ FOR LEGEND INFORMATION.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

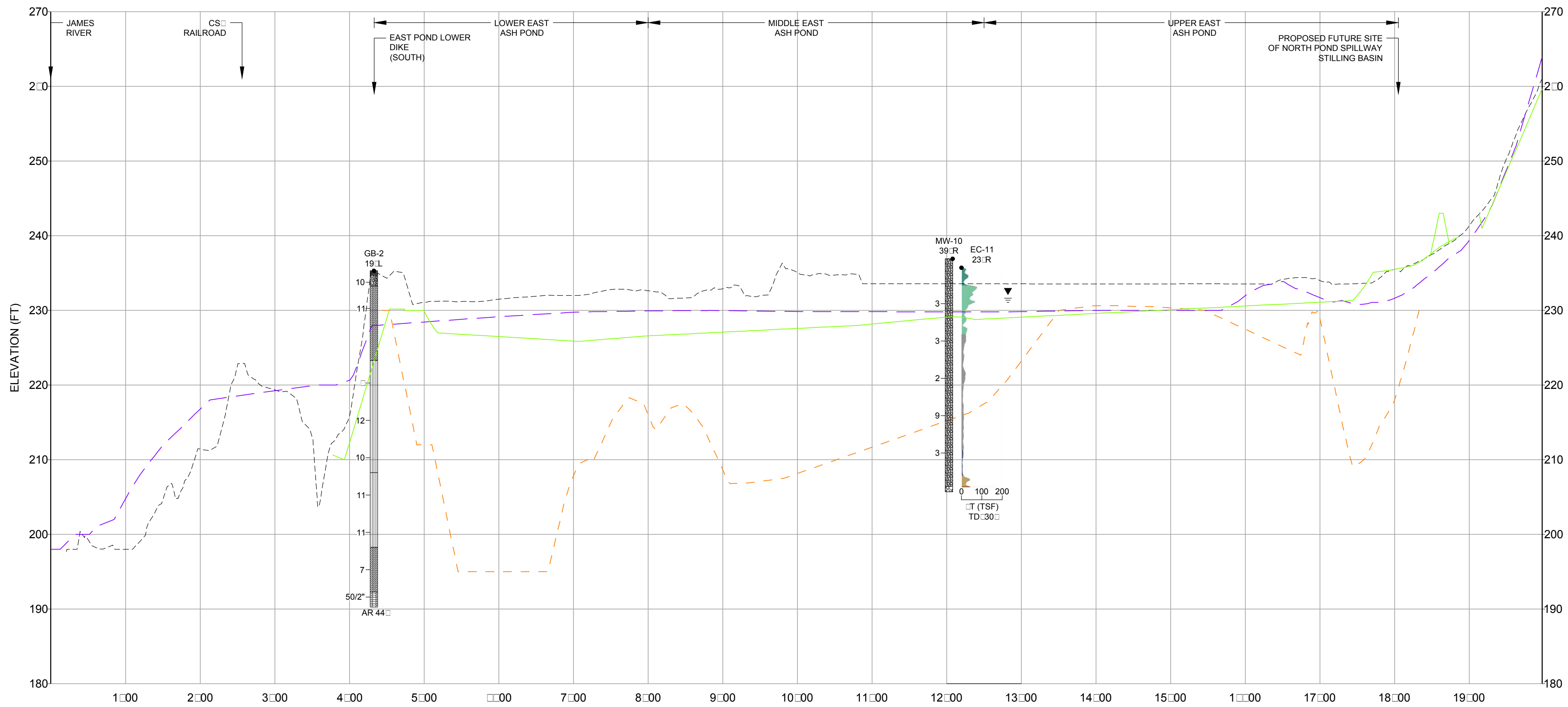
PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 3 OF 4)

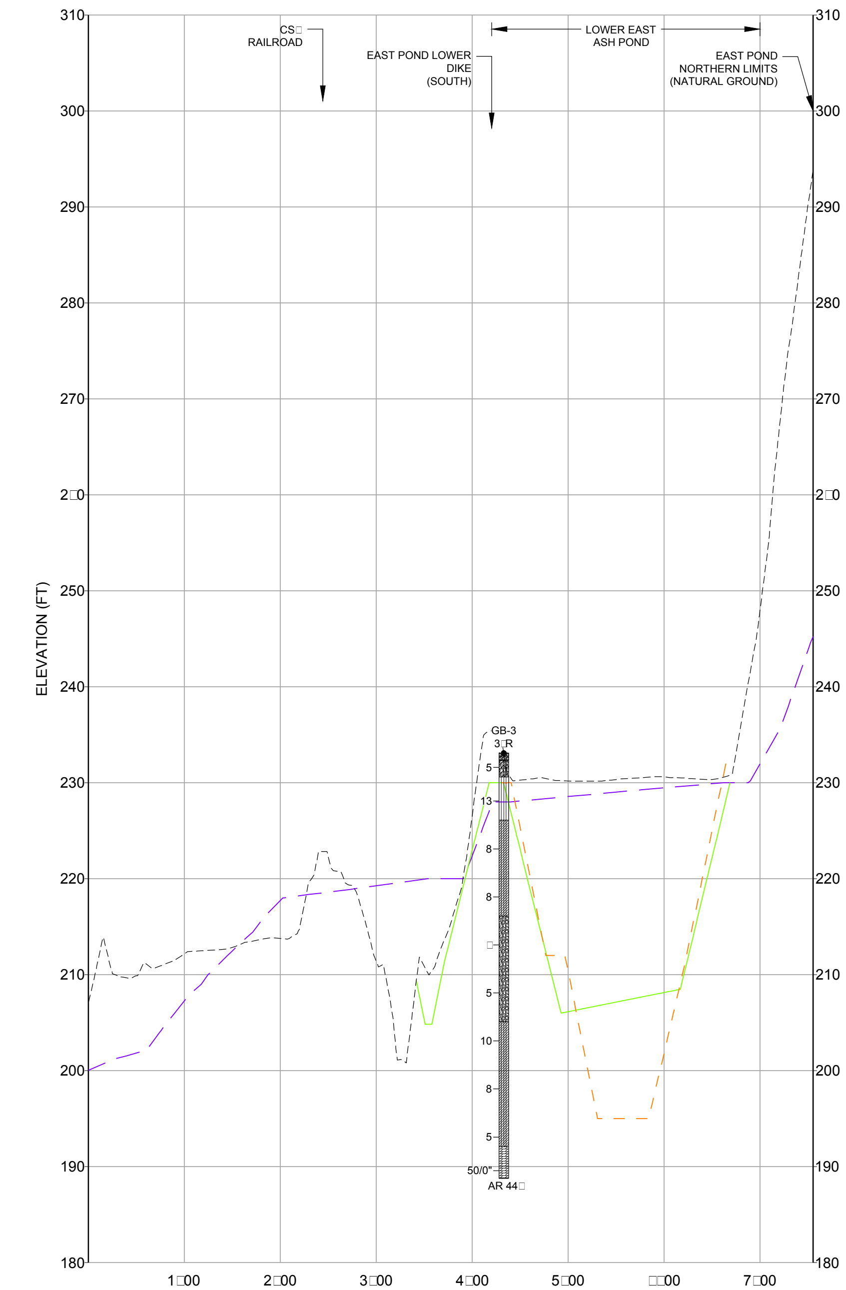
PROJECT No.		15-20347	FILE No.	1520347AG0□18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15	FIGURE G-10	
REVIEW	GLH	11/30/15		

Golder Associates

SCALE 100 0 100 FEET
10□ VERTICALLY E□AGGERATED



SECTION EP H - H'



SECTION EP I - I'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

100 0 100
SCALE FEET
10X VERTICALLY EXAGGERATED

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-6 FOR LEGEND INFORMATION.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (EAST POND 4 OF 4)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0□-18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15		

FIGURE G-11

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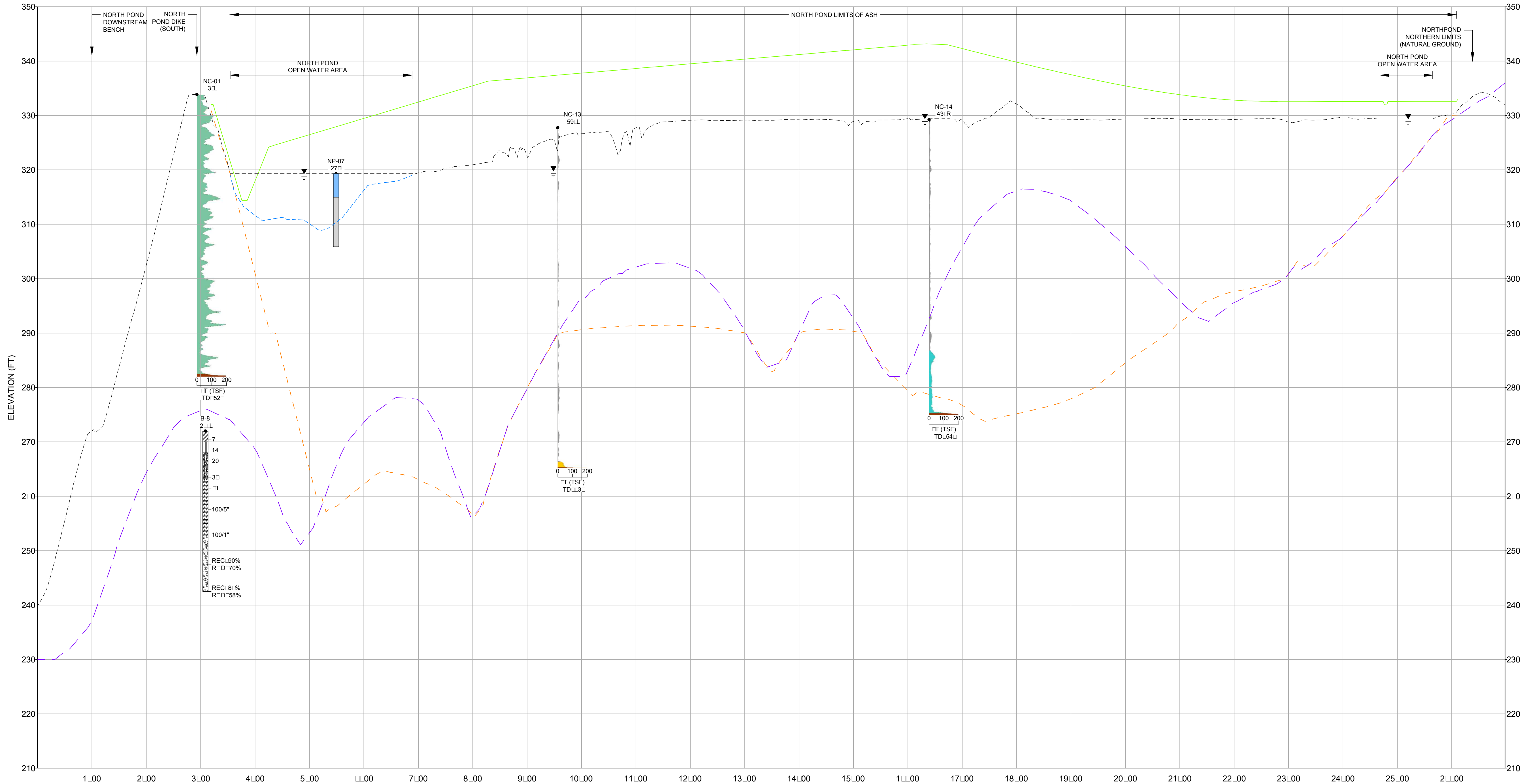

SECTION NP A - A'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G- FOR LEGEND INFORMATION.

100 0 100
SCALE FEET
10 VERTICALLY EXAGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 1 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0-18
DESIGN	-	-	SCALE	AS SHOWN
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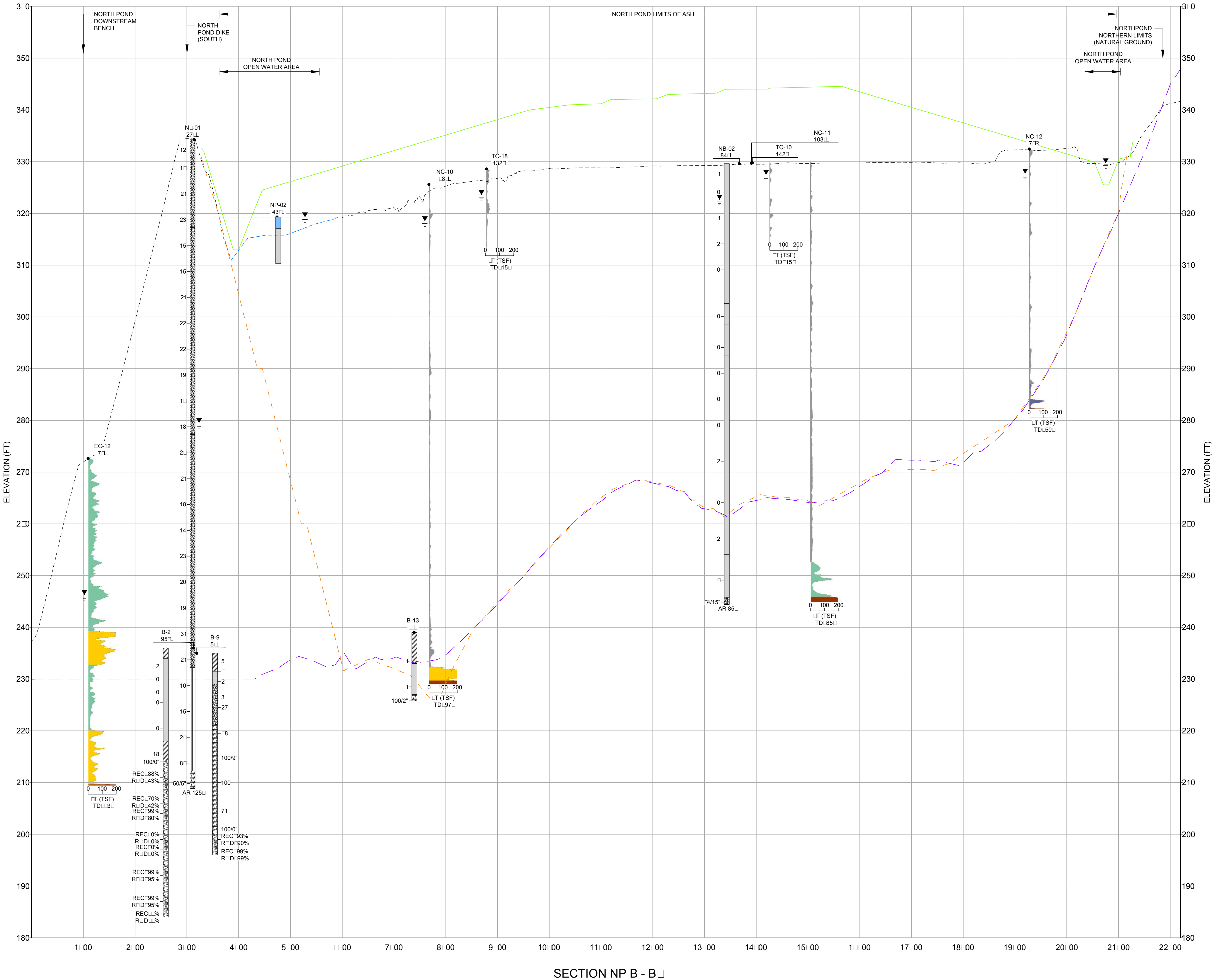
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15		

FIGURE G-12



LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G- FOR LEGEND INFORMATION.

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 2 OF 7)

Golder Associates

PROJECT No.	15-20347		FILE No.	1520347AG0 -18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15	FIGURE G-13	

SCALE 100 0 100 FEET
10 VERTICALLY EXAGGERATED

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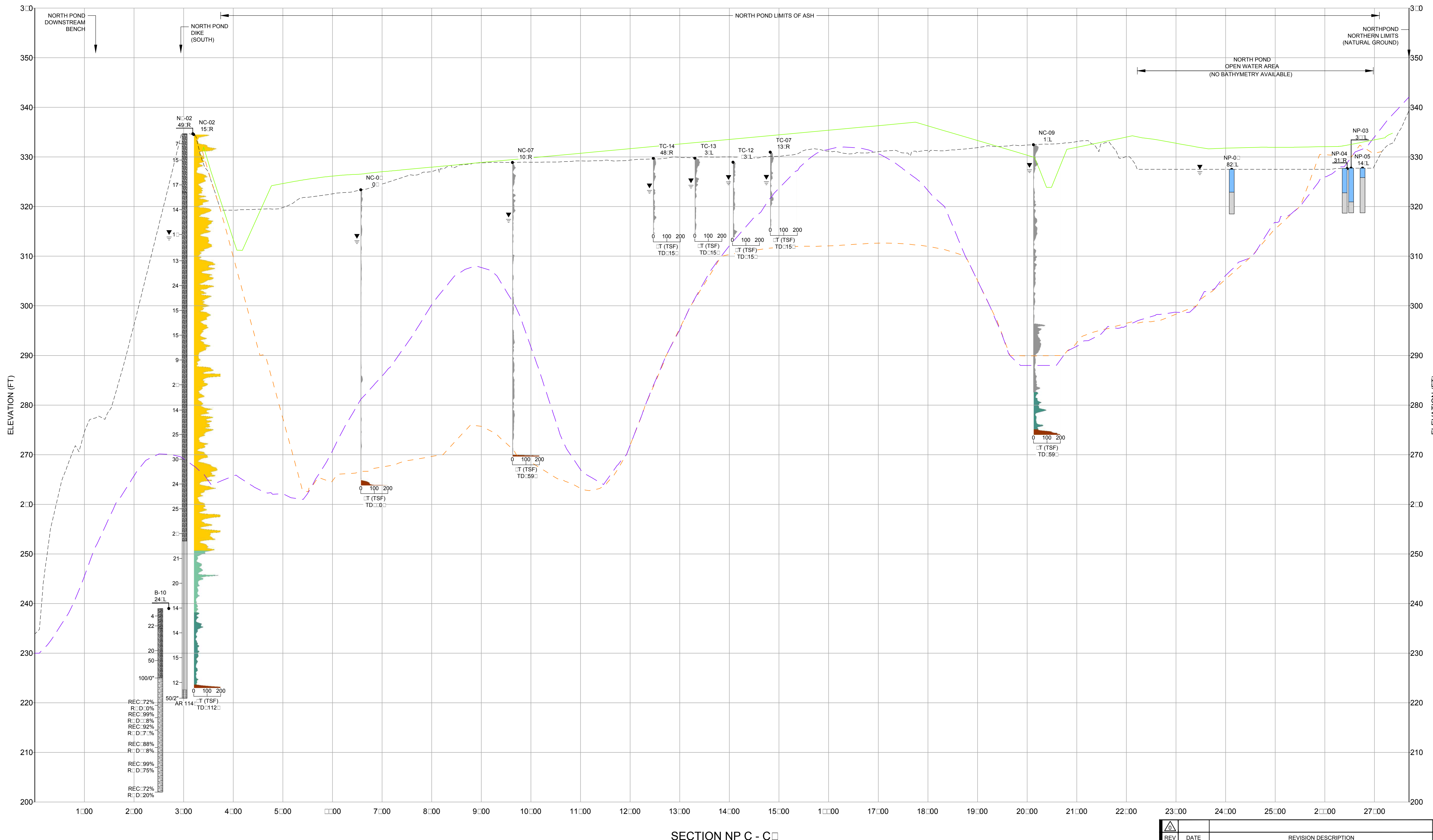

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-2 FOR LEGEND INFORMATION.

100 0 100
SCALE FEET
10X VERTICALLY EXAGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 3 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0X-18
DESIGN	-	-	SCALE	AS SHOWN
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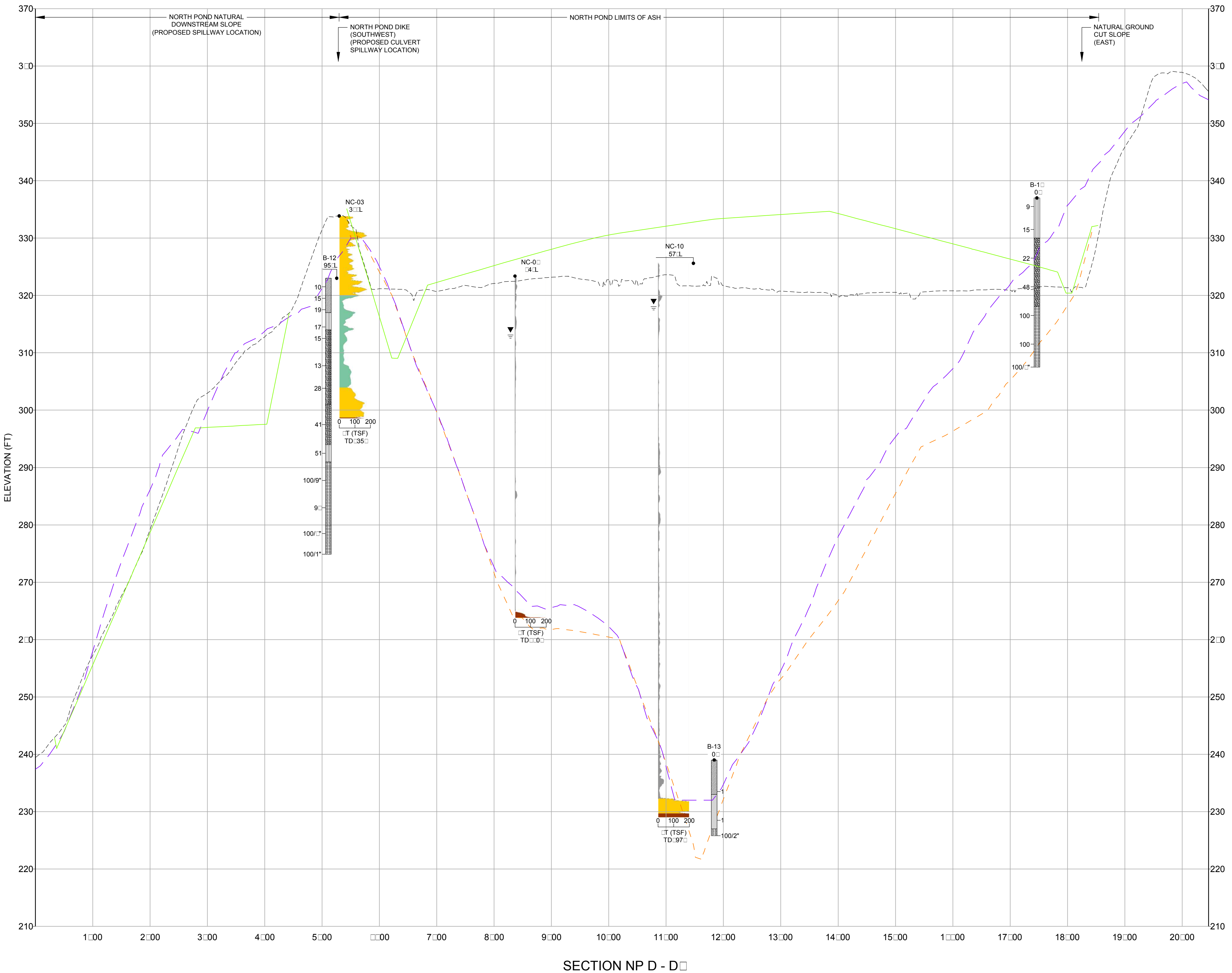
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15	FIGURE G-14	



LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-□ FOR LEGEND INFORMATION.

100 0 100
SCALE FEET
10□ VERTICALLY E□AGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 4 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0□-18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15	FIGURE G-15	
REVIEW	GLH	11/30/15		

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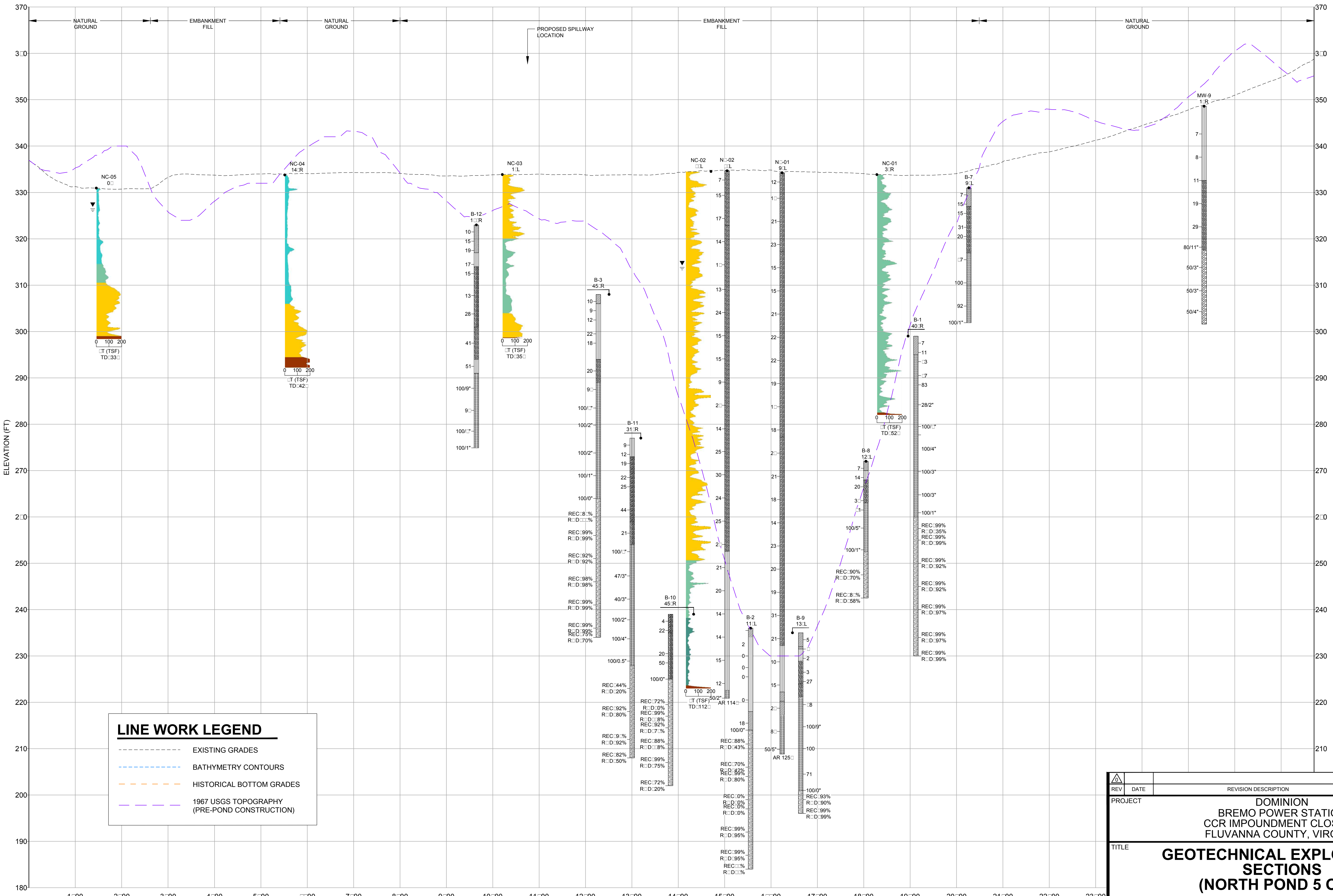


NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-□ FOR LEGEND INFORMATION.
3. PROPOSED CONTOURS ARE THE SAME AS E□ISTING GRADES.

SCALE 100 0 100 FEET
10□ VERTICALLY E□AGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT

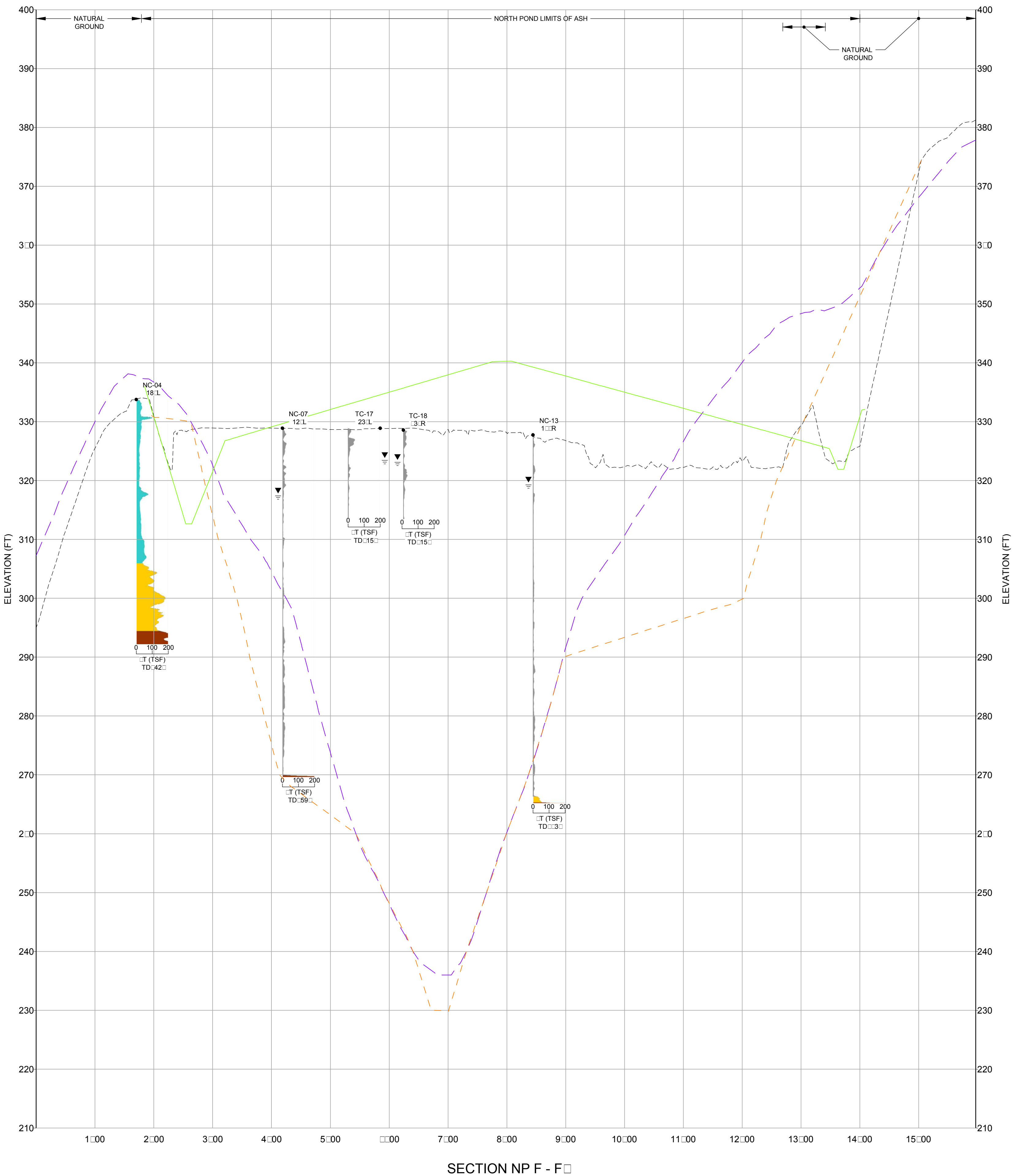
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE

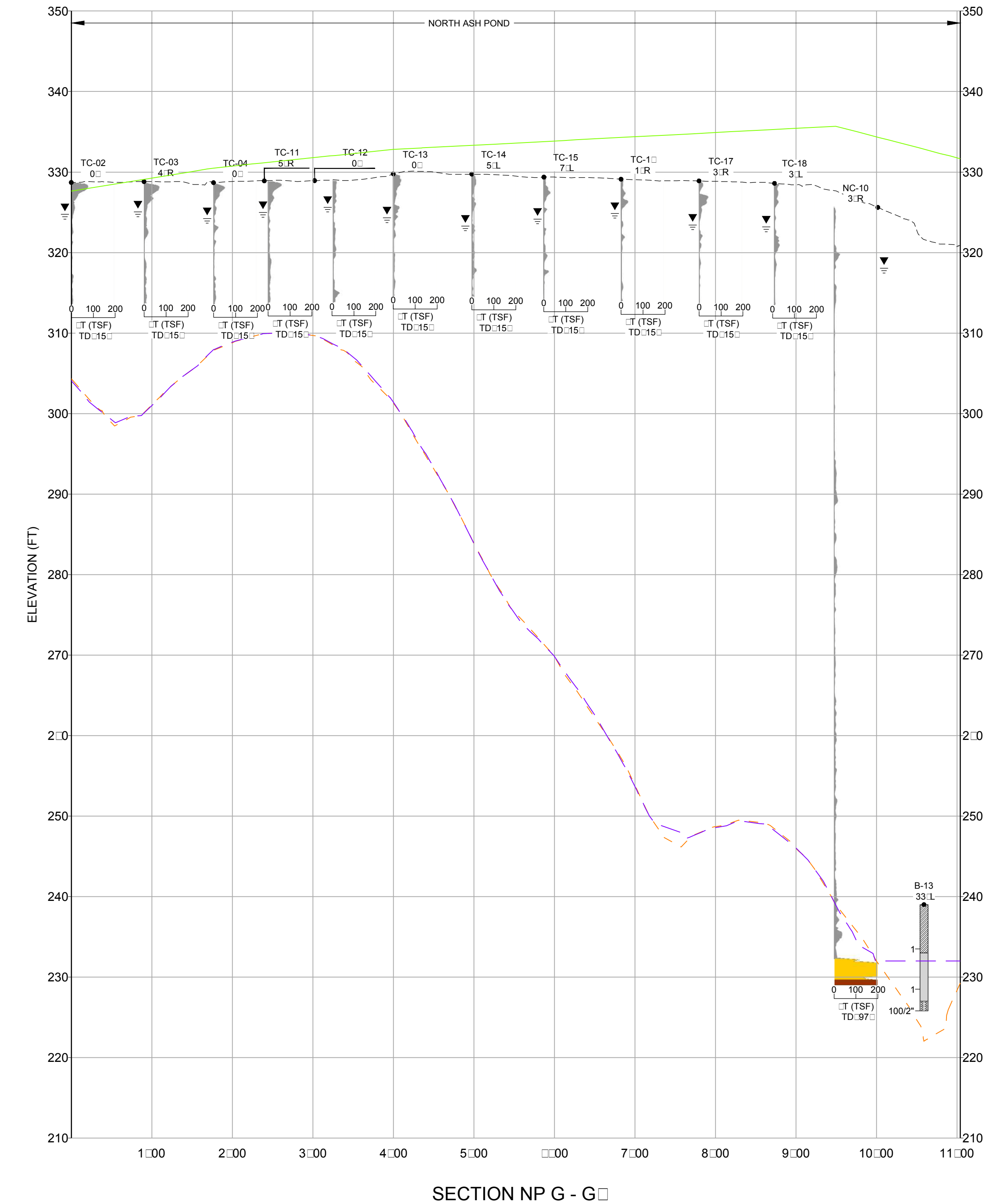
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 5 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0□-18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15	FIGURE G-16	



SECTION NP F - F'



SECTION NP G - G'

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G-□ FOR LEGEND INFORMATION.

SCALE 100 0 100 FEET
10□ VERTICALLY E□AGGERATED

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT
DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE
GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 6 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0□-18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15		

FIGURE G-17

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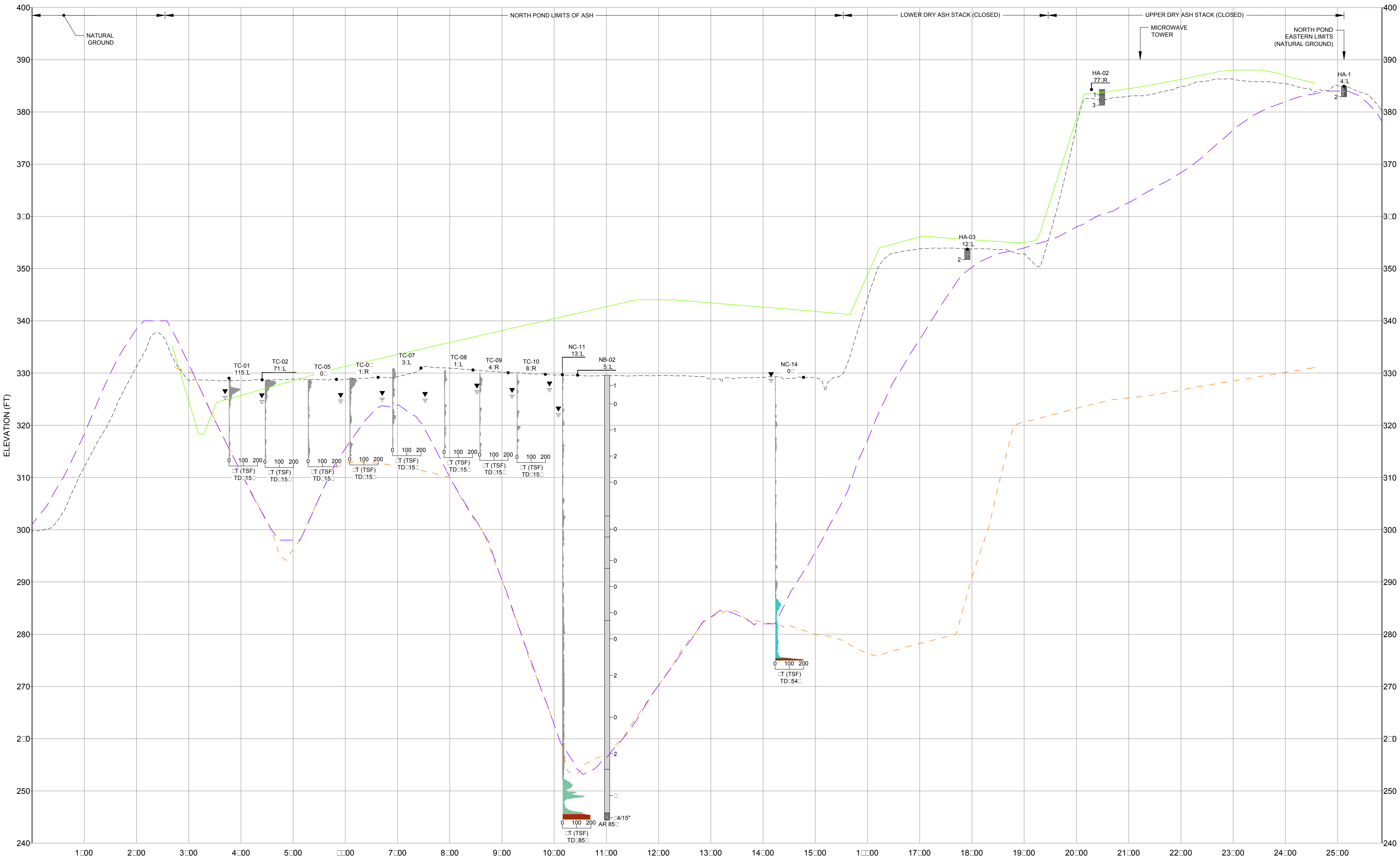


SECTION NP H - H

LINE WORK LEGEND

- EXISTING GRADES
- PROPOSED GRADES
- BATHYMETRY CONTOURS
- HISTORICAL BOTTOM GRADES
- 1967 USGS TOPOGRAPHY (PRE-POND CONSTRUCTION)

NOTES

1. REFER TO FIGURE G-1 FOR GENERAL NOTES AND REFERENCES.
2. REFER TO FIGURE G- FOR LEGEND INFORMATION.

SCALE 100 0 100 FEET

REV	DATE	REVISION DESCRIPTION	DES	CADD	CHK	RVW

PROJECT

DOMINION
BREMO POWER STATION
CCR IMPOUNDMENT CLOSURE
FLUVANNA COUNTY, VIRGINIA

TITLE

GEOTECHNICAL EXPLORATION SECTIONS (NORTH POND 7 OF 7)

Golder Associates

PROJECT No.		15-20347	FILE No.	1520347AG0-18
DESIGN	-	-	SCALE	AS SHOWN
CADD	CCP	11/30/15		
CHECK	JGM	11/30/15		
REVIEW	GLH	11/30/15	FIGURE G-18	

Tables

SUMMARY OF CPT/BOREHOLES											
Pond ID	**I.D.**	**Type**	**DATE**	**Surface Elevation (ft)**	**Top of CCR El. (ft)**	**Top of Fill (ft)**	**Top of Alluvium**	**Top of Residuum**	**Top of Disintegrated Rock**	**TERMINATION EL. (ft)**	**REMARKS**
EAST POND	GB-1	Borehole	8/27/2014	235	NA	235	NA	198	193	190 (AR)	EAP - South Dike
	GB-2	Borehole	8/27/2014	235	NA	235	NA	208	192	190 (AR)	EAP - South Dike
	GB-3	Borehole	8/27/2014	235	NA	235	NA	207	194	191 (AR)	EAP - South Dike
	GB-4	Borehole	8/27/2014	235	NA	235	206	195	192	191 (AR)	EAP - South Dike
	GB-5	Borehole	8/27/2014	234	NA	234	201	NA	196	195 (AR)	EAP - South Dike
	EB-01	Borehole	3/17/2015	248	247	NA	NA	NA	NA	212	EAP - CCR Extension Area EB-01 Completed as Offset (EB-01A) with Mud Rotary
	EB-01A	Borehole	3/17/2015	248	247	NA	198	NA	NA	193 (AR)	
	EB-02	Borehole	3/18/2015	248	247	NA	201	NA	NA	195 (AR)	EAP - CCR Extension Area
	EB-03	Borehole	3/19/2015	249	242	NA	197	NA	NA	192 (AR)	EAP, Center - CCR
	EB-04	Borehole	3/22/2015	238	237	234	202	NA	NA	194 (AR)	EAP - South Dike
	EB-05	Borehole	3/22/2015	252	251	NA	197	NA	NA	194 (AR)	EAP - South Extension Dike
	EC-01	CPT	3/21/2015	235	NA	235	197	NA	NA	194	EAP - South Dike
	EC-03	CPT	3/20/2015	253	251	NA	201	NA	196	195	EAP - West Extension Dike
	EC-04	CPT	3/17/2015	253	251	NA	200	NA	196	195	EAP - North Extension Dike
	EC-05	CPT	3/17/2015	252	250	NA	205	NA	195	194	EAP - North Extension Dike
	EC-06	CPT	3/18/2015	246	246	NA	200	NA	195	194	EAP - CCR Extension Area
	EC-07	CPT	3/18/2015	248	248	NA	198	NA	195	194	EAP - CCR Extension Area
	EC-08	CPT	3/18/2015	248	248	NA	198	NA	196	195	EAP - CCR Extension Area
	EC-09	CPT	3/20/2015	252	250	NA	205	196	195	195	EAP - South Extension Dike
	EC-10	CPT	3/18/2015	249	240	NA	204	NA	196	195	EAP, Center - East Dike
	EC-11	CPT	3/21/2015	236	227	NA	211	NA	206	206	Toe of North Dike
	EC-12	CPT	3/24/2015	273	NA	273	NA	NA	210	209	Downslope Bench of North Dike
NORTH POND	NB-02	Borehole	3/23/15	330	330	NA	NA	246	NA	244 (AR)	NAP - Center of CCR Pond
	NZ-01	Borehole	3/21/15	334	NA	334	NA	222	217	209 (AR)	NAP - South Dike
	NZ-02	Borehole	3/20/15	335	NA	335	NA	NA	223	221 (AR)	NAP - South Dike
	NC-01	CPT	3/19/15	334	NA	334	NA	NA	282	282	NAP - South Dike
	NC-02	CPT	3/25/15	335	NA	335	NA	NA	224	223	NAP - South Dike
	NC-03	CPT	3/20/15	334	NA	334	NA	330	299	299	NAP - West Dike
	NC-04	CPT	3/20/15	334	NA	NA	NA	334	294	292	NAP - West Dike
	NC-05	CPT	3/20/15	331	NA	NA	NA	331	299	298	NAP - West Dike
	NC-06	CPT	3/21/15	323	323	NA	NA	NA	265	264	NAP - CCR
	NC-07	CPT	3/23/15	329	329	NA	NA	NA	270	270	NAP - CCR
	NC-08	CPT	3/22/15	328	328	NA	NA	275	267	267	NAP - CCR
	NC-09	CPT	3/24/15	333	333	NA	NA	283	275	274	NAP - CCR
	NC-10	CPT	3/23/15	326	326	NA	232	NA	230	229	NAP - CCR
	NC-11	CPT	3/22/15	330	330	NA	253	NA	245	244	NAP - CCR
	NC-12	CPT	3/24/15	332	332	NA	NA	287	282	282	NAP - CCR
	NC-13	CPT	3/22/15	328	328	NA	267	NA	265	265	NAP - CCR
	NC-14	CPT	3/22/15	329	329	NA	287	NA	275	275	NAP - CCR
WEST POND	WB-1	Borehole	3/16/15	234	NA	234	NA	NA	194	185 (AR)	WAP - North Dike
	WB-2	Borehole	3/17/15	234	NA	234	217	NA	NA	196 (AR)	WAP - South Dike
	WC-01	CPT	3/21/15	235	NA	235	217	NA	198	198	WAP - West Splitter Dike
	WC-02	CPT	3/17/15	234	NA	234	NA	NA	196	196	WAP - South Dike
	WC-03	CPT	3/19/15	217	NA	NA	217	NA	197	197	WAP - Toe of Southeast Dike
	WC-04	CPT	3/21/15	235	NA	235	217	NA	196	196	WAP - East Dike
	WC-05	CPT	3/17/15	233	NA	NA	217	NA	NA	196	WAP - North Dike

Golder Associates				
	DATE	May 2015	Project:	Bremo Power Station CCR Pond Closure
	DESIGN	SH	Location:	Bremo Bluff, VA
	CHECK	JGM	Proj No.	1520347
	REVIEW	PD	**CPT/BOREHOLES STRATIGRAPHY SUMMARY**	

TABLE 2A - NATURAL SOILS
DOMINION BREMO POWER STATION CCR POND CLOSURE
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classi-fication	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		pH Soil	Gs	Unit Weight		Permeability (cm/sec)	Soil Resistivity		Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (pcf)		Moisture (%)	Minimum (ohms-cm)	
EB-01A S-10	Jar	48.5-50.6'		26.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-04 S-4	Jar/Bag	13.0-15.0'	(ML)	25.0	NP	NP	NP	NP	-	80.3	-	-	-	-	-	-	-	-	-	-	-
EB-04 S-6	Jar	23.0-25.0'	-	28.8	32	20	12	0.77	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-4 S-8	Jar	33.0-35.0'	-	22.2	24	17	7	0.73	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-15	Jar	83.5-84.8'	-	6.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NZ-1 S-3	Bag	8.5-10.5'	(SM)	17.9	-	-	-	-	92.5	30.4	-	-	-	-	-	-	-	-	-	-	-
NZ-1 S-8	Jar/Bag	33.5-35.5'	SM	23.6	32	27	5	-0.73	99.1	31.9	-	-	-	-	-	-	-	-	-	-	-
NZ-1 S-13	Jar/Bag	58.5-60.5'	(SM)	13.5	-	-	-	-	93.1	31.5	-	-	-	-	-	-	-	-	-	-	-
NZ-1 S-18	Jar/Bag	83.5-85.5'	(SM)	17.6	-	-	-	-	96.3	39.2	-	-	-	-	-	-	-	-	-	-	-
NZ-1 S-24	Jar/Bag	113.5-115.5'	ML	28.0	43	28	15	-0.02	98.4	59.1	-	-	-	-	-	-	-	-	-	-	-
NZ-2 S-6	Jar/Bag	23.6-25.6'	(SM)	19.6	-	-	-	-	98.1	37.5	-	-	-	-	-	-	-	-	-	-	-
NZ-2 S-10	Jar/Bag	43.6-45.6'	SM	25.3	35	32	3	-2.26	99.2	35.9	-	-	-	-	-	-	-	-	-	-	-
NZ-2 S-14	Jar	63.6-65.6'	(SM)	21.1	-	-	-	-	96.2	33.5	-	-	-	-	-	-	-	-	-	-	-
NZ-2 S-19	Bag	88.6-90.6'	ML	29.3	46	35	11	-0.46	99.8	53.3	-	-	-	-	-	-	-	-	-	-	-
NZ-2 S-23	Bag	108.6-110.6'	CL	26.8	42	26	16	0.04	98.8	50.8	-	-	-	-	-	-	-	-	-	-	-
WB-1 S-3	Bag	8.5-10.5'	CL	22.8	41	24	17	-0.10	-	82.8	-	-	-	-	-	-	-	-	-	-	-
WB-1 UD-1	UD	20.6-21.9'	ML	22.9	36	25	11	-0.20	100.0	89.5	-	-	-	-	2.72	22.9	103.3	-	-	-	T-CU w/pp
WB-1 S-6	Jar	23.5-25.5'	-	26.2	28	20	8	0.78	-	-	-	-	-	-	-	-	-	-	-	-	-
WB-1 S-8	Bag	33.5-35.5'	(CL)	24.9	-	-	-	-	99.8	67.7	-	-	-	-	-	-	-	-	-	-	-
WB-2 S-4	Jar	13.5-15.5'	-	23.3	35	23	12	0.00	-	-	-	-	-	-	-	-	-	-	-	-	-
WB-2 S-7	Bag	28.5-30.5'	CL	21.7	28	19	9	0.33	-	58.8	-	-	-	-	-	-	-	-	-	-	-

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

TABLE 2A - NATURAL SOILS
DOMINION BREMO POWER STATION CCR POND CLOSURE
SUMMARY OF SOIL DATA (GOLDER 2014 INVESTIGATION)

Sample Identification	Sample Type	Sample Depth	Soil Classification	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		pH Soil	Gs	Unit Weight		Permeability (cm/sec)	Soil Resistivity		Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (pcf)		Moisture (%)	Minimum (ohms-cm)	
B-1 S-08	Bag	33.5-35	CL	24.1	41	23	18.0	0.05	100.0	95.2	50.0	-	-	-	-	-	-	-	-	-	
B-2 UD-01	Tube	8-10	CL	22.1	38	25	13.0	-0.22	100.0	82.0	45.0	-	-	-	2.76	22.1	103.0	-	-	-	T-CU w/pp
B-3 UD-01	Tube	16-18	CL-ML	24.7	19	15	4	2.14	100.0	51.1	27.5	-	-	-	2.71	24.70	101.3	-	-	-	T-CU w/pp
B-4 S-03	Bag	8.5-10	CL	12.2	32	22	10	-0.95	100.0	69.4	40.0	-	-	-	-	-	-	-	-	-	-
B-5 S-03B	Bag	9-10	ML	30.1	44	33	11	-0.25	94.1	66.7	30.0	-	-	-	-	-	-	-	-	-	-

ABBREVIATIONS:
LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES:
T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

TABLE 2B - CCR
DOMINION BREMO POWER STATION CCR POND CLOSURE
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classi-fication	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		pH Soil	Gs	Unit Weight		Permeability (cm/sec)	Soil Resistivity		Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (pcf)		Moisture (%)	Minimum (ohms-cm)	
EB-01 UD-01	UD	2.5-4.5'		57.0	-	-	-	-	-	-	-	-	-	-	-	57.0	39.2	-	-	-	-
EB-01 S-2	Jar	8.5-10.5'		49.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01 S-3	Jar	13.5-15.5'		62.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01 S-4	Jar	18.5-20.5'		73.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01A UD-02	UD	23.9-26.1'	-	94.6	-	-	-	-	-	-	-	-	-	-	-	94.6	31.8	-	-	-	-
EB-01 S-6	Jar	28.5-30.5'		87.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01 S-7	Jar	33.5-35.5'		21.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01A S-8	Jar	38.3-40.3'		30.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-01A S-9	Jar/Bag	43.3-45.3'	(ML)	107.7	-	-	-	-	100.0	77.8	6.5	-	-	-	2.07	-	-	-	-	-	-
EB-02 Bulk-01	Bulk	0.0-10.0'	-	46.3	-	-	-	-	-	-	-	64.9	43.6	-	-	-	-	-	-	-	-
EB-02 S-3	Jar/Bag	8.5-10.5'	(ML)	21.2	-	-	-	-	100.0	97.4	4.7	-	-	-	2.14	-	-	-	-	-	-
EB-02 S-5	Jar	18.5-20.5'		21.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-02 S-6	Jar	23.5-25.5'		20.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-02 S-7	Jar	28.5-30.5'		67.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-02 UD-01	UD	33.0-35.0'	(ML)	124.9	-	-	-	-	100.0	77.1	7.5	-	-	-	2.10	124.9	35.9	-	-	-	C
EB-02 UD-01	UD	33.0-35.0'	-	116.1	-	-	-	-	-	-	-	-	-	-	-	116.1	22.4	-	-	-	DS
EB-02 S-8	Jar	35.0-37.0'		86.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-02 S-9	Jar/Bag	38.5-40.5'	(ML)	152.4	-	-	-	-	100.0	78.5	7.0	-	-	-	-	-	-	-	-	-	-
EB-02 UD-02	UD	43.0-45.0'	(ML)	127.3	-	-	-	-	100.0	91.3	11.0	-	-	-	2.10	127.3	34.2	-	-	-	C
EB-02 UD-02	UD	43.0-45.0'	(ML)	136.5	-	-	-	-	-	-	-	-	-	-	2.10	136.5	32.9	-	-	-	C - 24-hr
EB-03 S-3	Jar	8.7-10.7'		42.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 S-4	Jar	13.7-15.7'		53.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 UD-01	UD	18.6-20.6	-	78.5	-	-	-	-	-	-	-	-	-	-	-	78.5	48.7	-	-	-	-
EB-03 S-5	Jar	20.6-22.6'		85.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

ABBREVIATIONS:
- LIQUID LIMIT (LL)
- PLASTIC LIMIT (PL)
- PLASTICITY INDEX (PI)
- LIQUIDITY INDEX (LI)
- SPECIFIC GRAVITY (Gs)
- MOISTURE (Mc)

NOTES:
- T = TRIAXIAL TEST
- U = UNCONFINED COMPRESSION TEST
- C = CONSOLIDATION TEST
- DS = DIRECT SHEAR TEST
- O = ORGANIC CONTENT
- P = pH

TABLE 2B - CCR (CONTINUED)
DOMINION BREMO POWER STATION CCR POND CLOSURE
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classi-fication	Natural Moisture %	Atterberg Limits L.L.	Atterberg Limits P.L.	Atterberg Limits P.I.	Atterberg Limits L.I.	Grain Size Distribution % Finer No. 4 Sieve	Grain Size Distribution % Finer No. 200 Sieve	Grain Size Distribution % Finer .005 mm	Compaction Maximum Dry Density (lb/cuft)	Compaction Optimum Moisture %	pH Soil	Gs	Unit Weight Moisture %	Unit Weight Dry (pcf)	Permeability (cm/sec)	Soil Resistivity Moisture (%)	Soil Resistivity Minimum (ohms-cm)	Additional Tests Conducted (See Notes)
EB-03 S-6	Jar	23.7-25.7'		109.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 S-7	Jar	28.7-30.7'		80.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 S-8	Jar/Bag	33.7-35.7'	(ML)	69.6	-	-	-	-	100.0	90.3	7.5	-	-	-	-	-	-	-	-	-	-
EB-03 S-9	Jar	38.7-40.7'		125.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 S-10	Jar	43.7-45.7'		110.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-03 S-11	Jar	48.7-50.7		162.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-05 S-3	Jar/Bag	8.5-10.5'	(ML)	38.6	-	-	-	-	100.0	71.8	18.0	-	-	-	-	-	-	-	-	-	-
EB-05 S-6	Jar/Bag	23.5-25.5'	(ML)	148.7	-	-	-	-	100.0	53.0	7.5	-	-	-	-	-	-	-	-	-	-
EB-05 S-9	Jar/Bag	38.5-40.5'	(ML)	109.1	-	-	-	-	100.0	62.9	6.5	-	-	-	-	-	-	-	-	-	-
EB-05 10A	Jar	43.5-45.5'		92.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-5 S-11	Jar/Bag	48.5-50.5'	(ML)	103.8	-	-	-	-	100.0	50.5	3.9	-	-	8.7	-	-	-	-	-	-	-
EB-5 S-12	Jar	53.5-55.5	-	22.9	NP	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
EB-5 S-12	Bag	53.5-55.5	-	69.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	54.0	2,400	-
NB-02 Bulk-01	Bulk/Bag	0.0-7.5'	-	71.1	-	-	-	-	-	-	-	65.9	44.6								
NB-02 S-3	Jar	8.5-10.5'		72.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-4	Jar	13.5-15.5'	ML	66.4	NP	NP	NP	NP	100.0	75.8	6.5	-	-	-	-	-	-	-	-	-	-
NB-02 S-5	Jar	18.8-20.5		76.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-5&7	Jar/Bag	18.5-35.5'	-	70.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	55.1	3,200	-
NB-02 UD-01	UD	25.5-27.5'	(MH)	53.2	-	-	-	-	100.0	93.4	16.0	-	-	-	2.21	53.2	62.4	-	-	-	C
NB-02 UD-01	-	-	-	39.9	-	-	-	-	-	-	-	-	-	-	-	39.9	65.3	2.1E-04	-	-	-
NB-02 S-6	Jar	27.0-29.0'	-	59.0	-	-	-	-	-	-	-	-	-	-	2.16	-	-	-	-	-	-
NB-02 S-7	Jar	33.5-35.5'		69.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-8	Jar	38.5-40.5'	-	70.3	NP	NP	NP	NP	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-9	Jar/Bag	43.5-45.5'	ML	83.6	NP	NP	NP	NP	100.0	87.1	20.5	-	-	8.6	-	-	-	-	-	-	-

ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH

TABLE 2B - CCR (CONTINUED)
DOMINION BREMO POWER STATION CCR POND CLOSURE
SUMMARY OF SOIL DATA

Sample Identification	Sample Type	Sample Depth	Soil Classi-fication	Natural Moisture %	Atterberg Limits				Grain Size Distribution			Compaction		pH Soil	Gs	Unit Weight		Permeability (cm/sec)	Soil Resistivity		Additional Tests Conducted (See Notes)
					L.L.	P.L.	P.I.	L.I.	% Finer No. 4 Sieve	% Finer No. 200 Sieve	% Finer .005 mm	Maximum Dry Density (lb/cuft)	Optimum Moisture %			Moisture %	Dry (pcf)		Moisture (%)	Minimum (ohms-cm)	
NB-02 S-10	Jar	48.5-50.5'		91.0																	
NB-02 UD-02	UD	53.5-55.5'	(SM)	158.2	-	-	-	-	100.0	48.5	5.0	-	-	-	2.08	158.2	29.4	-	-	-	C
NB-02 UD-02	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	79.4	53.0	-	-	-	T-CU w/pp
NB-02 S-11	Jar	55.5-57.5'	-	89.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-12	Jar	63.5-65.5'	-	98.0	-	-	-	-	-	-	-	-	-	-	2.06	-	-	-	-	-	-
NB-02 UD-03	UD	68.5-70.5'	(MH)	101.5	-	-	-	-	-	-	-	-	-	-	2.13	101.5	41.7	-	-	-	C
NB-02 UD-03	-	-	-	103.1	NP	NP	NP	NP	-	-	-	-	-	-	-	103.1	43.4	2.5E-04	-	-	-
NB-02 S-13	Jar	70.5-72.5'	-	86.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NB-02 S-14A	Jar	78.5-80.5'	-	141.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NP-01 GB-01	Jar	1.5-3.9'	-	86.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
NP-07 GB-01	Jar	0.0-4.7'	-	72.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WP-01 Bulk-01	Bulk/Bag	0.5-2.0'	-	110.8	-	-	-	-	-	-	-	48.0	80.0	-	-	-	-	-	-	-	(1)
WP-02 Bulk-01	Bulk	0.5-1.5'	-	42.1	-	-	-	-	-	-	-	82.4	28.6	-	-	-	-	-	-	-	-
WP-02 Bulk-02	Bulk	1.5-2.0'	-	50.4	-	-	-	-	100.0	65.9	4.0	-	-	8.5	-	-	-	-	51.0	5,100	-

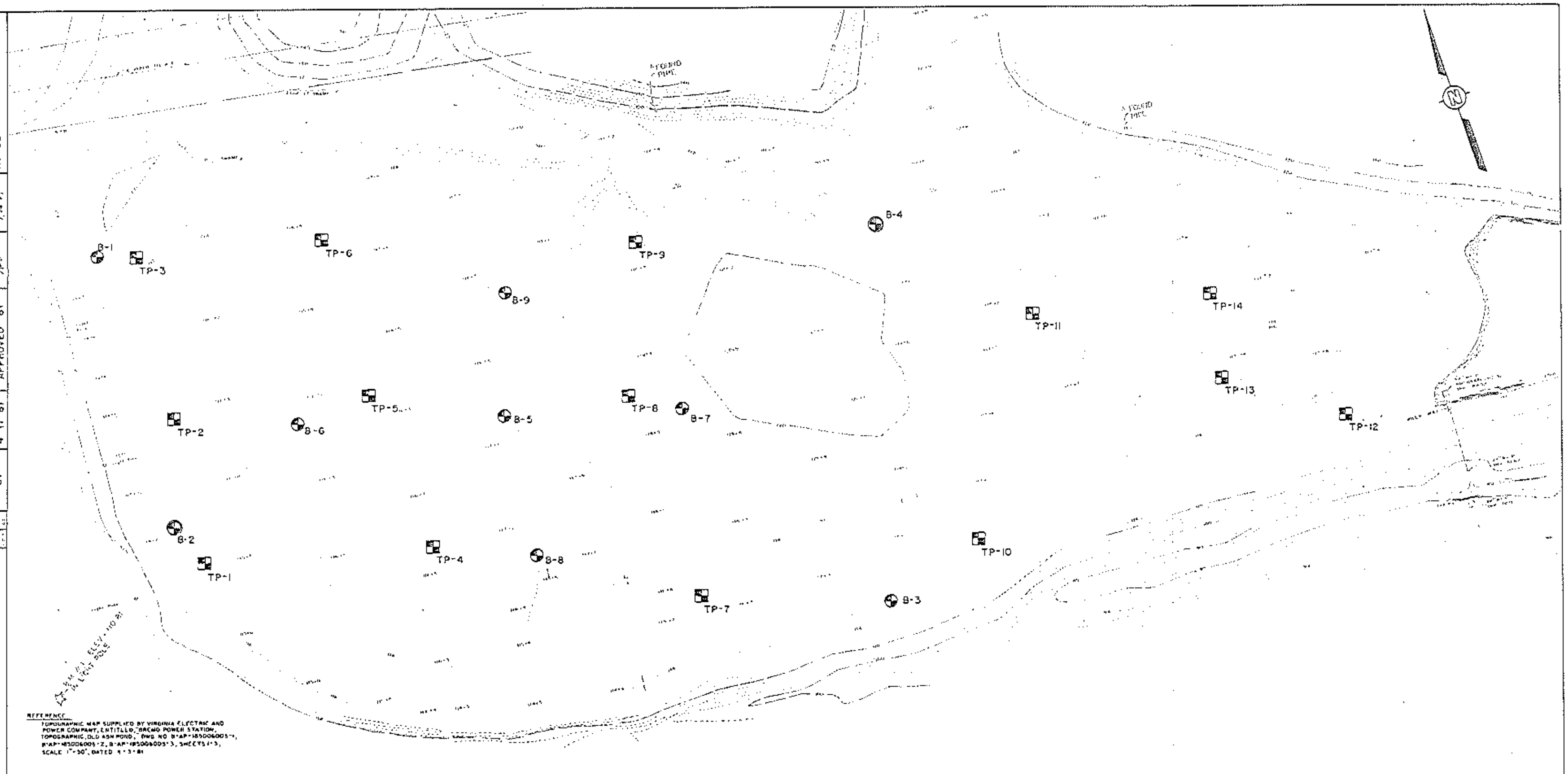
ABBREVIATIONS: LIQUID LIMIT (LL)
PLASTIC LIMIT (PL)
PLASTICITY INDEX (PI)
LIQUIDITY INDEX (LI)
SPECIFIC GRAVITY (Gs)
MOISTURE (Mc)

NOTES: T = TRIAXIAL TEST
U = UNCONFINED COMPRESSION TEST
C = CONSOLIDATION TEST
DS = DIRECT SHEAR TEST
O = ORGANIC CONTENT
P = pH
(1) = Conducted a check plug on material

Table 2C: Calculated Densities of Staturated CCR Samples					
Boring ID	Sample	Depth	Water Content (%)	Specific Gravity	Dry Density (pcf)
NB-02	3	8.5 - 10.5	73%	2.15	52
	4	13.5 - 15.5	66%	2.15	55
	5	18.8 - 20.5	53%	2.15	63
	UD-01	25.5 - 27.5	53%	2.21	62
	UD-01	25.5 - 27.5	40%	2.21	65
	6	27 - 29	59%	2.16	59
	7	33.5 - 35.5	70%	2.15	54
	8	38.5 - 40.5	70%	2.15	53
	9	43.5 - 45.5	84%	2.15	48
	10	48.5 - 50.5	91%	2.15	45
	UD-02	53.5 - 55.5	158%	2.08	30
	UD-02	53.5 - 55.5	79%	2.08	49
	11	55.5 - 57.5	90%	2.15	46
	12	63.5 - 65.5	98%	2.06	43
	UD-03	68.5 - 70.5	79%	2.13	53
	UD-03	68.5 - 70.5	102%	2.13	42
	13	70.5 72.5	87%	2.15	47
	14A	78.5 - 80.5	142%	2.15	33
EB-01	UD-01	2.5 - 4.5	57%	2.15	39
	2	8.5 - 10.5	50%	2.15	65
	3	13.5-15.5	63%	2.15	57
	4	18.5 - 20.5	74%	2.15	52
	6	28.5 - 30.5	87%	2.15	47
	7	33.5 - 35.5	22%	2.15	91
	8	38.3 - 40.3	30%	2.15	81
	UD-02	43.0 - 45.0	95%	2.15	32
	9	43.3 - 45.3	108%	2.07	40
	10	48.5 - 50.6	27%	2.15	85
EB-02	3	8.5 - 10.5	21%	2.14	92
	5	18.5 - 20.5	22%	2.15	91
	6	23.5 - 25.5	21%	2.15	93
	7	28.5 - 30.5	67%	2.15	55
	UD-01	33.0 - 35.0	125%	2.1	36
	UD-01	33.0 - 35.0	116%		22
	8	35 - 37	87%	2.15	47
	9	38.5 - 40.5	152%	2.15	31
	UD-02	43.0 - 45.0	127%	2.1	34
EB-03	3	8.7 - 10.7	43%	2.15	70
	4	13.7 - 15.7	53%	2.15	63
	UD-01	18.6 - 20.6	79%	2.15	49
	5	20.6 - 22.6	85%	2.15	47
	6	23.7 - 25.7	110%	2.15	40
	7	28.7 - 30.7	81%	2.15	49
	8	33.7 - 35.7	70%	2.15	54
	9	38.7 - 40.7	125%	2.15	36
	10	43.7 - 45.7	110%	2.15	40
	11	48.7 - 50.7	163%	2.15	30
EB-05	6	23.0 - 25.0	149%	2.15	32
	9	38.5 - 40.5	109%	2.15	40
	10A	43.5 - 45.5	83%	2.15	48
	11	48.5 - 50.5	104%	2.15	42
	12	53.5 - 55.5	23%	2.15	90

Attachment 1

Applicable Boring and Well Logs by Others



REFERENCE:
TOPOGRAPHIC MAP SUPPLIED BY VIRGINIA ELECTRIC AND POWER COMPANY, ENTITLED, "BREMO POWER STATION, TOPOGRAPHIC, OLD ASH POND," DWG NO B-AP-18500G005-1, B-AP-18500G005-2, B-AP-18500G005-3, SHEETS 1-3, SCALE 1"=30', DATED 4-3-81

LEGEND:
- TEST PIT LOCATION (3-30-81)
- BORING LOCATION (5-12-81)
- BORING LOCATION WITH PIEZOMETER (5-12-81)

NOTES:
1. ELEVATIONS SHOWN ARE VEPCO DATUM. VEPCO PLAN EL 100.0 EQUALS U.S.G.S. EL 222.44 MEAN SEA LEVEL
2. TEST PIT AND BORING LOCATIONS ARE APPROXIMATE ONLY.
3. FOR DETAILED DESCRIPTION OF BORINGS AND TEST PITS SEE BORING AND TEST PIT LOGS AT APPENDIX D.

SCALE 50 0 50 100 FEET

DRAWING NO.	SHEET NO.	FIGURE NO.
SE81-409-MI	2 of 9	3

EXISTING CONDITIONS
BORING AND TEST PIT LOCATIONS
BREMO POWER STATION
VIRGINIA ELECTRIC AND POWER COMPANY
BREMO BLUFF, FLUVANNA COUNTY, VIRGINIA

PREPARED FOR

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA

D'APPOLONIA

DRAWN BY	RAL	CHECKED BY		DRAWING NUMBER	SE81-409-MI
	4-17-81	APPROVED BY			

DATE BEGAN: 5-12-81
DATE FINISHED: 5-12-81
GROUND SURFACE EL.: 116.5±

BORING NO. B-1

N ________ E ________

FIELD ENGINEER: G.R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
110	5	S 2					
5-12-81 (water level)	10	S 3					120.2%
100	15	S 4		VERY LOOSE TO LOOSE BLACK FLY ASH--MOIST TO WET	NA		164.6%
	20	S 5					138.8%
90	25	S 6		28.0'			98.7%
85.0	30, 31.5	S 7		STIFF GRAY AND BROWN AND CLAY AND SILT--SOME FINE TO MEDIUM SAND--MOIST 31.5'	CL-ML		
				BOTTOM OF BORING 31.5'			

SE81-409
VEPCO

DATE BEGAN: 5-12-81
DATE FINISHED: 5-12-81
GROUND SURFACE EL.: 115.0±

BORING NO. B-2

N ____________ E ____________

FIELD ENGINEER: G. R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U S C S	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
110	5	S 2					
		S 3					
5-12-81 ▼	10	S 4					
		S 5					97.8%
100	15	I 20		VERY LOOSE TO MEDIUM DENSE BLACK FLY ASH--MOIST TO WET	NA		
		S 6					115.3%
	20						
		S 7					
90	25						
		S 8				WOT	134.4%
	30						
83.5	31.5	S 9		31.5'		WOT	

BOTTOM OF BORING
31.5'

NOTE: PIEZOMETER INSTALLED AT COMPLETION OF BORING. TIP AT ELEVATION 97.0'.

DATE BEGAN: 5-12-81

DATE FINISHED: 5-12-81

GROUND SURFACE EL.: 114.5±

BORING NO. B-3

N ____________ E ____________

FIELD ENGINEER: G. R. BRIDGER

CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
		1 / 24					
110	5						
5-12-81 (water level)		S 2					
		S 3					72.8%
	10	S 4					82.2%
100	15						
		S 5		VERY LOOSE TO LOOSE BLACK FLY ASH--MOIST TO WET	NA		107.9%
	20	S 6				WOT	158.8%
90	25						
		S 7					134.6%
	30	S 8					136.0%
80	35						
78.0	36.5	S 9		36.5'			120.8%

BOTTOM OF BORING
36.5'

DATE BEGAN: 5-12-81

DATE FINISHED: 5-12-81

GROUND SURFACE EL.: 115.0±

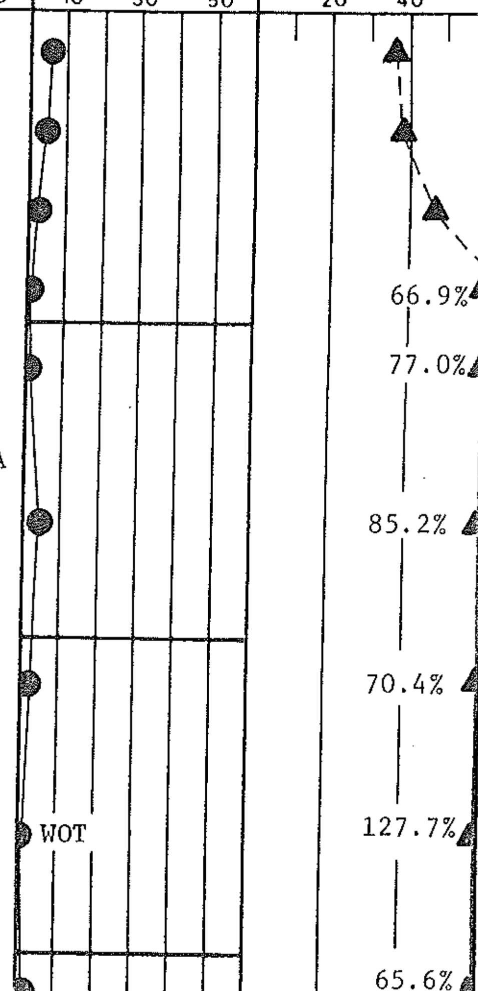
BORING NO. B-4

N ____________ E ____________

FIELD ENGINEER: G. R. BRIDGER

CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
		S 2					
110	5	S 3					
5-12-81 (water level)		S 4					
	10	S 5					66.9%
							77.0%
100	15	S 6		VERY LOOSE TO LOOSE BLACK FLY ASH--MOIST TO WET	NA		85.2%
	20	S 7					70.4%
90	25	S 8				WOT	127.7%
	30						
83.5	31.5	S 9		31.5'			65.6%



BOTTOM OF BORING
31.5'

NOTE: PIEZOMETER INSTALLED AT COMPLETION OF BORING. TIP AT ELEVATION 95.0'.

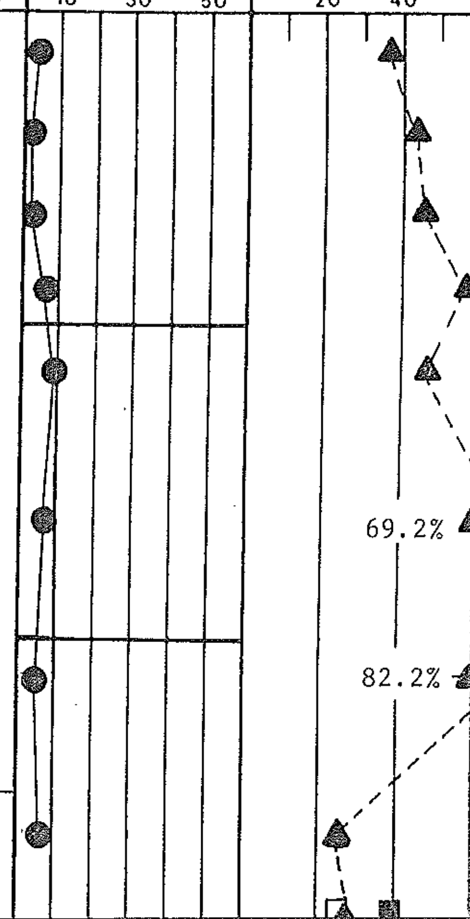
DATE BEGAN: 5-12-81
DATE FINISHED: 5-12-81
GROUND SURFACE EL.: 116.0±

BORING NO. B-5

N ______ E ______

FIELD ENGINEER: G. R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
110	5	S 1, S 2, S 3					
5-12-81 (water level)	10	S 4, S 5		VERY LOOSE TO LOOSE BLACK FLY ASH--MOIST TO WET	NA		
100	15	S 6					69.2%
	20	S 7					82.2%
90	25	S 8		25.0'			
82.0'	34.0	22		MEDIUM STIFF BROWN CLAY AND SILT--SOME FINE TO MEDIUM SAND--MOIST 29.0'	CL-ML		
				BOTTOM OF BORING 25.0'			



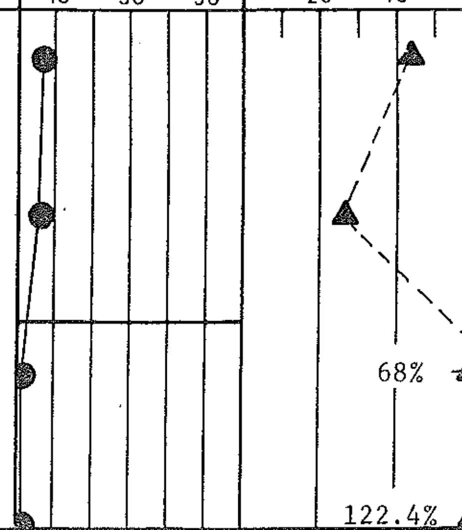
DATE BEGAN: 5-13-81
DATE FINISHED: 5-13-81
GROUND SURFACE EL.: 115.5±

BORING NO. B-6

N ____________ E ____________

FIELD ENGINEER: G. R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
110	5	S 1					
		S 2		VERY LOOSE TO LOOSE BLACK FLY ASH			
5-13-81	10	S 3					68%
100	15						
109.0	16.5	S 4		16.5'			122.4%
				BOTTOM OF BORING 16.5'			



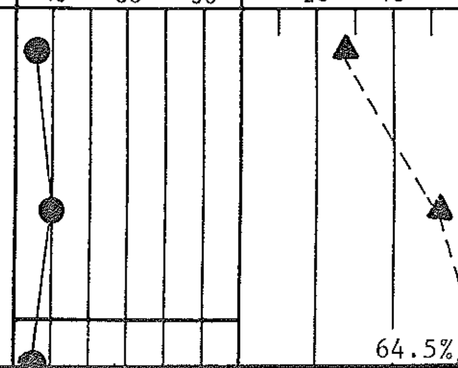
DATE BEGAN: 5-13-81
DATE FINISHED: 5-13-81
GROUND SURFACE EL.: 118.0±

BORING NO. B-7

N ____________ E ____________

FIELD ENGINEER: G. R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
110	5	S 2		LOOSE BLACK FLY ASH			
5-13-81 (water level)	10						
104.5	11.5	S 3		11.5'			64.5%
				BOTTOM OF BORING 11.5'			



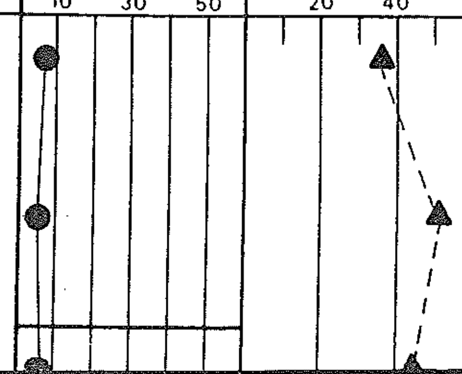
DATE BEGAN: 5-13-81
DATE FINISHED: 5-13-81
GROUND SURFACE EL.: 116.5±

BORING NO. B-8

N ______ E ______

FIELD ENGINEER: G. R. BRIDGER
CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
	5			LOOSE BLACK FLY ASH			
110		S 2					
5-13-81 (water level)	10						
104.0	11.5	S 3		11.5'			
				BOTTOM OF BORING 11.5'			



DATE BEGAN: 5-13-81

DATE FINISHED: 5-13-81

GROUND SURFACE EL.: 116±

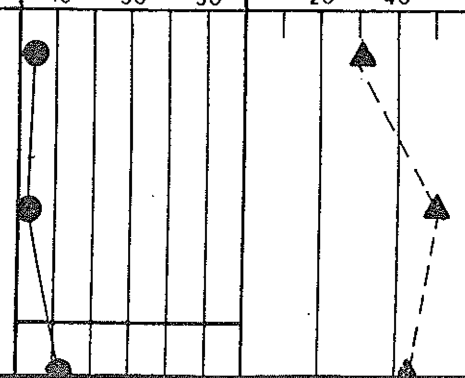
BORING NO. B-9

N ______ E ______

FIELD ENGINEER: G. R. BRIDGER

CHECKED BY: J. E. WALTER

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		S 1					
	5			VERY LOOSE TO MEDIUM DENSE BLACK FLY ASH			
110		S 2					
5-13-81 (water level)	10						
104.5	11.5	S 3		11.5'			
				BOTTOM OF BORING 11.5'			



DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 115±

TEST PIT NO. TP-1

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			DARK GRAY FLY ASH 2.0'	
			MIXTURE OF LIGHT AND DARK GRAY FLY ASH 4.0'	
110	5		LAYERS OF LIGHT AND DARK GRAY FLY ASH--SOME BOTTOM ASH 5.0'	
			DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH LENSES 7.5'	
			MIXTURE OF LIGHT AND DARK GRAY FLY ASH 8.5'	
	10		LAYERS OF LIGHT AND DARK GRAY FLY ASH--SOME BOTTOM ASH LENSES 9.5'	
3-18-81 ▽ 103.0	12.0		DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH 12.0'	
			BOTTOM OF TEST PIT 12.0'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 116±

TEST PIT NO. TP-2

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			MIXTURE OF LIGHT AND DARK GRAY FLY ASH 4.0'	
110	5		LAYERS OF LIGHT AND DARK GRAY FLY ASH--SOME BOTTOM ASH LENSES	
3-18-81 ▽ 104.0	10 12.0		12.0'	
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. SE80-735

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 116±

TEST PIT NO. TP-3

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH 3.0'	
110 3-18-81 (water level) 104.0	5 10 12.0		LAYERS OF LIGHT AND DARK GRAY FLY ASH 12.0'	
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. SE80-735

TEST PIT NO. TP-3
SHEET 1 OF 1

DATE BEGAN: 3-30-81
DATE FINISHED: 3-30-81
GROUND SURFACE EL.: 116±

TEST PIT NO. TP-4

FIELD ENGINEER: J.E. WALTER
CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
110	5		DARK GRAY FLY ASH--SOME MIXTURE OF LIGHT AND DARK GRAY FLY ASH 6.0'	
			DARK GRAY FLY ASH--SOME LAYERS OF LIGHT GRAY FLY ASH 9.0'	
3-18-81 104.0	10 12.0		LIGHT GRAY FLY ASH--SOME LAYERS OF DARK GRAY FLY ASH--SOME BOTTOM ASH LENSES 12.0'	
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. SE80-735

TEST PIT NO. TP-4
SHEET 1 OF 1

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 116±

TEST PIT NO. TP-5

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH--SOME BOTTOM ASH LENSES	
110	5		6.0'	
			LAYER OF BOTTOM ASH--SOME DARK GRAY FLY ASH 7.0'	
			LAYERS OF LIGHT AND DARK GRAY FLY ASH--SOME BOTTOM ASH	
106.3	9.7		9.7'	
			BOTTOM OF TEST PIT 9.7'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 116±

TEST PIT NO. TP-6

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
110	5		DARK GRAY FLY ASH--SOME MIXTURE OF LIGHT AND DARK GRAY FLY ASH 7.0'	
			BOTTOM ASH 8.0'	
3-18-81	10		LAYERS OF LIGHT AND DARK GRAY FLY ASH--SOME BOTTOM ASH LENSES 9.7'	
			BOTTOM ASH 12.0'	
104.0	12.0		BOTTOM OF TEST PIT 12.0'	

PROJECT NO. SE80-735

TEST PIT NO. TP-6
SHEET 1 OF 1

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 116±

TEST PIT NO. TP-7

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	5		DARK GRAY FLY ASH--SOME MIXTURE OF LIGHT AND DARK GRAY FLY ASH 5.0'	
110	10		DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH LENSES	
104.0	12.0		12.0'	
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. SE80-735

TEST PIT NO. TP-7
SHEET 1 OF 1

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 118±

TEST PIT NO. TP-8

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
110	5, 10		DARK GRAY FLY ASH--SOME LIGHT GRAY FLY ASH	
104.0	14.0		14.0'	
			BOTTOM OF TEST PIT 14.0'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 118±

TEST PIT NO. TP-9

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	5		DARK GRAY FLY ASH--SOME LAYERS OF LIGHT GRAY FLY ASH 6.0'	
110	10		LIGHT GRAY FLY ASH--SOME LAYERS OF DARK GRAY FLY ASH 10.0'	
106.0	12.0		LIGHT GRAY FLY ASH 12.0'	
			BOTTOM OF TEST PIT 12.0'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 115±

TEST PIT NO. TP-10

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
110	5		DARK GRAY FLY ASH--SOME LAYERS OF LIGHT GRAY FLY ASH 4.0'	
105.0	10.0		DARK GRAY FLY ASH--SOME SMALL LENSES OF LIGHT GRAY FLY ASH 10.0'	
			BOTTOM OF TEST PIT 10.0'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 117±

TEST PIT NO. TP-11

FIELD ENGINEER: J.E. WALTER

CHECKED BY: C.M. MCCORMACK

ELEV. (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			LAYERS OF DARK GRAY FLY ASH-- TRACE OF LIGHT GRAY FLY ASH 4.0'	
110	5		DARK GRAY FLY ASH	
3-18-81	10			
105.0	12.0		12.0'	
			BOTTOM OF TEST PIT 12.0'	

DATE BEGAN: 3-30-81

DATE FINISHED: 3-30-81

GROUND SURFACE EL.: 113±

TEST PIT NO. TP-12

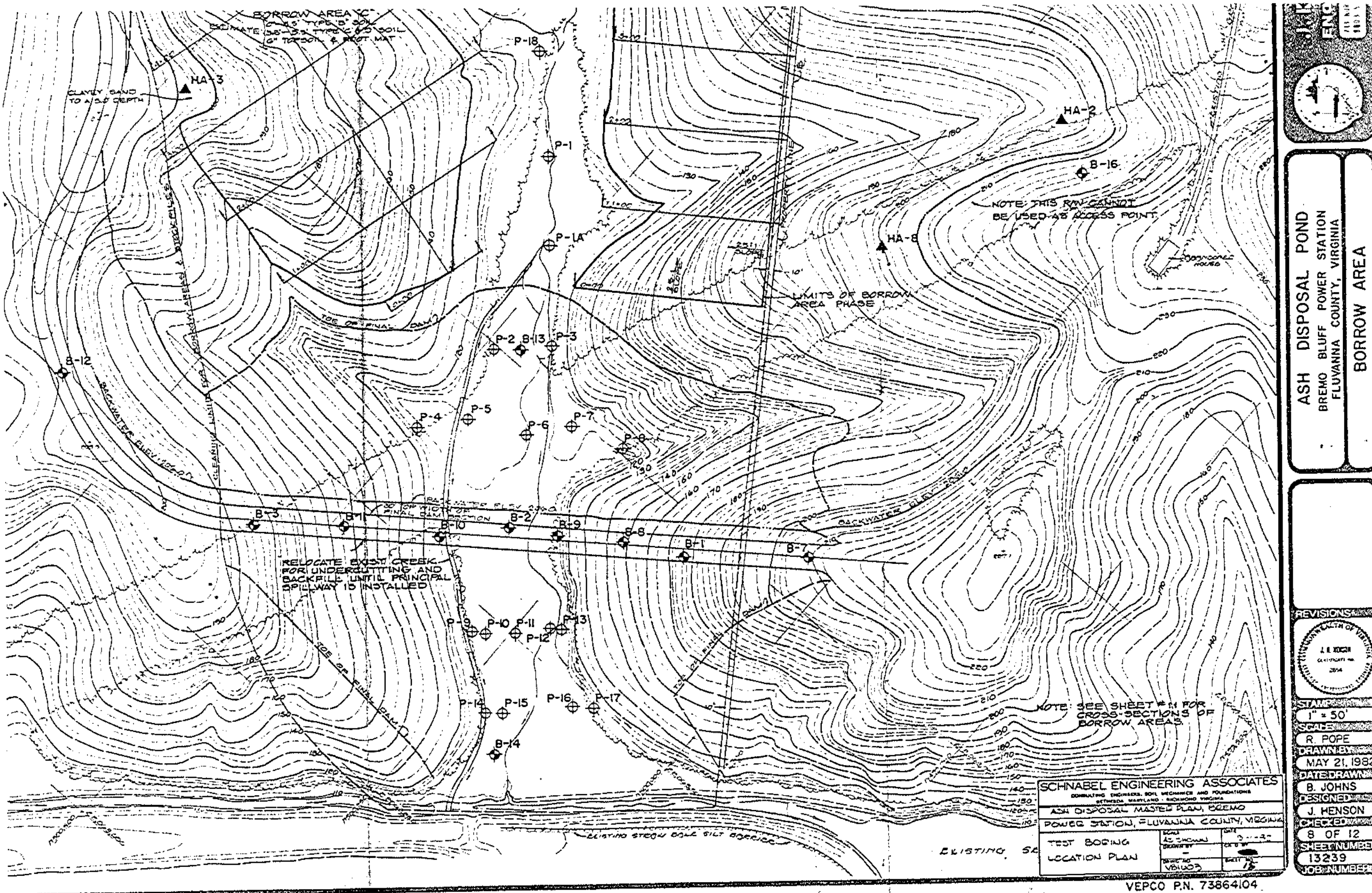
FIELD ENGINEER: J.E. WALTER

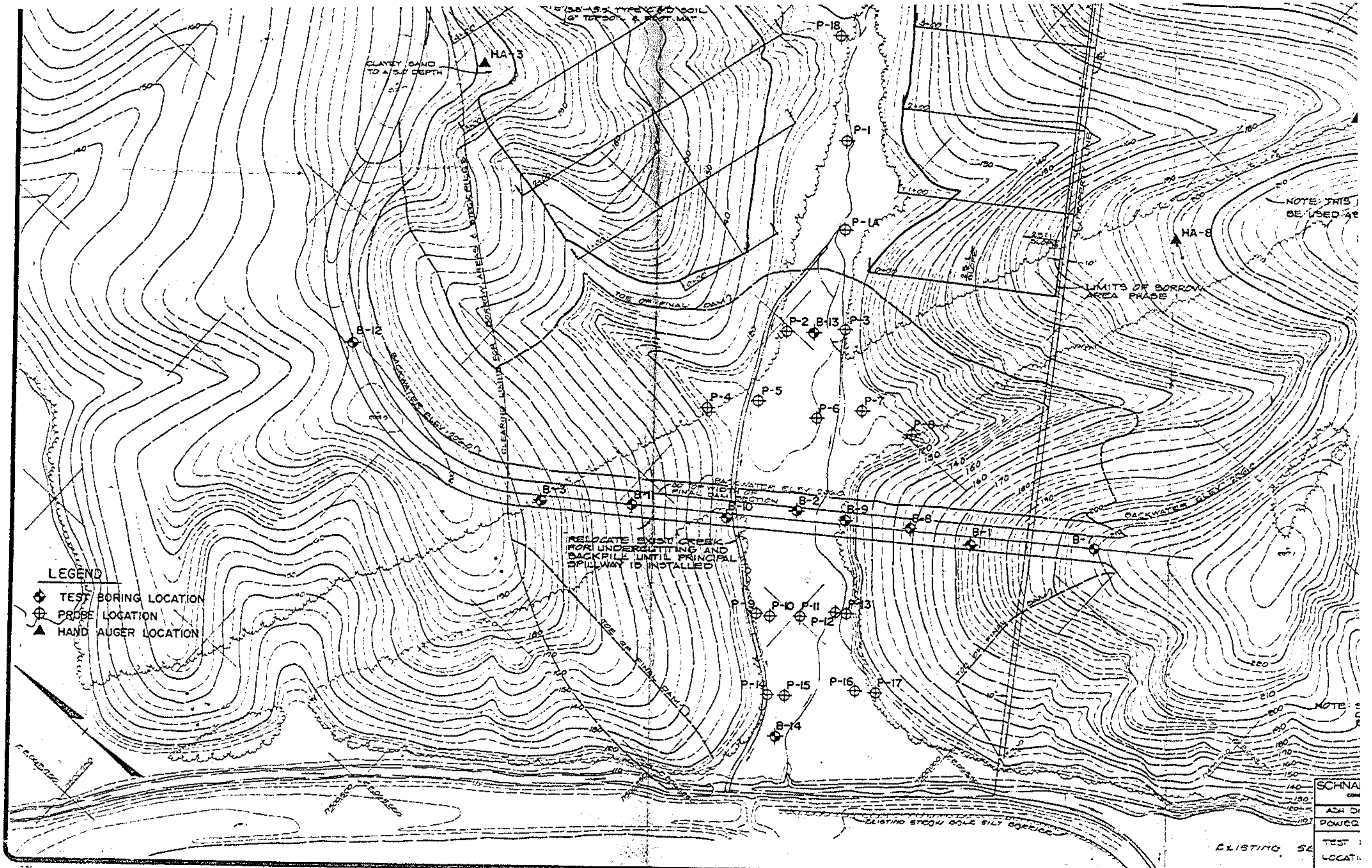
CHECKED BY: C.M. MCCORMACK

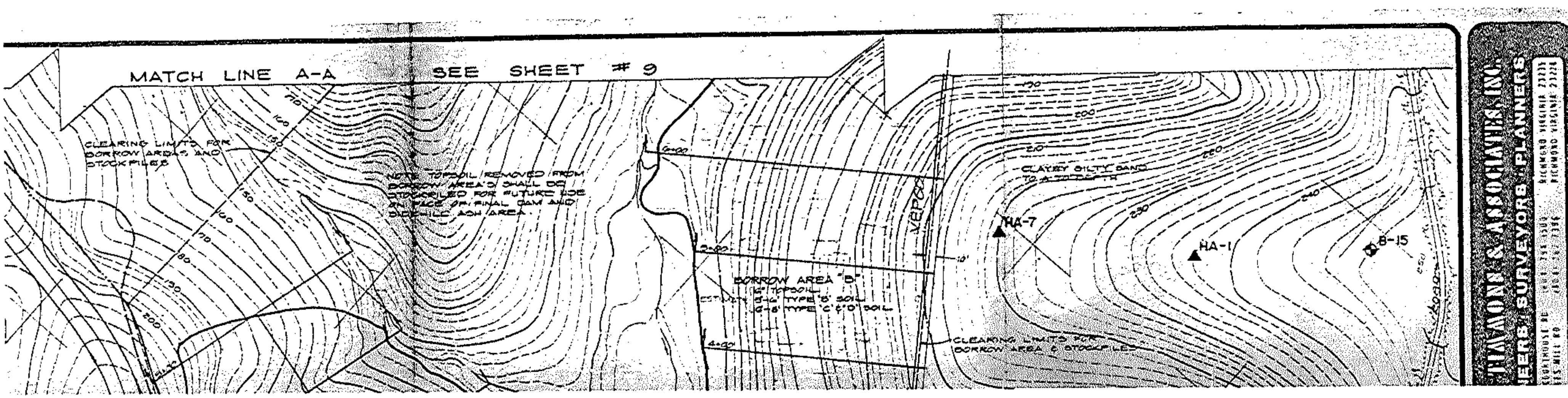
ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			MIXTURE OF LIGHT AND DARK GRAY FLY ASH 2.0'	
110	5		LAYERS OF LIGHT AND DARK GRAY FLY ASH	
105.0	8.0		8.0'	
			BOTTOM OF TEST PIT 8.0'	

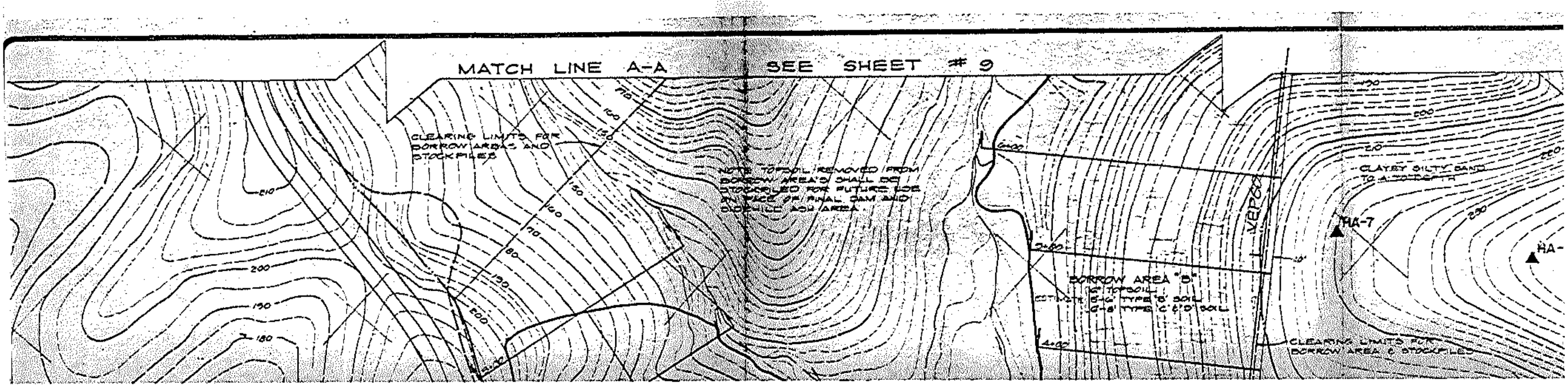
PROJECT NO. SE80-735

TEST PIT NO. TP-12
SHEET 1 OF 1

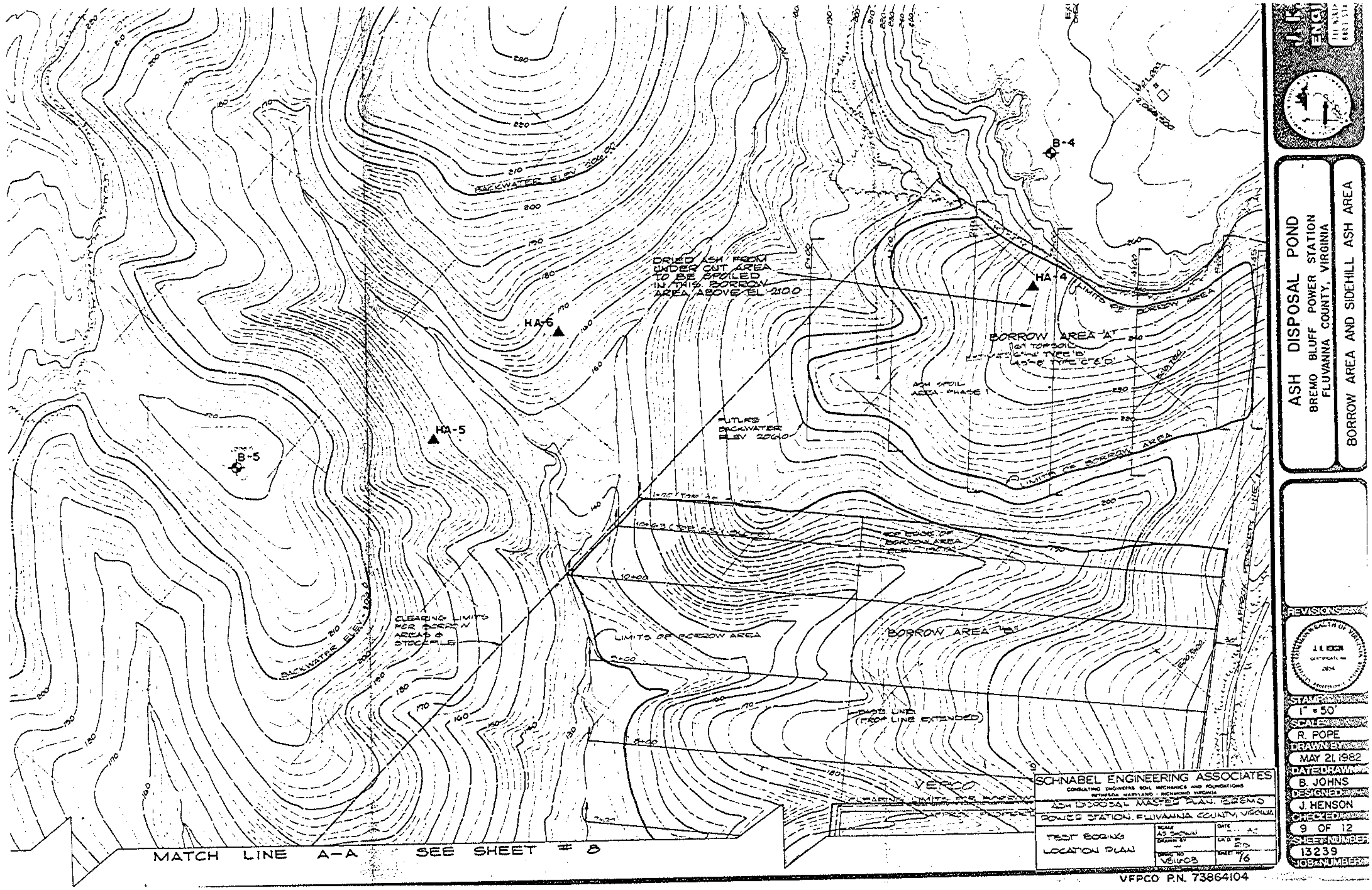

BORROW AREA "C"
CLAYEY SAND TO A 5.0' DEPTH
HA-3
HA-2
HA-8
B-16
NOTE: THIS R/W CANNOT BE USED AS ACCESS POINT
LIMITS OF BORROW AREA PHASE
TOE OF FINAL DAM
B-12
P-18
P-1
P-1A
P-2
B-13
P-3
P-4
P-5
P-6
P-7
P-8
B-3
B-11
B-10
B-2
B-9
B-8
B-1
B-7
RELOCATE EXIST. CREEK FOR UNDERCUTTING AND BACKFILL UNTIL PRINCIPAL SPILLWAY IS INSTALLED
P-9
P-10
P-11
P-12
P-13
P-14
P-15
P-16
P-17
B-14
NOTE: SEE SHEET #11 FOR CROSS-SECTIONS OF BORROW AREAS.
EXISTING
SCHNABEL ENGINEERING ASSOCIATES
ASH DISPOSAL MASTER PLAN, BREMO
POWER STATION, FLUVANNA COUNTY, VIRGINIA
TEST BORING LOCATION PLAN
VEPCO P.N. 73864104
ASH DISPOSAL POND
BREMO BLUFF POWER STATION
FLUVANNA COUNTY, VIRGINIA
BORROW AREA
REVISIONS
STAMP
1" = 50'
SCALE
R. POPE
DRAWN BY
MAY 21, 1982
DATE DRAWN
B. JOHNS
DESIGNED
J. HENSON
CHECKED
8 OF 12
SHEET NUMBER
13239
JOB NUMBER


LEGEND
TEST BORING LOCATION
PROBE LOCATION
HAND AUGER LOCATION
CLAYEY SAND TO A 5.0' DEPTH
HA-3
HA-8
LIMITS OF BORROW AREA PHASE
TOE OF FINAL DAM
BACKWATER ELEV. 206.00
RELOCATE EXIST. CREEK FOR UNDERCUTTING AND BACKFILL UNTIL PRINCIPAL SPILLWAY IS INSTALLED
B-1
B-2
B-3
B-7
B-8
B-9
B-10
B-11
B-12
B-13
B-14
P-1
P-1A
P-2
P-3
P-4
P-5
P-6
P-7
P-8
P-9
P-10
P-11
P-12
P-13
P-14
P-15
P-16
P-17
P-18
SCHNA
ASH
POWER
TEST
LOCATI
EXISTING

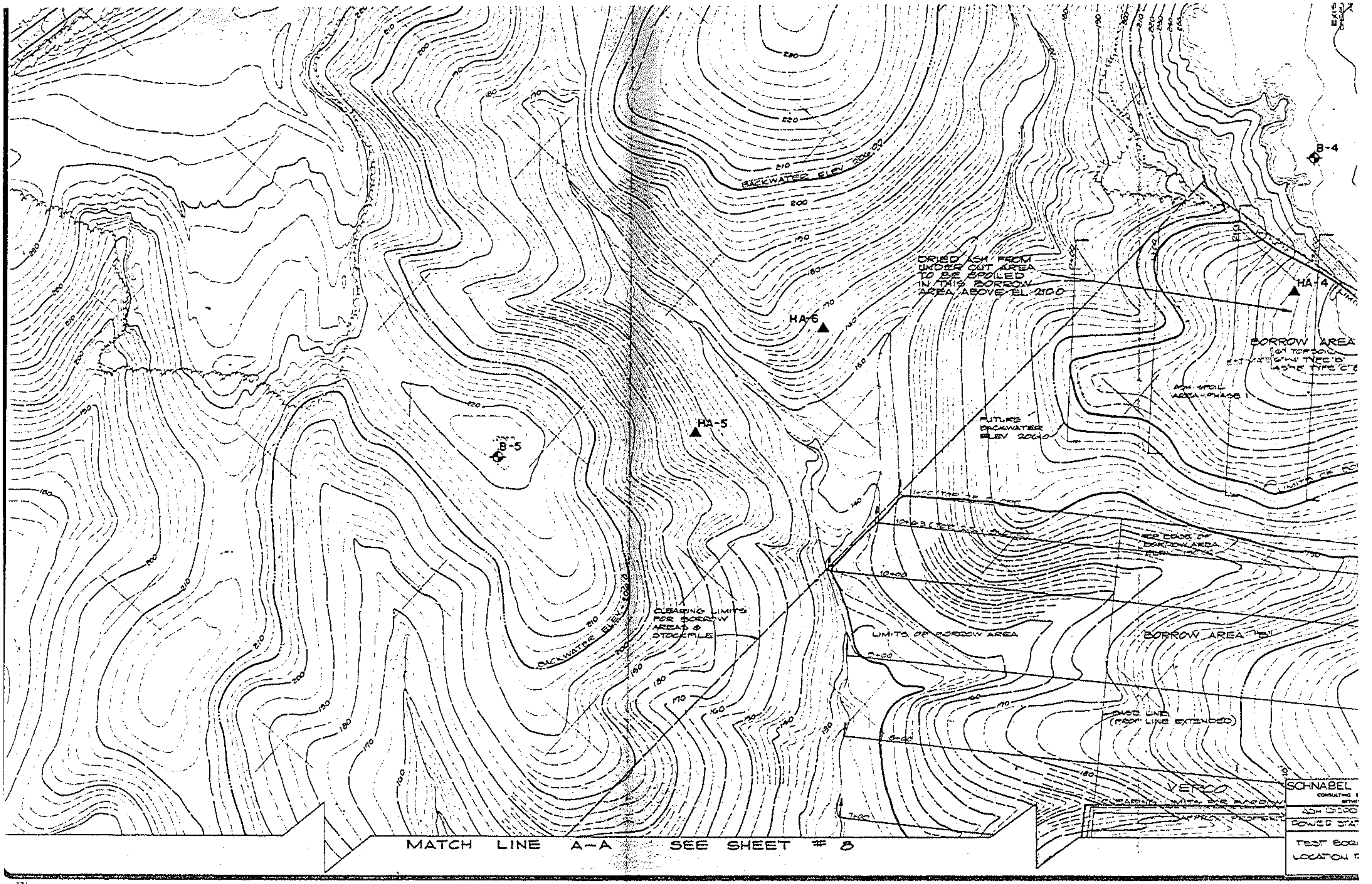

MATCH LINE A-A SEE SHEET # 9
CLEARING LIMITS FOR BORROW AREAS AND STOCKPILES
NOTE: TOPSOIL REMOVED FROM BORROW AREA'S SHALL BE STOCKPILED FOR FUTURE USE ON FACE OF FINAL DAM AND SIDEHILL ASH AREA.
BORROW AREA "B"
CLAYEY SILTY SAND
HA-7
HA-1
B-15
CLEARING LIMITS FOR BORROW AREA & STOCKPILES
ENGINEERS · SURVEYORS · PLANNERS

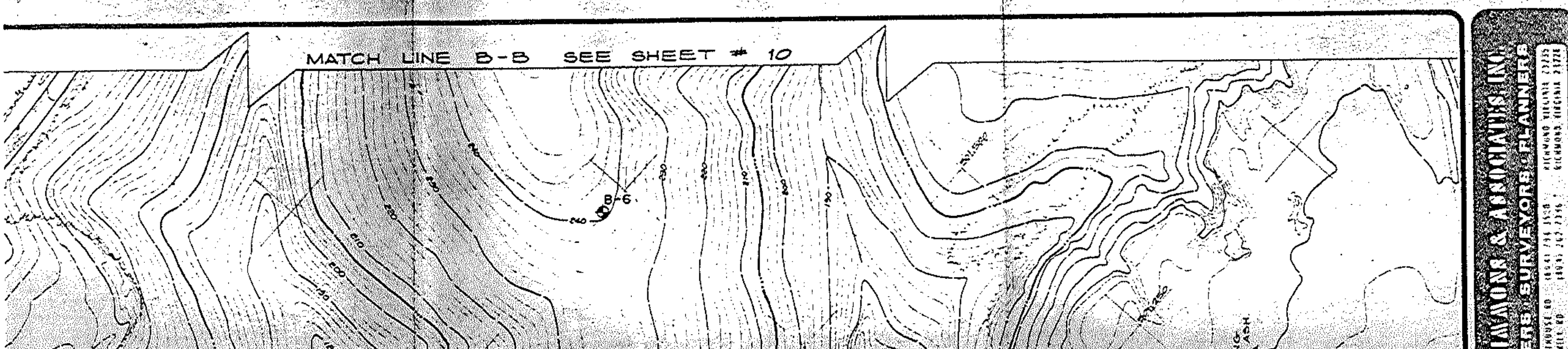


MATCH LINE A-A SEE SHEET # 9
CLEARING LIMITS FOR BORROW AREAS AND STOCKPILES
NOTE: TOPSOIL REMOVED FROM BORROW AREA'S SHALL BE STOCKPILED FOR FUTURE USE ON FACE OF FINAL DAM AND
ASH AREA
BORROW AREA "B"
TOPSOIL
TYPE "B" SOIL
TYPE "C" & "D" SOIL
CLEARING LIMITS FOR BORROW AREA & STOCKPILES
CLAYEY SILTY SAND
HA-7
210
200
190
180
170
160
150
200
230



ASH DISPOSAL POND
BREMO BLUFF POWER STATION
FLUVANNA COUNTY, VIRGINIA
BORROW AREA AND SIDEHILL ASH AREA
REVISIONS
STAMP
1" = 50'
SCALE
R. POPE
DRAWN BY
MAY 21, 1982
DATE DRAWN
B. JOHNS
DESIGNED
J. HENSON
CHECKED
9 OF 12
SHEET NUMBER
13239
JOB NUMBER
SCHNABEL ENGINEERING ASSOCIATES
ASH DISPOSAL MASTER PLAN, BREMO
POWER STATION, FLUVANNA COUNTY, VIRGINIA
TEST BORING
LOCATION PLAN
VEPCO P.N. 73864104
MATCH LINE A-A SEE SHEET # 8
B-4
B-5
HA-4
HA-5
HA-6
DRIED ASH FROM
UNDER CUT AREA
TO BE SPOILED
IN THIS BORROW
AREA ABOVE EL 210.0
BORROW AREA "A"
LIMITS OF BORROW AREA
BORROW AREA "B"
FUTURE
BACKWATER
ELEV 206.0
BACKWATER ELEV. 206.0
CLEARING LIMITS
FOR BORROW
AREAS &
STOCKPILE
BASE LINE
(PROP LINE EXTENDED)
VEPCO


B-4
HA-4
HA-6
HA-5
B-5
BACKWATER ELEV. 206.00
DRIED ASH FROM UNDER CUT AREA TO BE SPOILED IN THIS BORROW AREA ABOVE EL. 210.0
FUTURE BACKWATER ELEV. 206.0
BORROW AREA
BORROW AREA "B"
LIMITS OF BORROW AREA
CLEARING LIMITS FOR BORROW AREAS & STOCKPILE
BACKWATER ELEV. 206.0
BASE LINE (FROM LINE EXTENDED)
VEPCO
MATCH LINE A-A SEE SHEET # 8


MATCH LINE B-B SEE SHEET # 10
B-6
SURVEYORS · PLANNERS

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-1

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.								SHEET NO. 1 OF 2
CLIENT: VEPCO								JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.					DRILL: CME-45			ELEVATION: 177.0±
WATER LEVEL DATA					DRIVE	SAMPLER		CASING SIZE: 3½"
	DATE	TIME	DEPTH	CAVED	TYPE	S. S.		DATE START: 1/8/82
ENCOUNTERED	1/8	-	DRY	-	DIA.	2" OD		DATE FINISHED: 1/8/82
AFTER CASING PULLED	-	-	-	-	WT.	140 #		DRILLER: R. AYERS
82 DAY READING	3/31	-	DRY	19.0'	FALL	30"		INSPECTOR: G. ADAMS

STRATUM	DEPTH FT.	ELEV. 177.0±	BLOWS ON SAMPLE SPOON, PER 6	SYMBOL	IDENTIFICATION	REMARKS
					8"± TOPSOIL	
B			3+3+4	S	SILTY CLAY, SOME FINE TO MEDIUM SAND WITH MICA, MOIST - BROWN (CL)	
	2.0					
			4+4+7	S	CLAYEY SILT, SOME FINE TO MEDIUM SAND WITH MICA, DRY - VARICOLORED (ML)	
	4.0					
			8+24+39	S		RESIDUAL
		170				
D			19+23+44	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (ML TO SM)	
			22+35+48	S		
			72-28/2"	S		
		160				
			100/6"	S		
			100/4"	S		
		150				
			100/3"	S		
			100/3"	S		
		140				
	39.0		100/1"	S		
E			REC=99% RQD=35%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANODIORITE GNEISS, MEDIUM HARD TO SOFT, MODERATELY TO HIGHLY FRACTURED	Foliation Dips 30° - 45°±
	41.5					
			REC=99% RQD=99%	NX	FRESH TO SLIGHTLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	
	44.0					
		130	REC=86% RQD=92%	NX	SLIGHTLY TO MODERATELY WEATHERED VARICOLORED GRANODIORITE GNEISS, HARD TO MEDIUM HARD, SLIGHTLY TO MODERATELY FRACTURED	GRANODIORITE UNIT
	49.0					
			REC=99% RQD=92%	NX	FRESH TO SLIGHTLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	
		120	REC=99% RQD=97%	NX		Highly Weathered and Fractured Zone from: 59 to 59.2 ft 64 to 64.2 ft
			REC=99% RQD=97%	NX		

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-1
PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.		SHEET NO. 2 OF 2
CLIENT: VEPCO		JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.		ELEVATION: 177.0±

	DEPTH FT.	ELEV.	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
E	69.0	110	REC=99% RQD=99%	NX	FRESH TO SLIGHTLY WEATHERED, VARI-COLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
					BORING TERMINATED AT 69.0 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-2

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA. — SHEET NO. 1 OF 1
CLIENT: VEPCO — JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC. — DRILL: CME-45 — ELEVATION: 114.0±

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED	DRIVE SAMPLER		
					TYPE	S.S.	CASING SIZE: 3½"
ENCOUNTERED	OBSERVATION WELL INSTALLED				DIA.	2" OD.	DATE START: 1/15/82
AFTER CASING PULLED					WT.	140 #	DATE FINISHED: 1/20/82
___HR. READING	SEE TABLE BELOW				FALL	30"	DRILLER: R. AYERS
							INSPECTOR: G. P. ADAMS

STRATUM	DEPTH FT.	ELEV. 114.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A1	2.0				SILTY CLAY, FILL, SOME FINE TO MEDIUM SAND MOIST - BROWN (CL)	FILL
		110	1+1+1	S*		
			WOR	S	FLY ASH, WET - DARK GRAY	
			WOR	S*		
A			WOR	S		FLYASH FILL
		100				
	18.0		WOR	S		
			2+2+16	S	CLAYEY SILT, SOME FINE SANDY, TRACE ORGANIC MATTER AND ROCK FRAGMENTS, MOIST - GRAY (ML)	RESIDUAL
B	22.0		100/0"	S*		
		90	Rec=88% ROD=43%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANODIORITE GNEISS, MEDIUM HARD TO SOFT, MODERATELY TO HIGHLY FRACTURED	
			Rec=70% ROD=42%	NX		
	30.0					
	32.0		Rec=99% ROD=80%	NX	FRESH TO SLIGHTLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
E		80	Rec=0% ROD=0%	NX	HIGHLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, SOFT, HIGHLY FRACTURED	
	39.0		Rec=0% ROD=0%	NX		
			Rec=99% ROD=95%	NX	FRESH TO SLIGHTLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	* No Recovery
		70	Rec=99% ROD=95%	NX		
	52.0			NX		
					BORING TERMINATED AT 52.0 FT	

Date	Reading	Depth
1/20/82	Installed	G.S.
1/22/82	2 Day	G.S.

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-3

PROJECT: ASH DISPOSAL, MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC. — DRILL: CME-45

SHEET NO. 1 OF 2
JOB NO.: V81603
ELEVATION: 186.0±
CASING SIZE: 3½"
DATE START: 1/19/82
DATE FINISHED: 1/25/82
DRILLER: R. AYERS
INSPECTOR: G. P. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	-	-	-	-
AFTER CASING PULLED	1/25	4:00	68.0'	74.0'
22 HR. READING	1/25	2:15	69.5'	74.0'

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 186.0±	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					5"± TOPSOIL	
B			3+4+6	S	SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	
	2.0		4+4+5	S	CLAYEY SILT, TRACE FINE SAND, WITH MICA, MOIST - BROWN (ML)	
		180	4+6+8	S	do, SANDY - VARICOLORED	
			7+10+12	S		
			4+7+11	S		
C	14.0	170	4+8+12	S	FINE CLAYEY SILTY SAND, DRY - VARICOLORED (SM)	RESIDUAL
D	19.0		24+46+50	S	DISINTEGRATED ROCK, DRY - VARICOLORED (ML TO SM)	
		160	100/6"	S		
			100/2"	S		
		150	100/2"	S		
			100/1"	S		
			100/0"			
E	44.0	140	REC=86% ROD=66%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANODIORITE GNEISS, HARD TO SOFT, MODERATELY FRACTURED	Casing to 44 ft
	48.0		REC=99% ROD=99%	NX	SLIGHTLY TO MODERATELY WEATHERED, VARICOLORED GRANODIORITE GNEISS, HARD TO MEDIUM HARD, SLIGHTLY FRACTURED	Foliation dips 50 - 70±
	51.0	130	REC=92% ROD=92%	NX	FRESH TO SLIGHTLY WEATHERED, VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
			REC=98% ROD=98%	NX	do, FRESH	
			REC=99% ROD=99%	NX		

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-3
PROJECT: ASH DISPOSAL, MASTER PLAN, VEPCO, BREMO BLUFF, VA.		SHEET NO. 2 OF 2
CLIENT: VEPCO		JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.		ELEVATION: 186.0±

	DEPTH FT.	ELEV.	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
E		120	REC=99% RQD=99%	NX	FRESH TO SLIGHTLY WEATHERED, VARI-COLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
	71.0					
	74.0		REC=75% RQD=70%	NX	SLIGHTLY TO MODERATELY WEATHERED VARI-COLORED GRANODIORITE GNEISS, MEDIUM HARD TO HARD, MODERATELY TO SLIGHTLY FRACTURED	
					BORING TERMINATED AT 74.0 FT	
					Water reading taken 3/31/82, 71 days after drilling - dry	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-4

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45

SHEET NO. 1 OF 2
JOB NO.: V81603
ELEVATION: 258.0±
CASING SIZE: 2½"
DATE START: 1/8/82
DATE FINISHED: 1/8/82
DRILLER: R. AYERS
INSPECTOR: G. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	1/8	1:00	DRY	-
AFTER CASING PULLED	1/8	1:30	DRY	-
___HR. READING				

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140#
FALL	30"

STRATUM	DEPTH FT.	ELEV. 258.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A			2+3+4	S	FLYASH FILL - GRAY	FLYASH FILL
			9+9+10	S		
		250				
			3+4+5	S		
			1+3+4	S		
		240				
			1+2+6	S		
			1+3+5	S		
		230				
			3+4+5	S		
	36.0		4+7+10	S		
B		220			SILTY CLAY, SOME FINE TO MEDIUM SAND, WITH MICA, MOIST - BROWN (CL)	RESIDUAL
	39.0		8+9+12	S	CLAYEY SILT, SOME FINE TO MEDIUM SAND, WITH MICA, MOIST - VARICOLORED (ML)	
			6+9+15	S	FINE SANDY SILT, WITH MICA, DRY - GRAY TO BROWN (ML)	
		210				
			15+21+32	S		
			14+18+22	S		
		200				
	59.0					
D			16+32+50	S	DISINTEGRATED ROCK, DRY - VARICOLORED (ML TO SM)	
			20+49+34	S		

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-4

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA — SHEET NO. 2 OF 2
CLIENT: VEPCO — JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC. — ELEVATION: 258.0±

	DEPTH FT.	ELEV.	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
D		190			DISINTEGRATED ROCK, DRY - VARICOLORED (ML TO SM)	RESIDUAL
	69.5		100/5"	S		
					BORING TERMINATED AT 69.5 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-5

PROJECT: ASH DISPOSAL, MASTER PLAN, VEPCO, BREMO BLUFF, VA.	SHEET NO. 1 OF 1
CLIENT: VEPCO	JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45	ELEVATION: 223.0±

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED	DRIVE SAMPLER		
					TYPE	S.S.	CASING SIZE: 2¼"
ENCOUNTERED	1/26	10:00	DRY	-	DIA.	2" OD	DATE START: 1/26/82
AFTER CASING PULLED	1/26	10:20	DRY	14.7'	WT.	140 #	DATE FINISHED: 1/26/82
__HR. READING	BACKFILLED UPON COMPLETION				FALL	30"	DRILLER: R. AYERS
							INSPECTOR: G. P. ADAMS

STRATUM	DEPTH FT.	ELEV. 223.0±	BLOWS ON SAMPLE SPOON, PER 6	SYMBOL	IDENTIFICATION	REMARKS
					6"± TOPSOIL	
C	1.0		2+4+4	S	FINE SILTY SAND, MOIST - TAN (SM)	Bulk Sample 0-10 ft
	2.0				SILTY CLAY, TRACE FINE SAND, MOIST - BROWN (CL)	
		220	4+4+6	S		
B			4+7+9	S	CLAYEY SILT, SOME FINE SAND, WITH MICA, DRY - VARICOLORED (ML)	
	7.0					
C			6+7+11	S	FINE CLAYEY SILTY SAND, WITH MICA, DRY - VARICOLORED (SM)	RESIDUAL
			8+11+12	S		
		210				
	14.0					
D			15+40+50	S	DISINTEGRATED ROCK, DRY - VARICOLORED (ML TO SM)	
			20+45+54	S		
		200				
			22+30+42	S		
			22+80	S		
		190				
	34.5		100/4"	S		
					BORING TERMINATED AT 34.5 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-6
PROJECT: ASH DISPOSAL, MASTER PLAN, VEPCO, BREMO BLUFF, VA.		SHEET NO. 1 OF 1
CLIENT: VEPCO		JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.	DRILL: CME-45	ELEVATION: 240.0±
		CASING SIZE: 2¼"
		DATE START: 1/26/82
		DATE FINISHED: 1/26/82
		DRILLER: R. AYERS
		INSPECTOR: G. P. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED	DRIVE	SAMPLER
					TYPE	S.S.
ENCOUNTERED	1/26	1:30	DRY	-	DIA.	2" OD
AFTER CASING PULLED	1/26	1:50	DRY	15.5'	WT.	140 #
___HR. READING	BACKFILLED UPON COMPLETION				FALL	30"

STRATUM	DEPTH FT.	ELEV. 240.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					5.5"± TOPSOIL	
C	1.0		5+5+7	S	FINE SILTY SAND, WITH ROOT MATTER, MOIST - GRAY (SM)	Bulk Sample 0-10 ft
			6+8+11	S	SILTY CLAY, SOME FINE SAND, WITH MICA, MOIST - BROWN (CL)	
	5.0		5+8+12	S		
B			4+6+7	S	FINE TO COARSE SANDY CLAYEY SILT WITH MICA, MOIST - REDDISH BROWN (MH)	RESIDUAL
		230	6+8+12	S		
			7+14+13	S		
	19.0					
C		220	7+19+20	S	FINE CLAYEY SILTY SAND, DRY - VARICOLORED (SM)	
	24.0		8+32+30	S	DISINTEGRATED ROCK, DRY - VARICOLORED (ML TO SM)	
D		210	15+32+42	S		
			100/6"	S		
	34.5				BORING TERMINATED AT 34.5 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-7

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.								SHEET NO. 1 OF 1
CLIENT: VEPCO								JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.					DRILL: CME-45			ELEVATION: 209.0±
WATER LEVEL DATA					DRIVE	SAMPLER		CASING SIZE: 2½"
	DATE	TIME	DEPTH	CAVED	TYPE	S.S.		DATE START: 3/30/82
ENCOUNTERED	3/30	2:40	DRY	-	DIA.	2" O.D.		DATE FINISHED: 3/30/82
AFTER CASING PULLED	3/30	3:16	DRY	9.8'	WT.	140 #		DRILLER: R. AYERS
___ HR. READING	BACKFILLED UPON COMPLETION				FALL	30"		INSPECTOR: G. ADAMS

STRATUM	DEPTH FT.	ELEV. 209.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					6"± TOPSOIL	
B			3+4+5	S	SILTY CLAY, TRACE FINE TO MEDIUM SAND, WITH MICA, MOIST - BROWN (CL)	
			5+7+8	S		
	4.0					RESIDUAL
C			5+7+8	S	FINE CLAYEY SILTY SAND WITH MICA, MOIST - VARICOLORED (SM)	
			7+17+14	S	do, WITH ROCK FRAGMENTS	
		200	5+10+10	S		
	14.0					
D			14+25+42	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (ML TO SM)	
		190	17+49+51	S		
			21+45+47	S		
	29.1	180	100/1"	S		
					BORING TERMINATED AT 29.1 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-8

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC.
DRILL: CME-45

SHEET NO. 1 OF 1
JOB NO.: V81603
ELEVATION: 150.0±
CASING SIZE: 3½"
DATE START: 3/29/82
DATE FINISHED: 3/30/82
DRILLER: R. AYERS
INSPECTOR: G. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/29	-	-	-
AFTER CASING PULLED	3/30	12:10	8.0'	29.5'
24 HR. READING	3/31	2:10	22.5'	-

DRIVE SAMPLER	
TYPE	S. S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 150.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
			3+4+5	S	SILTY CLAY, SOME FINE TO MEDIUM SAND, WITH MICA, MOIST - BROWN (CL)	
B	2.0		3+6+8	S	CLAYEY SILT, SOME FINE SAND, WITH MICA, DRY - VARICOLORED (ML)	
C	4.0		6+10+10	S	FINE CLAYEY SILTY SAND WITH MICA, DRY - VARICOLORED (SM)	RESIDUAL
			8+17+19	S	do, WITH DISINTEGRATED ROCK FRAGMENTS	
D	9.0	140	15+29+32	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (SM)	
			100/5"	S		
	19.5	130	100/1"	S		
E			REC=90% RQD=70%	NX	SLIGHTLY TO MODERATELY WEATHERED VARICOLORED GRANODIORITE GNEISS, HARD TO MEDIUM HARD, SLIGHTLY MODERATELY FRACTURED; do, HIGHLY WEATHERED AND FRACTURED	GRANODIORITE UNIT
		120	REC=86% RQD=58%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANODIORITE GNEISS, MEDIUM HARD TO SOFT, MODERATELY TO HIGHLY FRACTURED	
	29.5				BORING TERMINATED AT 29.5 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-9

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.	SHEET NO. 1 OF 1
CLIENT: VEPCO	JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45	ELEVATION: 113.0±

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED	DRIVE	SAMPLER	
					TYPE	S.S.	CASING SIZE: 3½"
ENCOUNTERED	3/29	8:00	6.0'	-	DIA.	2" OD	DATE START: 3/29/82
AFTER CASING PULLED	3/29	1:20	2.0'	21.0'	WT.	140 #	DATE FINISHED: 3/29/82
2 DAY READING	3/31	2:00	1.5'	-	FALL	30"	DRILLER: R. AYERS
							INSPECTOR: G. ADAMS

STRATUM	DEPTH FT.	ELEV. 113.0±	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A1			3+2+3	S	SILTY CLAY, FILL, SOME FINE TO MEDIUM SAND, MOIST - VARICOLORED (CL)	FILL
		110	2+3+3	S	do, WITH FLY ASH	
	3.5					
A			1+1+1	S	FLY ASH, WET - DARK GRAY	FLYASH FILL
	6.0					
C	8.0		1+1+2	S		
			8+12+15	S	FINE TO COARSE SILTY SAND, WITH ROCK FRAGMENTS AND MICA, DRY - VARICOLORED (SM)	RESIDUAL
		100				
	14.0					
D			20+38+30	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (ML TO SM)	
			20+50+50/3"	S		
		90				
			45+55	S		
			25+13+58	S		
		80				
	34.0		100/0"	S		
E			REC=93% RQD=90%	NX	SLIGHTLY TO MODERATELY WEATHERED, VARICOLORED GRANODIORITE GNEISS, HARD TO MEDIUM HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
	39.0		REC=99% RQD=99%	NX	FRESH VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	Packer test 34-39' k=3.4x10^{-6} cm/sec
					BORING TERMINATED AT 39.0 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-10

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC.
DRILL: CME-45

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/25	8:00	12.0'	-
AFTER CASING PULLED	3/25	11:45	12:00	-
___HR. READING	BACKFILLED UPON COMPLETION			

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

SHEET NO. 1 OF 1
JOB NO.: V81603
ELEVATION: 117.0±
CASING SIZE: 3¼"
DATE START: 3/25/82
DATE FINISHED: 3/25/82
DRILLER: R. AYERS
INSPECTOR: A. SAMFORD

STRATUM	DEPTH FT.	ELEV. 117.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
C			2+2+2	S	FINE SILTY CLAYEY SAND, MOIST - BROWN (SC)	
			4+8+14	S	do, WITH ROCK FRAGMENTS	
	4.0					
B		110		\	FINE SANDY SILT WITH ROCK FRAGMENTS AND MICA, MOIST - VARICOLORED (ML)	Tube pressed 12" Recovery = 6"
			4+8+12	S		RESIDUAL
			8+12+38	S		
	14.0		100/0"	S		
D						
	17.0	100				
E			REC=72% RQD=0%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANDORITE GNEISS, MEDIUM HARD TO SOFT, MODERATELY FRACTURED	Packer Test 17-22' k = 2.1 x 10^{-3} cm/sec
	19.5					
			REC=99% RQD=68%	NX	SLIGHTLY TO MODERATELY WEATHERED VARICOLORED GRANDORITE GNEISS, MEDIUM HARD TO HARD, SLIGHTLY TO MODERATELY FRACTURED	Packer test 22-24.5 - packers would not hold
			REC=92% RQD=76%	NX		Packer test 25-28 k = 1.4 x 10^{-5} cm/sec
		90	REC=88% RQD=68%	NX		
			REC=99% RQD=75%	NX		
	32.0					
			REC=72% RQD=20%	NX	MODERATELY TO HIGHLY WEATHERED VARICOLORED GRANDORITE GNEISS, MEDIUM HARD TO SOFT, MODERATELY TO HIGHLY FRACTURED	
	37.0	80				
					BORING TERMINATED AT 37.0 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-11

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC.
DRILL: CME-45

SHEET NO. 1 OF 2
JOB NO.: V81603
ELEVATION: 155.0±
CASING SIZE: 3½"
DATE START: 3/23/82
DATE FINISHED: 3/24/82
DRILLER: R. AYERS
INSPECTOR: A. SANFORD

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/23	2:00	DRY	-
AFTER CASING PULLED	3/24	3:00	DRY	-
8 DAY READING	3/31	-	DRY	-

DRIVE SAMPLER	
TYPE	S. S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 155.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					6.0± TOPSOIL	
B			2+4+5	S	CLAYEY SILT, TRACE FINE SAND, MOIST - BROWN (ML)	
			3+5+7	S	do, WITH MICA	
	4.0					
C		150	4+7+12	S	FINE SILTY CLAYEY SAND, WITH MICA, MOIST - VARICOLORED (SC)	
			6+9+13	S		
			7+12+13	S		
		140	24+22+22	S	do, FINE TO COARSE, SOME SILT WITH ROCK FRAGMENTS	
	18.0					RESIDUAL
B			7+10+11	S	FINE SANDY SILT WITH MICA AND ROCK FRAGMENTS, MOIST - VARICOLORED (ML)	
	23.0					
D		130	100/6"	S		
			62+47/3"	S	DISINTEGRATED ROCK WITH MICA, MOIST - VARICOLORED (SM)	
		120	60+40/3"	S		
	39.0		100/2"	S		
	42.0		100/4"	S		Packer test 44-49' k = 2.4 x 10^{-5} cm/sec
		110				
	49.0		100/0.5"	S		
			REC=44% ROD=20%	NX	MODERATELY WEATHERED VARICOLORED GRANODORITE GNEISS, MEDIUM HARD, SLIGHTLY TO MODERATELY FRACTURED	Packer test 49-54' k = 7.2 x 10^{-5} cm/sec
		100	REC=92% ROD=80%	NX		Foliation dips 70° - 85°±
						GRANODIORITE UNIT
			REC=96% ROD=92%	NX	FRESH TO SLIGHTLY WEATHERED VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-11
PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA		SHEET NO. 2 OF 2
CLIENT: VEPCO		JOB NO.: V81603
BORING CONTRACTOR: AYERS & AYERS, INC.		ELEVATION: 155.0±

	DEPTH FT.	ELEV.	BLOWS ON SAMPLE SPOON PER 6"	SYMBOL	IDENTIFICATION	REMARKS
E	69.0	90	REC=82% RQD=50%	NX	FRESH TO SLIGHTLY WEATHERED VARICOLORED GRANODIORITE GNEISS, VERY HARD TO HARD, SLIGHTLY FRACTURED	GRANODIORITE UNIT
					BORING TERMINATED AT 69.0 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-12

PROJECT ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT VEPCO
BORING CONTRACTOR · AYERS & AYERS, INC.

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/23	10:00	DRY	-
AFTER CASING PULLED	3/23	1:15	DRY	
_-_ HR. READING		-		

DRILL: CME-45	
DRIVE	SAMPLER
TYPE	S. S.
DIA.	2" OD
WT.	140 #
FALL	30"

SHEET NO. 1 OF 1
JOB NO. · V81603
ELEVATION: 201.0±
CASING SIZE: 2½"
DATE START: 3/23/82
DATE FINISHED: 3/23/82
DRILLER: R. AYERS
INSPECTOR: A. SANFORD

STRATUM	DEPTH FT.	ELEV. 201.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					6" TOPSOIL	
		200	2+3+7	S	SILTY CLAY, SOME FINE SAND, MOIST - BROWN (CL)	
			4+6+9	S	do, WITH MICA	
			4+8+11	S		
	6.0					
			3+7+10	S	CLAYEY SILT, TRACE FINE SAND WITH MICA, MOIST - VARICOLORED (ML)	
	9.0		3+7+8	S	FINE SANDY SILT WITH MICA, MOIST - REDDISH BROWN (ML)	
B		190				
			5+7+8	S	do, SILT	RESIDUAL
			12+13+15	S	do, FINE SANDY	
		180				
	22.0					
			13+18+23	S	FINE SILTY SAND WITH MICA MOIST - VARICOLORED (SM)	
C						
	29.0					
			11+23+28	S	SILT, SOME FINE SAND WITH MICA, MOIST - VARICOLORED (ML)	
B		170				
	32.0					
			25+50+50/3"	S	DISINTEGRATED ROCK WITH MICA, MOIST - VARICOLORED (ML)	
D						
			36+70	S		
		160				
			100/6"	S		
					do, (SM)	
	48.0		100/1"	S		
					BORING TERMINATED AT 48.0 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-13

PROJECT ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.								SHEET NO. 1 OF 1
CLIENT VEPCO								JOB NO.: V81603
BORING CONTRACTOR AYERS & AYERS, INC.					DRILL: CME-45			ELEVATION: 117.0±
WATER LEVEL DATA					DRIVE SAMPLER			CASING SIZE: 2¼"
	DATE	TIME	DEPTH	CAVED	TYPE	S.S.		DATE START: 3/31/82
ENCOUNTERED	3/31	11:40	2.0'	-	DIA.	2" OD		DATE FINISHED: 3/31/82
AFTER CASING PULLED	3/31	12:30	1.0'	1.0'	WT.	140 #		DRILLER: R. AYERS
___HR. READING					FALL	30"		INSPECTOR: G. ADAMS

STRATUM	DEPTH FT.	ELEV. 117.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A1			1+1+WOH	S	SILTY CLAY, FILL, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	FILL
	6.0	110				
A			1/18"	S	FLY ASH, WET - DARK GRAY	FLYASH FILL
	12.0					
D	13.2		100/2"	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (SM)	RESIDUAL
					BORING TERMINATED AT 13.2 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-14

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC.

SHEET NO. 1 OF 1	
JOB NO.: V81603	
ELEVATION: 116.0±	
CASING SIZE: 2½"	
DATE START: 3/26/82	
DATE FINISHED: 3/26/82	
DRILLER: R. AYERS	
INSPECTOR: G. SEESE	

DRILL: CME-45

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/26	9:30	1.5'	-
AFTER CASING PULLED	3/26	10:00	1.5'	-
___ HR. READING	BACKFILLED UPON COMPLETION			

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 116.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A1	1.0		1+WOH/12"	S	SILTY CLAY FILL, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	FILL
			1+WOH/12"	S		
A		110	2+1+1	S	FLY ASH, WET - DARK GRAY	FLYASH FILL
			1+WOH/12"	S		
			1+WOH/12"	S		
	12.0					
D		100	32+47+50/3"	S	DISINTEGRATED ROCK WITH MICA - MOIST (ML TO SM)	RESIDUAL
	19.0		100/2"	S		
					BORING TERMINATED AT 19.0 FT	

SCHNABEL ENGINEERING ASSOCIATES
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO.: B-15

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.	SHEET NO. 1 OF 1
CLIENT: VEPCO	JOB NO. V81603
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45	ELEVATION: 248.0±
	CASING SIZE: 2½"
	DATE START: 3/31/82
	DATE FINISHED: 3/31/82
	DRILLER: R. AYERS
	INSPECTOR: G. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/31	2:40	DRY	--
AFTER CASING PULLED	3/31	3:00	DRY	14.8'
___ HR. READING	BACKFILLED UPON COMPLETION			

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 248.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					6"± TOPSOIL	
			4+5+7	S	CLAYEY SILT, SOME FINE TO MEDIUM SAND, MOIST - BROWN (MH)	
	4.0					
B			4+7+14	S	do, TRACE SAND	
	9.0	240				
			4+7+8	S		RESIDUAL
			7+9+12	S	FINE CLAYEY SILTY SAND, WITH MICA, DRY - VARICOLORED (SM)	
		230				
C			6+8+21	S		
			6+12+17	S	do, WITH ROCK FRAGMENTS	
	29.0	220				
D	30.5		30+60+10/1"	S	DISINTEGRATED ROCK WITH MICA, DRY - VARICOLORED (SM TO ML)	
					BORING TERMINATED AT 30.5 FT	

SCHNABEL ENGINEERING ASSOCIATES CONSULTING ENGINEERS	TEST BORING LOG	BORING NO.: B-16

PROJECT ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR AYERS & AYERS, INC. DRILL: CME-45

SHEET NO. 1 OF 1
JOB NO.: V81603
ELEVATION: 215.0±
CASING SIZE: 2½"
DATE START: 3/31/82
DATE FINISHED: 3/31/82
DRILLER: R. AYERS
INSPECTOR: G. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	3/31	8:45	DRY	–
AFTER CASING PULLED	3/31	9:00	DRY	9.8'
5 HR. READING	3/31	3:30	DRY	9.8'

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 215.0±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
					7"± TOPSOIL	
B			3+4+5	S	CLAYEY SILT, SOME FINE TO COARSE SAND, WITH MICA, MOIST - BROWN (ML)	
		210	5+7+8	S	do, SANDY	
	7.0					
C			8+10+12	S	FINE TO MEDIUM SAND, SOME SILT WITH MICA, DRY - VARICOLORED (SM)	RESIDUAL
		200	20+23+25	S	do, WITH ROCK FRAGMENTS	
	19.0					
D			12+49+51	S	DISINTEGRATED ROCK, WITH MICA, DRY - VARICOLORED (ML TO SM)	
		190	15+51+49	S		
	29.5		100/6"	S		
					BORING TERMINATED AT 29.5 FT	

SCHNABEL ENGINEERING ASSOCIATES
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO.: B-17

PROJECT: ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45

SHEET NO. 1 OF 1
JOB NO.: V81603
ELEVATION: 116.3±
CASING SIZE: 2½"
DATE START: 8/23/82
DATE FINISHED: 8/23/82
DRILLER: R. AYERS
INSPECTOR: G. P. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	8/23	8:45	9.0'	-
AFTER CASING PULLED	8/23	9:00	DRY	4.8'
2 HR. READING	8/23	11:00	DRY	4.8'

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 116.3±	BLOWS ON SAMPLE SPOON, PER 6"	SYMBOL	IDENTIFICATION	REMARKS
A			1+1+1	S	FLY ASH FILL, DRY - GRAY	FLYASH FILL
		110	1+2+2	S		
			1+1+1	S	do, WET	
		100	1/18"	S		
			1/18"	S		
A1	24.0	90	1+2+3	S	SILTY CLAY, PROBABLE FILL, SOME FINE SAND WITH ROOT MATTER, MOIST - BROWN (CL)	PROBABLE FILL
B	29.0		3+4+7	S	SILTY CLAY, TRACE FINE SAND WITH ROOT MATTER, MOIST - GRAY (CL)	RESIDUAL
C	34.0	80	3+4+6	S	FINE TO MEDIUM SILTY SAND, WET - GRAY (SM)	
B	37.0				CLAY, TRACE FINE SAND, MOIST - GRAY AND BROWN (CH)	
	39.0		3+4+5	S		
					BORING TERMINATED AT 40.0 FT	

SCHNABEL ENGINEERING ASSOCIATES
CONSULTING ENGINEERS

TEST BORING LOG

BORING NO.: B-18

PROJECT. ASH DISPOSAL MASTER PLAN, VEPCO, BREMO BLUFF, VA.
CLIENT: VEPCO
BORING CONTRACTOR: AYERS & AYERS, INC. DRILL: CME-45

SHEET NO. 1 OF 1
JOB NO.: V81603
ELEVATION: 114.0±
CASING SIZE: 2½"
DATE START: 8/23/82
DATE FINISHED: 8/23/82
DRILLER: R. AYERS
INSPECTOR: G. P. ADAMS

WATER LEVEL DATA	DATE	TIME	DEPTH	CAVED
ENCOUNTERED	8/23	10:10	4.0'	-
AFTER CASING PULLED	8/23	10:25	3.5'	3.5'
2 HR. READING	8/23	11:02	3.5'	3.5'

DRIVE	SAMPLER
TYPE	S.S.
DIA.	2" OD
WT.	140 #
FALL	30"

STRATUM	DEPTH FT.	ELEV. 114.0±	BLOWS ON SAMPLE SPOON, PER 6	SYMBOL	IDENTIFICATION	REMARKS
A			1+1+1	S	FLY ASH FILL, DRY - GRAY	FLYASH FILL
		110				
			1+1/12"	S	do, WET	
			1/18"	S		
		100				
	15.0		1+1+1	S		
B	17.0				CLAYEY SILT, TRACE FINE SAND, WET - GRAY (ML)	RESIDUAL
	20.0		1+2+4	S	SILTY CLAY, TRACE FINE TO MEDIUM SAND, MOIST - BROWN AND GRAY (CL)	
					BORING TERMINATED AT 2.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-11-82 TIME - JOB NO. V81603

FINISHED DATE 1-11-82 TIME - HAND AUGER NO. HA-1

CLIENT VEPCO SITE Bremo Bluff, Va.

SURFACE ELEVATION 238± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	STRATA	DESCRIPTION OF SOIL	REMARK
		3"± TOPSOIL	
0.5	C	FINE TO MEDIUM SILTY SAND, WITH ROOT MATTER, MOIST - TAN (SM)	
		SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	
2.3		do, SANDY WITH MICA	RESIDU
	B	CLAYEY SILT, SOME FINE SAND, WITH MICA, MOIST - VARI-COLORED (ML)	
5.0		do, FINE SANDY	
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-11-82 TIME - JOB NO. V81603

FINISHED DATE 1-11-82 TIME - HAND AUGER NO. HA-2

CLIENT VEPCO SITE Bremo Bluff, Virginia

SURFACE ELEVATION 195± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	SAMPLE DEPTH	DESCRIPTION OF SOIL	REMARKS
		4"± TOPSOIL	
0.5	C	FINE TO MEDIUM SAND, TRACE SILTY CLAY, WITH ROOT MATTER, MOIST - TAN (SC)	
		SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	
2.5	B	CLAYEY SILT, SOME FINE SAND, WITH MICA, MOIST - VARICOLORED (ML)	
5.0		do	
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-11-82 TIME - JOB NO. V81603

FINISHED DATE 1-11-82 TIME - HAND AUGER NO. HA-3

CLIENT VEPCO SITE Bremo Bluff, Va.

SURFACE ELEVATION 205± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	STRATA	DESCRIPTION OF SOIL	REMARKS
		4"± TOPSOIL	
0.3	C	FINE TO MEDIUM SILTY SAND, WITH ROOT MATTER, MOIST - TAN (SM)	
	B	SILTY CLAY, TRACE FINE SAND, MOIST - BROWN (CL)	
		do, FINE TO MEDIUM, SANDY	
2.2		CLAYEY SILT, SOME FINE SAND, WITH MICA, MOIST - VARICOLORED (ML)	RESIDUA
3.5	C	FINE TO MEDIUM CLAYEY SILTY SAND, WITH MICA, MOIST - VARICOLORED (SM)	
5.0			
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-12-82 TIME - JOB NO. V81603

FINISHED DATE 1-12-82 TIME - HAND AUGER NO. HA-4

CLIENT VEPCO SITE Bremo Bluff, Va.

SURFACE ELEVATION 235± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	STRATA	DESCRIPTION OF SOIL	REMARKS
		4.5"± TOPSOIL	
0.5	C	FINE TO MEDIUM SILTY SAND, MOIST - TAN (SM)	
2.5	B	SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	RESIDUAL
4.5		CLAYEY SILT, SOME FINE SAND, WITH MICA MOIST - VARICOLORED (ML)	
5.0	C	FINE TO MEDIUM SAND, SOME CLAYEY SILT, MOIST - VARICOLORED (SM)	
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-22-82 TIME - JOB NO. V81603

FINISHED DATE 1-22-82 TIME - HAND AUGER NO. HA-5

CLIENT VEPCO SITE Bremo Bluff, Va.

SURFACE ELEVATION 165± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	STRATA	DESCRIPTION OF SOIL 5"± TOPSOIL	REMARKS
0.5	C	FINE SILTY SAND WITH ROOT MATTER, MOIST - TAN (SM)	
		SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST - BROWN (CL)	RESIDUAL
2.5	B	do, SANDY, WITH MICA	
		CLAYEY SILT, SOME FINE SAND, WITH MICA, MOIST - VARICOLORED (ML)	
		do, FINE TO MEDIUM SANDY	
4.2			
5.0	C	FINE SAND, SOME SILTY CLAY, WITH MICA, MOIST - VARICOLORED (SM)	
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 1-12-82 TIME - JOB NO. V81603

FINISHED DATE 1-12-82 TIME - HAND AUGER NO. HA-6

CLIENT VEPCO SITE Bremo Bluff, Va.

SURFACE ELEVATION 165± EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION None INSPECTOR G. P. Adams

DEPTH	STRATA	DESCRIPTION OF SOIL	REMARKS
		5"± TOPSOIL	
0.5	C	FINE TO MEDIUM SAND, SOME CLAYEY SILT, WITH ROOT MATTER, MOIST - TAN (SM)	
	B	SILTY CLAY, TRACE FINE SAND, MOIST - BROWN (CL) do, FINE TO MEDIUM, SANDY, WITH MICA	RESIDUAL
2.8			
		CLAYEY SILT, SOME FINE SAND, WITH MICA, MOIST - VARICOLORED (ML)	
4.0			
	C	FINE SAND, SOME CLAYEY SILT, WITH MICA, MOIST - VARICOLORED (SM)	
5.0			
		HAND AUGER TERMINATED AT 5.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 3-31-82 TIME 4:10 JOB NO. V81603

FINISHED DATE 3-31-82 TIME 4:30 HAND AUGER NO. HA-7

CLIENT VEPCO SITE Bremo Bluff, Virginia

SURFACE ELEVATION 220 EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION Dry INSPECTOR G. Adams

DEPTH	STRATA	6.5± TOPSOIL DESCRIPTION OF SOIL	REMARKS
4.0	B	SILTY CLAY, TRACE FINE SAND, MOIST - BROWN (CL)	
6.0		CLAYEY SILT, SOME FINE TO MEDIUM SAND WITH MICA, MOIST - VARICOLORED (ML)	
7.0	C	FINE CLAYEY SILTY SAND, DRY - VARICOLORED (SM)	
		HAND AUGER TERMINATED AT 7.0 FT	

HAND AUGER LOG

SCHNABEL ENGINEERING ASSOCIATES

STARTED DATE 3-23-82 TIME ______ JOB NO. V81603

FINISHED DATE 3-23-82 TIME ______ HAND AUGER NO. HA-8

CLIENT VEPCO

SITE Bremo Bluff, Virginia

SURFACE ELEVATION 200

EXCAVATOR -

EQUIPMENT Hand Auger

WATER ELEVATION Dry

INSPECTOR A. Samford

DEPTH	STRATA	DESCRIPTION OF SOIL	REMARKS
		7"± TOPSOIL	
.5	C	FINE TO MEDIUM SILTY SAND, WITH GRAVEL AND COBBLES, MOIST - BROWN (SM)	
1.0	B	FINE TO MEDIUM SANDY CLAYEY SILT, MOIST - REDDISH BROWN (ML)	
4.0	C	FINE TO MEDIUM SILTY SAND WITH MICA, MOIST - VARICOLORED (SM)	RESIDUAL
7.0	B	SILT, SOME FINE SAND, WITH MICA, MOIST - VARICOLORED (ML)	
9.0		do, SANDY	
		HAND AUGER TERMINATED AT 9.0 FT	

G:\2009 Projects\09130163 Dominion Ash Pond Slope Stability Evaluation\CAD\DRAWINGS\00-BASE_DRAWINGS\EXISTING\Bremo\GF_overlay_bremo.dwg, Layout1, 11/30/2009 1:53:31 PM, rmattingly, Adobe PDF.pc3, ANSI expand B (11.00 x 17.00 Inches), 1:1

1 WEST ASH POND
Scale: N.T.S.

NOTE:
BASE PLAN PREPARED BY VIRGINIA POWER AND ELECTRIC COMPANY.

LEGEND:
⌖ APPROXIMATE TEST BORE OR HAND AUGER LOCATION

Schnabel Engineering	WEST ASH POND SLOPE STABILITY EVALUATION	TEST BORING AND HAND AUGER LOCATION PLAN
	BREMO POWER STATION BREMO BLUFF, VA	FIGURE A1

Schnabel ENGINEERING | **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-1A**
Contract Number: 09130163.00.03
Sheet: 1 of 2

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/24/09 **Finished:** 9/24/09

North: 37.710491 ft **East:** 78.294061 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 43.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ∇	9/24	9:33 AM	23.0'	---	---
Completion ▼	9/24	10:04 AM	23.5'	---	---
Temporary Well ▼	9/24	3:31 PM	18.0'	---	---
Temporary Well ▼	9/28	12:08 PM	16.8'	---	---
Temporary Well ▼	9/29	4:04 PM	17.0'	---	---
Temporary Well ▼	10/16	2:00 PM	17.0'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Crushed stone		111.7			S-1, SPT 8+6+6+8 REC=20", 83%	PP >4.50 tsf	0.0 - 22.0 ft: FILL 0.1 ft: flush mount cover installed over temporary well
	FILL, sampled as lean clay; moist, brown and light grayish brown, estimated <5% sand, contains mica Change: brown and dark grayish brown, contains organics Change: dark grayish brown	FILL				S-2, SPT 4+5+5+7 REC=24", 100%	PP >4.50 tsf	
4.0	FILL, sampled as fat clay; moist, dark gray and dark grayish brown, estimated <5% sand, contains mica, wood fragments	FILL	108.0		5	S-3, SPT 9+8+9+9 REC=21", 88%	PP >4.50 tsf	
5.5	FILL, sampled as lean clay; moist, brown, estimated <5% sand, contains mica Change: brown and grayish brown, contains rock fragments Change: brown and dark grayish brown	FILL	106.5	A		S-4, SPT 5+7+9+8 REC=15", 63%	PP = 3.50 tsf LL = 43 PL = 23 MC = 20.0% % Passing #200 = 89.1	
					10	S-5, SPT 2+5+6+7 REC=16", 67%	PP = 3.50 tsf	
					15	S-6, SPT 4+5+7+8 REC=18", 75%	PP = 3.50 tsf	
	Change: grayish brown and brown Change: brown and grayish brown				20	S-7, SPT 5+7+9+9 REC=20", 83%	PP = 4.50 tsf PP = 2.75 tsf	
22.0	SANDY LEAN CLAY; wet, brown, contains mica	CL	90.0	B1		S-8, SPT 2+1+2+4 REC=19", 79%	PP <0.25 tsf	22.0 - 37.0 ft: ALLUVIUM
24.5	LEAN CLAY WITH SAND; moist, brown,	CL	87.5					

(continued)

Schnabel Engineering TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: B-1A Contract Number: 09130163.00.03 Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	contains mica	CL					PP = 2.50 tsf	22.0 - 37.0 ft: ALLUVIUM *(continued)*
27.0	FAT CLAY; moist, brown, estimated <5% sand, contains mica	CH	85.0	B1	30	S-9, SPT 2+3+4+4 REC=24", 100%	PP = 0.75 tsf	
32.0	LEAN CLAY; moist, brown and light brown, estimated <5% sand, contains mica	CL	80.0		35	S-10, SPT 2+3+3+3 REC=24", 100%	LL = 40 PL = 22 MC = 28.0% % Passing #200 = 87.5 PP = 1.25 tsf	
37.0	DISINTEGRATED ROCK, sampled as silty sand, fine to coarse grained sand; moist, dark gray, estimated 30 - 45% mica	DR	75.0	C	40	S-11, SPT 42+58/2" REC=8", 100%		37.0 - 42.9 ft: RESIDUAL SCHIST 37.1 - 38.0 ft: slight auger chatter
42.0	DISINTEGRATED ROCK, sampled as silty sand with gravel, fine to coarse grained sand; moist, dark gray, estimated 15 - 25% rock fragments, contains mica	DR	70.0					
43.0			69.0			S-12, SPT 100/1" REC=1", 100%		42.5 - 42.9 ft: strong auger chatter 43.0 ft: sampler refusal

Bottom of Boring at 43.0 ft.
Auger refusal at 42.9 ft.
Temporary well installed upon completion.
Sampler refusal at 43 ft.

Schnabel Engineering TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: **B-2A** Contract Number: 09130163.00.03 Sheet: 1 of 2

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/24/09 **Finished:** 9/24/09

North: 37.711467 ft **East:** 78.291061 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 38.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/24	12:38 PM	Dry	---	---
Completion ▽	9/24	12:54 PM	37.9'	---	---
Casing Pulled ▽	9/24	1:04 PM	35.5'	---	37.0'
After Drilling ▽	9/25	10:20 AM	35.5'	---	36.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Crushed stone		111.7	A		S-1, SPT 7+7+8+6 REC=14", 58%	PP >4.50 tsf	0.0 - 19.0 ft: FILL
	FILL, sampled as lean clay; moist, brown and light brown, estimated <5% sand, contains mica Change: contains roots	FILL				S-2, SPT 4+4+5+6 REC=15", 63%	PP = 2.75 tsf	
4.0	FILL, sampled as fat clay; moist, brown and light grayish brown, estimated <5% sand, contains mica	FILL	108.0		5	S-3, SPT 4+5+6+6 REC=20", 83%	PP = 4.50 tsf	
	Change: brown and grayish brown					S-4, SPT 4+6+7+9 REC=22", 92%	MC = 23.0% PP = 2.00 tsf	
					10	S-5, SPT 3+5+7+7 REC=24", 100%	PP >4.50 tsf	
					15	S-6, SPT 2+5+6+6 REC=15", 63%	PP = 2.75 tsf	
	Change: brown and light grayish brown Change: brown and dark grayish brown					S-7, SPT 3+4+6+6 REC=24", 100%	PP = 3.50 tsf	
19.0	LEAN CLAY; moist, dark brown and dark grayish brown, estimated <5% sand, contains organics, mica	CL	93.0		20		PP >4.50 tsf	19.0 - 38.0 ft: ALLUVIUM
22.0	FAT CLAY; moist, brown and light gray, estimated <5% sand, contains mica	CH	90.0	B1		S-8, SPT 3+5+8+7 REC=24", 100%	MC = 23.2% PP = 3.50 tsf	

(continued)

Schnabel Engineering TEST BORING LOG	**Project:** Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	**Boring Number:** **B-2A** **Contract Number:** 09130163.00.03 **Sheet:** 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		CH						19.0 - 38.0 ft: ALLUVIUM *(continued)*
27.0	LEAN CLAY; moist, brown and light brown, estimated <5% sand, contains mica	CL	85.0	B1	30	S-9, SPT 4+6+9+9 REC=24", 100%	PP = 3.00 tsf	
32.0	FAT CLAY; moist, brown and light grayish brown, estimated <5% sand, contains mica	CH	80.0		35	S-10, SPT 3+6+7+9 REC=24", 100%	PP = 2.75 tsf	37.5 ft: driller states drilling resistance increased below depth of 37.5 ft
38.0			74.0			S-11, SPT 100/0" REC=0"		38.0 ft: sampler refusal

Bottom of Boring at 38.0 ft.
Auger refusal at 38.0 ft.
Boring backfilled with cement-bentonite grout upon completion.

Schnabel ENGINEERING — TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: B-2A1 Contract Number: 09130163.00.03 Sheet: 1 of 1

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 3-3/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/24/09 **Finished:** 9/24/09

North: 37.711456 ft **East:** 78.291058 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 25.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/24	2:06 PM	Dry	---	---
Completion	9/24	2:07 PM	Dry	---	---
Casing Pulled	9/24	2:11 PM	Dry	---	25.2'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Auger probe to 8 ft; see B-2A for material description							
8.0	No sample recovered		104.0	A		UD-1, UNDIST REC=0", 0% UD-2, UNDIST REC=0", 0%		8.0 - 12.0 ft: FILL
12.0	Auger probe to 23 ft; see B-2A for material description		100.0					
23.0	FAT CLAY; moist, brown and light gray, estimated <5% sand, contains mica	CH	89.0	B1		UD-3, UNDIST REC=13.5", 56%	PP = 3.75 tsf	23.0 - 25.0 ft: ALLUVIUM
25.0			87.0		25			

Bottom of Boring at 25.0 ft.
Offset about 3 ft south of B-2A along crest.
No noticeable change in ground surface elevation.
Boring backfilled with cement-bentonite grout upon completion.

Schnabel Engineering TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: **B-2A2** Contract Number: 09130163.00.03 Sheet: 1 of 1

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 3-3/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/24/09 **Finished:** 9/24/09

North: 37.711439 ft **East:** 78.291047 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 4.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/24	2:46 PM	Dry	---	---
Completion	9/24	2:46 PM	Dry	---	---
Casing Pulled	9/24	2:46 PM	---	---	4.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Auger probe to 2 ft; see B-2A for material description							
2.0	FILL, sampled as lean clay; moist, brown and light brown, estimated <5% sand, contains mica	FILL	110.0	A		UD-1, UNDIST REC=22.5", 94%	PP >4.50 tsf	2.0 - 4.0 ft: FILL
4.0			108.0					

Bottom of Boring at 4.0 ft.
Offset about 6 ft south of B-2A along crest.
No noticeable change in ground surface elevation.
Boring backfilled with cement-bentonite grout upon completion.

Schnabel ENGINEERING **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-2B**
Contract Number: 09130163.00.03
Sheet: 1 of 1

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia
Contractor Foreman: K. Dodson
Schnabel Representative: K. Megginson
Equipment: CME-55 (Track)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)
Dates Started: 9/25/09 **Finished:** 9/25/09
North: 37.711456 ft **East:** 78.290833 ft

Ground Surface Elevation: 90± (ft) **Total Depth:** 16.5 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/25	1:42 PM	13.0'	---	---
Completion	9/25	1:53 PM	---	---	---
Casing Pulled	9/25	1:57 PM	Dry	---	14.8'
After Drilling ▼	9/28	8:32 AM	12.3'	13.0'	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.1	Rootmat and topsoil		89.9	A		S-1, SPT 8+7+8+7 REC=13", 54%	PP = 2.50 tsf	0.0 - 6.5 ft: FILL
	FILL, sampled as silt with sand; moist, brown, contains roots	FILL						
2.0	FILL, sampled as fat clay; moist, brown and light brown, estimated <5% sand, contains mica	FILL	88.0			S-2, SPT 3+4+7+7 REC=16", 67%	PP >4.50 tsf	
					5	S-3, SPT 8+10+13+13 REC=20", 83%	PP >4.50 tsf	
						S-4, SPT 4+7+7+7 REC=24", 100%	PP >4.50 tsf PP = 3.00 tsf	
6.5	SANDY LEAN CLAY; moist, brown, contains mica	CL	83.5	B1				6.5 - 16.0 ft: ALLUVIUM
8.0	ELASTIC SILT; moist, brown, estimated 5 - 10% sand, contains mica	MH	82.0			S-5, SPT 2+4+5+4 REC=20", 83%	MC = 19.2% PP = 1.75 tsf	
					10			
12.0	FAT CLAY; moist, brown and light brown, estimated <5% sand, contains mica	CH	78.0			S-6, SPT 2+3+5+5 REC=24", 100%	PP = 2.50 tsf	
					15			
16.0	DISINTEGRATED ROCK, sampled as poorly graded gravel; moist, light pinkish brown, estimated <5% silt	DR	74.0	C		S-7, SPT 100/6" REC=2", 33%		16.0 - 16.5 ft: RESIDUAL
16.5			73.5					

Bottom of Boring at 16.5 ft.
Auger refusal at 16.0 ft.
Boring backfilled with cement-benonite grout on 9/28/09.

Schnabel ENGINEERING **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-3A**
Contract Number: 09130163.00.03
Sheet: 1 of 2

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia
Contractor Foreman: K. Dodson
Schnabel Representative: K. Megginson
Equipment: CME-55 (Track)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)
Dates Started: 9/23/09 **Finished:** 9/23/09
North: 37.711933 ft **East:** 78.293722 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 48.4 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/23	10:59 AM	33.0'	---	---
Completion ▼	9/23	11:38 AM	48.0'	---	---
Casing Pulled	9/23	12:01 PM	Dry	---	43.0'
After Drilling ▽	9/23	3:08 PM	21.7'	---	35.0'
After Drilling ▽	9/24	7:58 AM	19.0'	---	32.3'
After Drilling ▽	9/24	3:45 PM	18.8'	---	32.1'
After Drilling ▽	9/25	10:25 AM	19.0'	---	32.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.4	Crushed stone		111.6	A		S-1, SPT 13+10+11+10 REC=24", 100%	PP >4.50 tsf	0.0 - 14.0 ft: FILL
	FILL, sampled as fat clay; moist, brown and dark brown, estimated <5% sand, contains mica	FILL				S-2, SS 4+7+8+8 REC=18", 75%	MC = 19.0% PP >4.50 tsf	
	Change: brown and grayish brown				5	S-3, SS 5+5+7+8 REC=20", 83%	PP >4.50 tsf	
	Change: brown and dark brown					S-4, SS 3+4+6+5 REC=16", 67%	PP = 2.50 tsf	
8.0	FILL, sampled as lean clay; moist, brown and dark brown, estimated <5% sand, contains mica	FILL	104.0		10	S-5, SS 2+4+4+6 REC=17", 71%	MC = 23.0% PP = 3.75 tsf	
	Change: brown and grayish brown					S-6, SS 3+3+3+5 REC=20", 83%	PP = 1.25 tsf	
14.0	FAT CLAY; moist, dark grayish brown and brown, estimated <5% sand, contains roots, wood	CH	98.0	B1	15		PP = 1.75 tsf	14.0 - 42.0 ft: ALLUVIUM
17.0	LEAN CLAY; moist, dark grayish brown, estimated <5% sand, contains organics, mica	CL	95.0			S-7, SS 3+4+5+5 REC=24", 100%	PP >4.50 tsf	
19.0	LEAN CLAY; moist, brown, estimated <5% sand, contains mica	CL	93.0		20		PP = 2.25 tsf	
22.0	FAT CLAY; moist, dark yellowish brown with mottles of gray, estimated <5% sand, contains organics, mica	CH	90.0			S-8, SS 1+6+6+8 REC=24", 100%	PP = 2.75 tsf	

(continued)

Schnabel ENGINEERING TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: B-3A Contract Number: 09130163.00.03 Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
		CH						14.0 - 42.0 ft: ALLUVIUM *(continued)*
27.0	SANDY LEAN CLAY; moist, dark orangish brown with mottles of gray, estimated <5% fine gravel, contains rock fragments, mica	CL	85.0	B1	30	S-9, SPT 3+5+4+5 REC=24", 100%	PP = 3.00 tsf	
32.0	SILTY SAND, fine to medium grained sand; wet, dark orangish brown and grayish brown, contains mica	SM	80.0	B2	35	S-10, SPT 2+3+3+5 REC=24", 100%		
36.0	SILTY GRAVEL WITH SAND; wet, brown and gray	GM	76.0			S-11, SPT 30+27+20+18 REC=20", 83%		36.0 - 38.0 ft: Auger chatter
39.0	SANDY LEAN CLAY WITH GRAVEL; wet, brown and gray, contains mica	CL	73.0	B1	40			
42.0	DISINTEGRATED ROCK, sampled as sandy silt; moist, brown and grayish brown, contains mica	DR	70.0	C	45	S-12, SPT 43+52/2" REC=8", 100%		42.0 - 48.4 ft: RESIDUAL SCHIST 44.0 - 48.0 ft: Auger chatter
48.4			63.6			S-13, SPT 100/5" REC=4", 80%	PP >4.50 tsf	

Bottom of Boring at 48.4 ft.
Boring backfilled with cement-bentonite grout on 9/28/09.

Schnabel ENGINEERING TEST BORING LOG

Project:	Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia
Boring Number:	**B-3A1**
Contract Number:	09130163.00.03
Sheet:	1 of 2

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 3-3/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/28/09 **Finished:** 9/28/09

North: 37.711935 ft **East:** 78.293705 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 27.0 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered	9/28	10:56 AM	---	---	---
Completion	9/28	10:56 AM	---	---	---
Casing Pulled	9/28	11:16 AM	---	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
	Auger probe to 6 ft; see B-3A for material description				5			
6.0	FILL, sampled as lean clay; moist, brown and dark brown, estimated <5% sand, contains mica	FILL	106.0	A		UD-1, UNDIST REC=20", 83%	PP = 3.00 tsf	6.0 - 8.0 ft: FILL
8.0	Auger probe to 23 ft; see B-3A for material description		104.0		10, 15, 20			
23.0	No sample recovered		89.0	B1		UD-2, UNDIST REC=0", 0%		

(continued)

TEST BORING LOG 09130163.00.03_BREMO LOGS.GPJ SCHNABEL DATA TEMPLATE 2008_07_06.GDT 2/5/10

Schnabel Engineering TEST BORING LOG	Project: Dominion Ash Pond Slope Evaluation Bremo Power Station Fluvanna County, Virginia	Boring Number: B-3A1 Contract Number: 09130163.00.03 Sheet: 2 of 2

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
25.0 – 27.0	SANDY SILTY CLAY; moist, dark yellowish brown with mottles of gray, estimated 5 - 10% sand, contains mica	CL-ML	87.0 – 85.0	B1		UD-3, UNDIST REC=27", 113%	PP = 3.50 tsf	25.0 - 27.0 ft: ALLUVIUM

Bottom of Boring at 27.0 ft.
Offset about 5 ft east of B-3A.
No noticeable change in ground surface elevation.
Boring backfilled with cement-bentonite grout on 9/28/09.

Schnabel ENGINEERING — **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: B-3B
Contract Number: 09130163.00.03
Sheet: 1 of 1

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia
Contractor Foreman: K. Dodson
Schnabel Representative: K. Megginson
Equipment: CME-55 (Track)
Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)
Dates Started: 9/25/09 **Finished:** 9/25/09
North: 37.712128 ft **East:** 78.293739 ft

Ground Surface Elevation: 97± (ft) **Total Depth:** 24.2 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/25	12:15 PM	6.0'	---	---
Encountered ▽	9/25	12:42 PM	23.0'	---	---
Completion ▼	9/25	12:43 PM	20.0'	---	---
Casing Pulled ▼	9/25	12:50 PM	18.5'	---	20.0'
After Drilling ▼	9/28	8:39 AM	2.9'	---	15.8'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.2	Rootmat and topsoil		96.8			S-1, SPT 3+4+4+4 REC=24", 100%	PP >4.50 tsf	0.0 - 2.0 ft: FILL
2.0	FILL, sampled as lean clay; moist, reddish brown, estimated <5% sand, contains roots	FILL	95.0	A				
6.0	LEAN CLAY; moist, brown and dark grayish brown, estimated <5% sand, contains organics Change: brown and light brown	CL	91.0	B1	5	S-2, SPT 2+1+2+3 REC=18", 75% S-3, SPT 2+2+2+2 REC=24", 100%	LL = 48 PL = 27 MC = 38.3% % Passing #200 = 90.8 PP = 0.50 tsf PP = 1.75 tsf	2.0 - 23.0 ft: ALLUVIUM
8.0	FAT CLAY; wet, brown and light brown, estimated <5% sand, contains rock fragments	CH	89.0			S-4, SPT 3+5+7+8 REC=0.7", 3%	PP <0.25 tsf	
12.0	ELASTIC SILT WITH SAND; moist, brown and light gray, contains mica, rock fragments	MH	85.0		10	S-5, SPT 2+4+6+8 REC=24", 100%	PP = 2.75 tsf	
17.0	SANDY ELASTIC SILT; moist, brown, contains mica	MH	80.0		15	S-6, SPT 3+3+4+5 REC=24", 100%	PP = 0.75 tsf	
21.0	ELASTIC SILT; moist, brown and gray, estimated 5 - 10% sand, contains mica	MH	76.0		20	S-7, SPT 2+2+4+3 REC=24", 100%	PP = 0.75 tsf	
23.0	SILTY GRAVEL; wet, brown and gray	GM	74.0	B2				21.0 - 23.0 ft: Auger chatter
24.2	DISINTEGRATED ROCK, sampled as sandy silt; wet, brownish gray and orangish brown, estimated 30 - 45% mica	DR	72.8	C		S-8, SPT 15+53+47/3" REC=16", 107%		23.0 - 24.2 ft: RESIDUAL SCHIST

Bottom of Boring at 24.2 ft.
Boring backfilled with cement-bentonite grout on 9/28/09.

Schnabel ENGINEERING | **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-4A**
Contract Number: 09130163.00.03

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 3-3/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/23/09 **Finished:** 9/23/09

North: 37.711191 ft **East:** 78.295486 ft

Ground Surface Elevation: 112± (ft) **Total Depth:** 40.5 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/23	2:26 PM	33.0'	---	---
Completion ▼	9/23	2:34 PM	39.5'	---	---
Casing Pulled ▼	9/23	3:00 PM	38.0'	---	---
After Drilling ▽	9/23	3:15 PM	30.3'	---	36.7'
After Drilling ▽	9/24	8:15 AM	21.0'	---	28.1'
After Drilling ▽	9/24	3:39 PM	20.4'	---	27.5'
After Drilling ▽	9/25	10:21 AM	21.0'	---	29.0'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.5	Crushed stone		111.5			S-1, SPT 10+8+9+8 REC=24", 100%	PP >4.50 tsf	0.0 - 22.0 ft: FILL
	FILL, sampled as fat clay; moist, brown and light brown, estimated <5% sand, contains roots, mica	FILL				S-2, SPT 4+7+9+9 REC=16", 67%	MC = 18.3% PP >4.50 tsf	
4.0	FILL, sampled as lean clay; moist, brown and grayish brown, estimated <5% sand, contains mica, and rock fragments	FILL	108.0		5	UD-1, UNDIST REC=8", 33%	PP >4.50 tsf	
						S-3, SPT 3+3+6+6 REC=24", 100%	LL = 43 PL = 23 MC = 21.1% % Passing #200 = 91.3 PP = 3.75 tsf	
					10	S-4, SPT 2+4+5+5 REC=16", 67%		
				A				
12.0	FILL, sampled as fat clay; moist, brown and light brown, estimated <5% sand, contains mica	FILL	100.0					
					15	S-5, SPT 3+4+6+7 REC=24", 100%	PP = 3.50 tsf	
	Change: brown and dark grayish brown				20	S-6, SPT 2+4+6+8 REC=20", 83%	PP = 2.50 tsf	
22.0	CLAYEY SAND, fine grained sand; moist, brown, contains mica	SC	90.0	B2		S-7, SPT 3+4+4+5 REC=24", 100%	PP = 1.25 tsf	22.0 - 37.0 ft: ALLUVIUM

(continued)

Schnabel ENGINEERING — **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-4A**
Contract Number: 09130163.00.03

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
25.0	SANDY LEAN CLAY; moist, brown and grayish brown, contains mica	CL	87.0	B2		UD-2, UNDIST REC=28", 117%	PP = 1.50 tsf	22.0 - 37.0 ft: ALLUVIUM *(continued)*
27.0	LEAN CLAY; moist, brown and light grayish brown, estimated <5% sand, contains mica	CL	85.0			S-8, SPT 3+6+6+9 REC=24", 100%	PP = 3.25 tsf	
					30			
	Change: wet					S-9, SPT WOH+2+2+2 REC=24", 100%	PP = 1.00 tsf	
					35			
37.0	DISINTEGRATED ROCK, sampled as poorly graded gravel with sand; moist, dark gray, estimated <5% silt, estimated 50 - 100% rock fragments	DR	75.0	C		S-10, SPT 14+100/2" REC=6", 75%		37.0 - 40.5 ft: RESIDUAL SCHIST
					40			
40.5			71.5			S-11, SPT 100/0" REC=1"		40.5 ft: Sampler refusal

Bottom of Boring at 40.5 ft.
Auger refusal at 40.5 ft.
Boring backfilled with cement-bentonite grout on 9/28/09.

Schnabel ENGINEERING **TEST BORING LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Boring Number: **B-4B**
Contract Number: 09130163.00.03
Sheet: 1 of 1

Contractor: Fishburne Drilling, Inc.
Ashland, Virginia

Contractor Foreman: K. Dodson

Schnabel Representative: K. Megginson

Equipment: CME-55 (Track)

Method: 2-1/4" I.D. Hollow Stem Auger

Hammer Type: Auto Hammer (140 lb)

Dates Started: 9/28/09 **Finished:** 9/28/09

North: 37.711769 ft **East:** 78.295442 ft

Ground Surface Elevation: 92± (ft) **Total Depth:** 18.5 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/28	1:12 PM	8.0'	---	---
Completion ▼	9/28	1:12 PM	17.5'	---	---
Casing Pulled ▼	9/28	1:18 PM	17.0'	---	18.4'

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.3	Rootmat and topsoil		91.7			S-1, SPT 1+2+1+2 REC=19", 79%	PP = 0.25 tsf	0.0 - 2.0 ft: FILL 0.5 ft: Observed pooled water at ground sutface
	FILL, sampled as elastic silt with sand; moist, reddish brown, contains roots	FILL		A				
2.0	ELASTIC SILT; moist, brown and grayish brown, estimated <5% sand	MH	90.0			S-2, SPT 1+1+2+2 REC=24", 100%	PP = 0.25 tsf	2.0 - 17.8 ft: ALLUVIUM
3.0	LEAN CLAY; moist, dark gray and reddish brown, estimated <5% sand, contains mica	CL	89.0				PP = 1.75 tsf	
4.0	FAT CLAY; moist, dark gray and brown, estimated <5% sand, contains mica, organics	CH	88.0		5	S-3, SPT 1+1+3+3 REC=17", 71%	PP = 1.25 tsf	
6.0	LEAN CLAY WITH SAND; moist, brown and gray, contains mica	CL	86.0	B1		S-4, SPT 1+2+2+2 REC=24", 100%	LL = 47 PL = 27 MC = 34.1% % Passing #200 = 84.5 PP = 1.25 tsf	
	Change: wet, gray and brown					S-5, SPT 1+1+2+2 REC=16", 67%	PP = 0.25 tsf	
	Change: moist, gray with mottles of brown				10			
					15	S-6, SPT 2+2+3+2 REC=24", 100%	PP = 0.25 tsf	
17.8	DISINTEGRATED ROCK, sampled as poorly graded gravel; moist, black, estimated <5% silt, estimated 50 - 100% rock fragments	DR	74.2	C		S-7, SPT 100/3"		17.8 - 18.5 ft: RESIDUAL SCHIST 17.8 - 18.0 ft: Auger chatter
18.5			73.5			S-8, SPT 100/0"		18.5 ft: Sampler refusal at 18.5 ft

Bottom of Boring at 18.5 ft.
Auger refusal at 18.5 ft.
Boring backfilled with cement-bentonite grout upon completion.

Schnabel ENGINEERING — **HAND AUGER LOG**

Project: Dominion Ash Pond Slope Evaluation
Bremo Power Station
Fluvanna County, Virginia

Hand Auger Number: **HA-1B**
Contract Number: 09130163.00.03
Sheet: 1 of 1

Contractor: Not Applicable

Contractor Foreman: Not Applicable

Schnabel Representative: K. Megginson

Equipment:

Method: 3" O.D. Hand Auger

Dates Started: 9/29/09 **Finished:** 9/29/09

North: 37.710386 ft **East:** 78.293953 ft

Ground Surface Elevation: 95± (ft) **Total Depth:** 10.1 ft

Groundwater Observations

	Date	Time	Depth	Casing	Caved
Encountered ▽	9/29	2:09 PM	4.7'	---	---
Completion ▼	9/29	3:15 PM	4.4'	---	---
Temporary Well	9/29	3:15 PM	---	---	---
Temporary Well ▼	10/16	2:15 PM	3.5'	---	---

DEPTH (ft)	MATERIAL DESCRIPTION	SYMBOL	ELEV (ft)	STRATUM	SAMPLING DEPTH	SAMPLING DATA	TESTS	REMARKS
0.5	Rootmat and topsoil		94.5					0.0 - 2.0 ft: FILL
1.0	FILL, sampled as elastic silt; moist, brown, estimated 5 - 10% sand, contains mica, roots	FILL	94.0	A				1.0 ft: DCP@1'=19+40+39
2.0	FILL, sampled as silt with sand; moist, brown, contains roots, mica	FILL	93.0					2.0 - 10.1 ft: ALLUVIUM 2.2 ft: DCP@2.2'=19+22+24 3.2 ft: DCP@3.2'=8+12+16 4.0 ft: DCP@4'=11+14+15
	ELASTIC SILT; moist, brown and grayish brown, estimated <5% sand, contains mica Change: wet Change: contains organics	MH		B1	5			5.2 ft: DCP@5.3'=12+14+19 6.1 ft: DCP@6.1'=12+13+23 7.2 ft: DCP@7.2'=10+11+13
8.0	FAT CLAY; wet, brown, estimated <5% sand, contains mica	CH	87.0					8.3 ft: DCP@8.3'=8+13+12 9.4 ft: DCP@9.4'=13+13+16
10.1			84.9		10			

Bottom of Hand Auger at 10.1 ft.
Temporary well installed upon completion.

SCALE 1:5333

0 1000

FEET

Dominion Bremo Power Station
Groundwater Monitoring Well Network
March 5, 2013

LEGEND

Monitoring Well

Well Construction Log

Well ID: MW-1

PROJECT INFORMATION

PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**12/4/12 - 1130**
WELL ID	**MW-1**

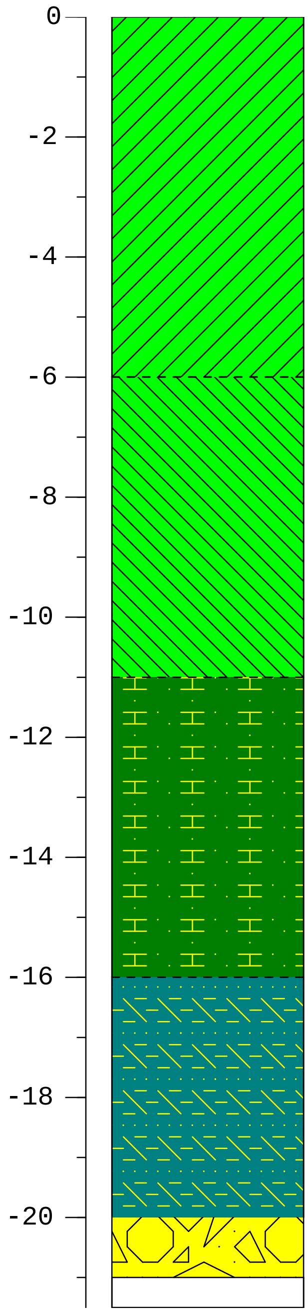
DRILLING INFORMATION

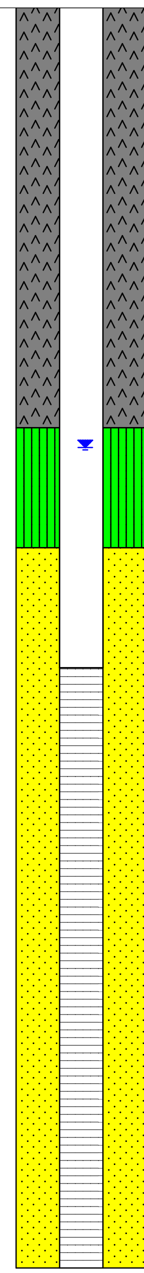
DRILLER:	**Brian Thomas**
BORING DEPTH:	**21.59 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES
0		Silty CLAY, brown, med plastic, moist. CL				Boring diameter 6"
-2						
-4						PVC Casing: 0' - 11' below grade
						Grout: 0'-7' below grade
-6		Lean CLAY with trace silt, wet pockets of moisture, moist. CL		2-1-2-3		
-8						Bentonite Seal: 7'-9' below grade
-10						
		Clayey SILT with rounded to sub-angular peopples, wet. ML		2-3-4-4		Flush Joint, ATSM F480-88 2 thread
-12						
-14						Sand Pack DSI #2: 9'-21' below grade
-16		Clayey SAND, fine to medium grained, sub angular to rounded, poorly sorted. SC		2-4-4-5		
						PVC Screen 10- slot screen: 11'-21' below grade
-18						
-20		Alluvium deposit of sand and cobbles. GP				
		Auger refusal @ 21.5'		5-16-6-7		





Well Construction Log

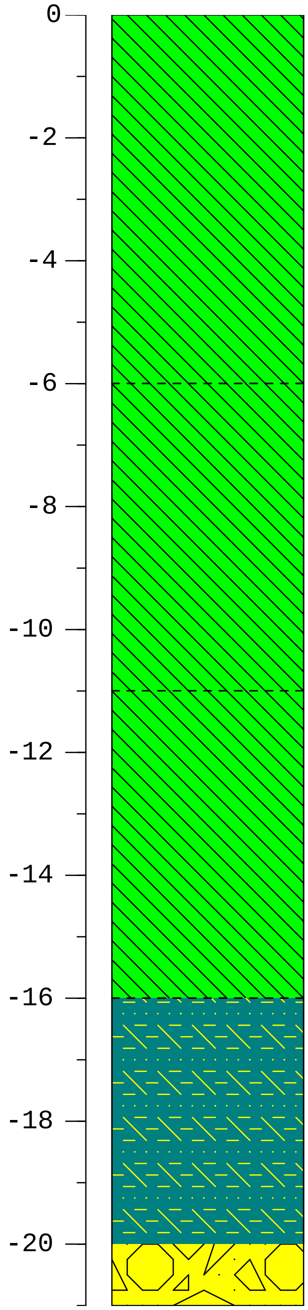
Well ID: MW-2

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**21.11 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**Hollow Stem Auger**
DATES DRILLED:	**11/30/12 - 1130**	SAMPLING METHODS:	**2 - ft Spit-Spoon Macrocores**
WELL ID	**MW-2**	HAMMER:	**140 LBS**

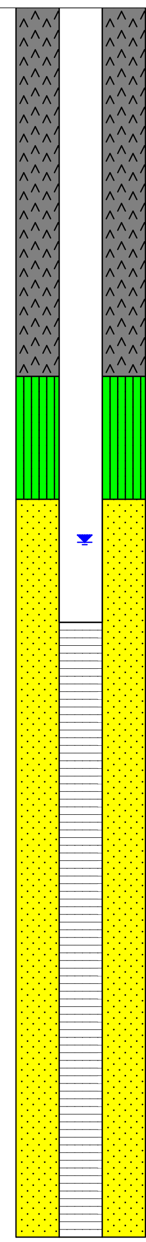
▼ Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES



Depth	Soil Description	Notes (bls)
0	CLAY, tan to grey moltled, non-plastic, dry. CL	
-6	CLAY, Same as above, slightly plastic, moist.CL	2-3-5-5
-11	Silty CLAY, tan, slightly plastic, wet. CL	3-4-5-7
-16	Clayey SAND, fine to medium grained, sub angular to rounded, poorly sorted. SC	3-3-2-2
-20	Alluvium deposit of sub rounded gravel 1cm to 1" in diameter. GP	



Well Material Notes:

Boring diameter 6"

PVC Casing: 0' - 10' below grade

Grout: 0'-6' below grade

Bentonite Seal: 6'-8' below grade

Flush Joint, ATSM F480-88 2 thread

Sand Pack DSI #2: 8'-20' below grade

PVC Screen 10- slot screen: 10'-20' below grade

Well Construction Log

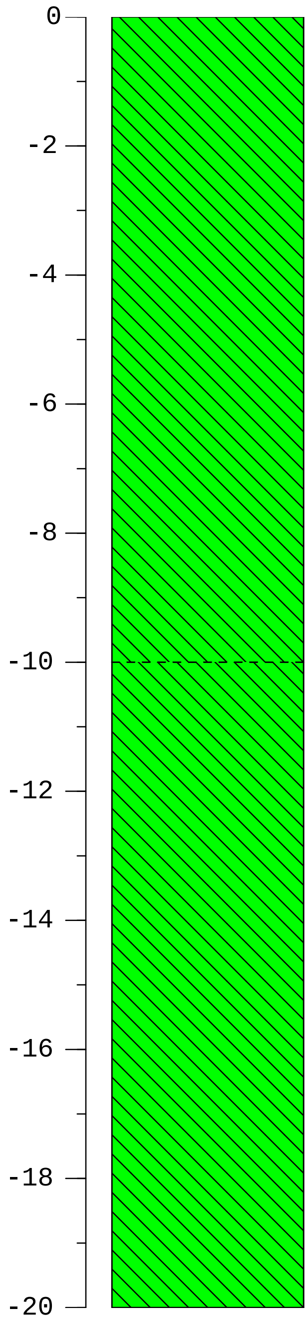
Well ID: MW-3

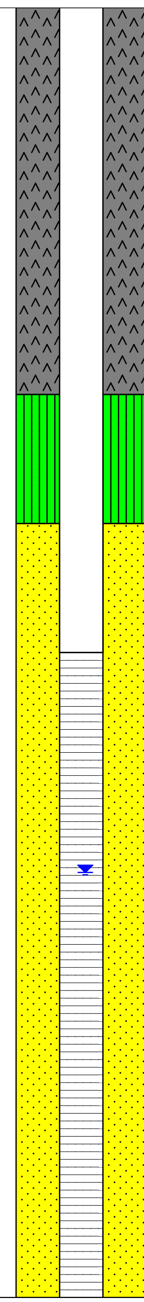
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**19.97 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**HSA**
DATES DRILLED:	**11/29/12 - 1545**	SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
WELL ID	**MW-3**	HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES
0		CLAY, tan to brown, non-plastic, moist. CL				Boring diameter 6"
-2						
-4						PVC Casing: 0' - 10' below grade
-6				1-2-4-5		Grout: 0'-8' below grade
-8						Bentonite Seal: 6'-8' below grade
-10		Same as above, slightly plastic, moist. CL Auger refusal on believed cobble layer @ 20.5'		4-4-7-8		Flush Joint, ATSM F480-88 2 thread
-12						
-14						Sand Pack DSI #2: 8'-20' below grade
-16				2-4-5-8		
-18						PVC Screen 10- slot screen: 10'-20' below grade
-20				2-3-23-50/5		





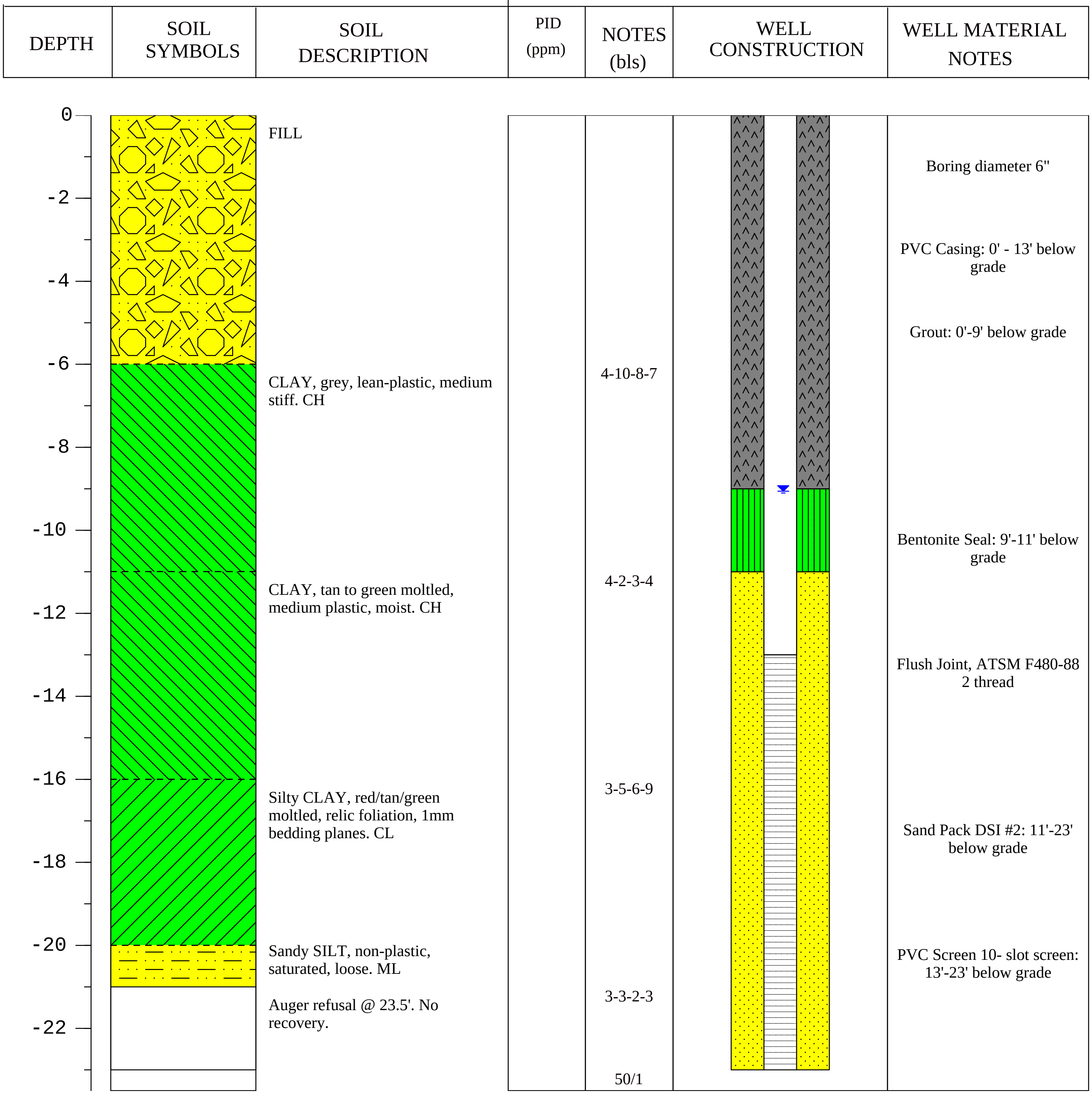
Well Construction Log

Well ID: MW-4

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**23.65 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**HSA**
DATES DRILLED:	**11/28/12 - 1020**	SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
WELL ID	**MW-4**	HAMMER:	**140 LBS**

Observed Water Level

N/A = Not Applicable



Well Construction Log

Well ID: MW-5

PROJECT INFORMATION

PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**11/28/12 - 915**
WELL ID	**MW-5**

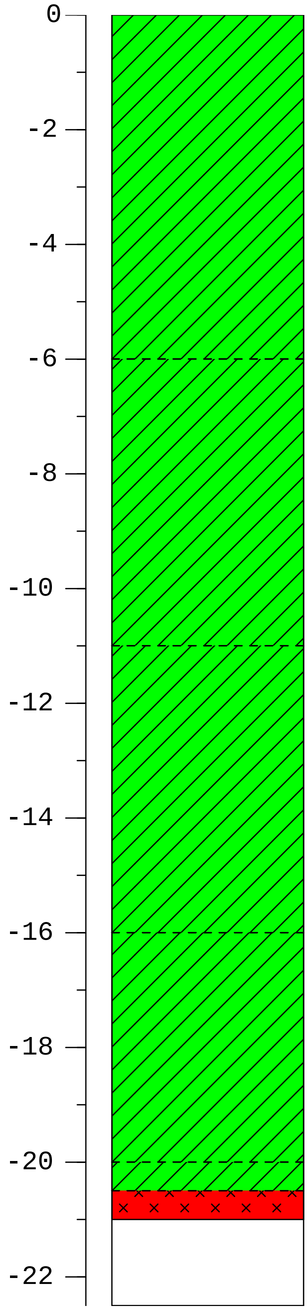
DRILLING INFORMATION

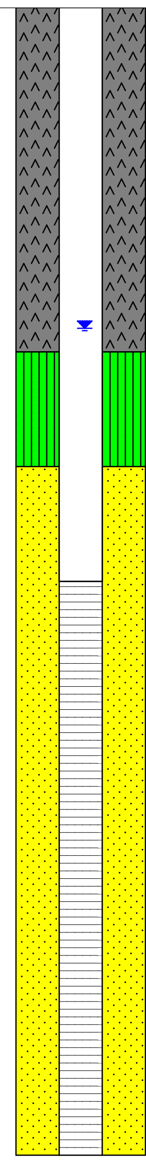
DRILLER:	**Brian Thomas**
BORING DEPTH:	**20.95 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES
0		Silty CLAY, tan to brown, non-plastic, moist. CL				Boring diameter 6"
-2						PVC Casing: 0' - 10' below grade
-4						Grout: 0'-6' below grade
-6		Silty CLAY with angular gravel, tan to grey, non-plastic, damp. CL		3-3-4-3		Bentonite Seal: 6'-8' below grade
-8						
-10						Flush Joint, ATSM F480-88 2 thread
-11		Silty CLAY, grey to tan moltled, non-plastic, damp with moisture pockets. CL		2-4-4-6		
-14						Sand Pack DSI #2: 8'-20' below grade
-16		SAA, saturated. CL		3-3-3-5		
-18						PVC Screen 10- slot screen: 10'-20' below grade
-20		SAA, with fine grained sand, well rounded/sorted. SM				
-21		Auger refusal @ 21'. Shards of foliated rock with feldspar, hornblende, biotite, and other fine crystals found in split spoon.		3-3-4-50/4		
-22						





Well Construction Log

Well ID: MW-6

PROJECT INFORMATION

PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**11/27/12 - 1513**
WELL ID	**MW-6**

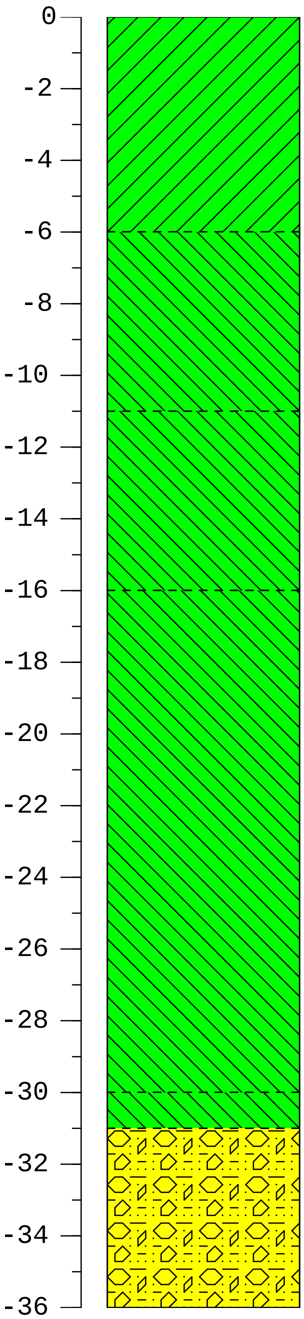
DRILLING INFORMATION

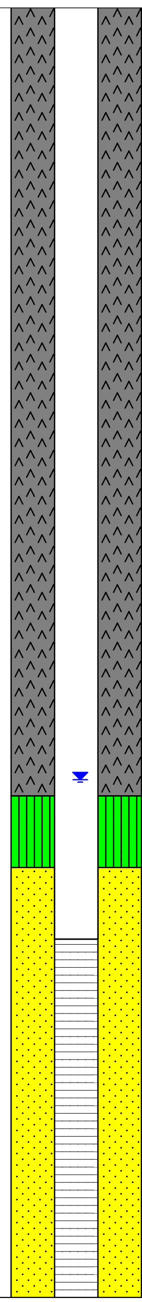
DRILLER:	**Brian Thomas**
BORING DEPTH:	**35.10 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES
0 to -6		Silty CLAY with rock frags, orange to brown, dry, stiff. CL				Boring diameter 6"
-6 to -11		Clay with trace silt, red, med plastic, dry stiff. CH		3-5-6-8		PVC Casing: 0' - 22' below grade
-11 to -16		CLAY, brown to tan, med plastic, dry, stiff. CH		4-4-6-9		Grout: 0'-22' below grade
-16 to -30		CLAY, with rock frags, dry, very stiff. CH		4-4-7-8		
				4-5-8-11		Bentonite Seal: 22'-24' below grade
				5-7-10-12		Flush Joint, ATSM F480-88 2 thread
-30 to -31		CLAY, wet. CH				
-31 to -36		GRAVEL and SAND, rounded to angular, poorly sorted, alluvium, wet. GP		4-4-4-4		PVC Screen 10- slot screen: 26'-36' below grade
						Sand Pack DSI #2: 24'-36' below grade





Well Construction Log

Well ID: MW-7

PROJECT INFORMATION

PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**11/27/12 - 835**
WELL ID	**MW-7**

DRILLING INFORMATION

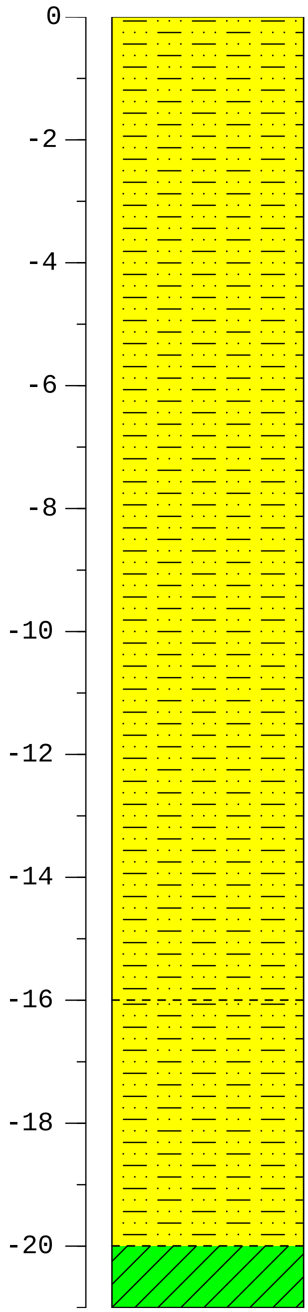
DRILLER:	**Brian Thomas**
BORING DEPTH:	**21.96 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**Hollow Stem Auger**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

Observed Water Level

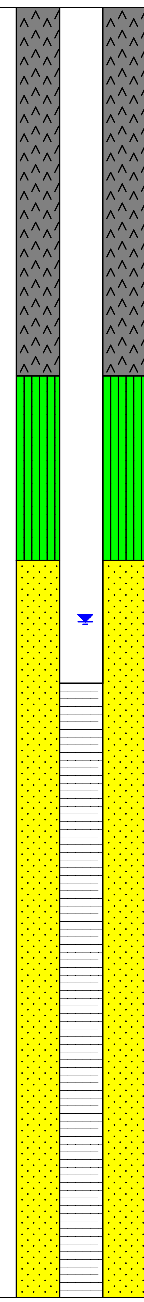
N/A = Not Applicable

DEPTH	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL MATERIAL NOTES
0	Sandy SILT, fine grained, gray to black, non-plastici, dry, loose. ML			Boring diameter 6"
-2 to -4				PVC Casing: 0' - 11' below grade
-4 to -6				Grout: 0'-7' below grade
-6			4-4-3-6	
-8				Bentonite Seal: 7'-9' below grade
-11			2-1-1-2	Flush Joint, ATSM F480-88 2 thread
-14				Sand Pack DSI #2: 9'-21' below grade
-16	Sandy SILT, with trace clay, plastic, saturated. ML		1-1-1	
-17				PVC Screen 10- slot screen: 11'-21' below grade
-20	Silty CLAY, dry, some structure. CL			

SOIL SYMBOLS



WELL CONSTRUCTION



Well Construction Log

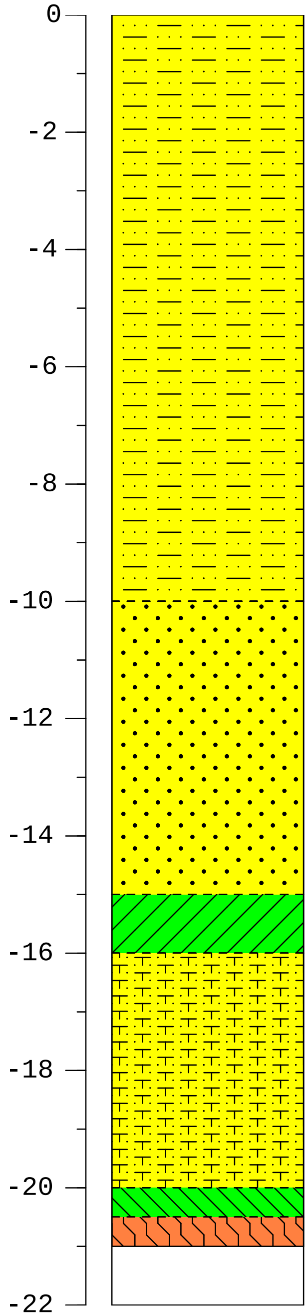
Well ID: MW-8

PROJECT INFORMATION	
PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**11/27/12 - 1400**
WELL ID	**MW-8**

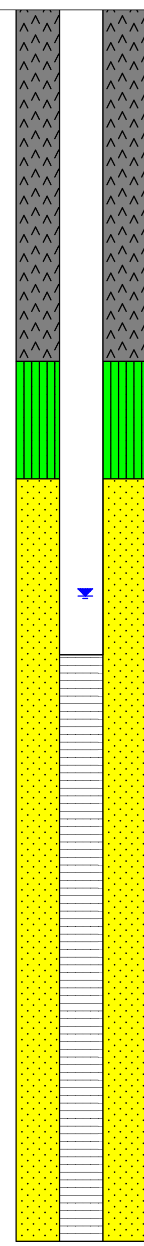
DRILLING INFORMATION	
DRILLER:	**Brian Thomas**
BORING DEPTH:	**22.55 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable



DEPTH	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)
0 to -10	Sandy SILT, fine grained, gray to green, low plasticity, moist, thinly bedded. ML		1-2-2-2
-10 to -15	SAND with trace silt, fine grained, grey to dark grey, wet to saturated, loose. SM		3
-15 to -16	Silty CLAY, grey to brown, moist. CL		
-16 to -20	Silty SAND, fine grained, salt and pepper colored. SM		1-2-5-5
-20 to -20.5	CLAY, brown to tan. CL		
-20.5 to -22	Partially weathered rock, SAPPROLITE with rock fragments and mica flakes		3-5-5-8



WELL MATERIAL NOTES

Boring diameter 6"

PVC Casing: 0' - 11' below grade

Grout: 0'-7' below grade

Bentonite Seal: 7'-9' below grade

Flush Joint, ATSM F480-88 2 thread

Sand Pack DSI #2: 9'-21' below grade

PVC Screen 10- slot screen: 11'-21' below grade

Well Construction Log

Well ID: MW-9

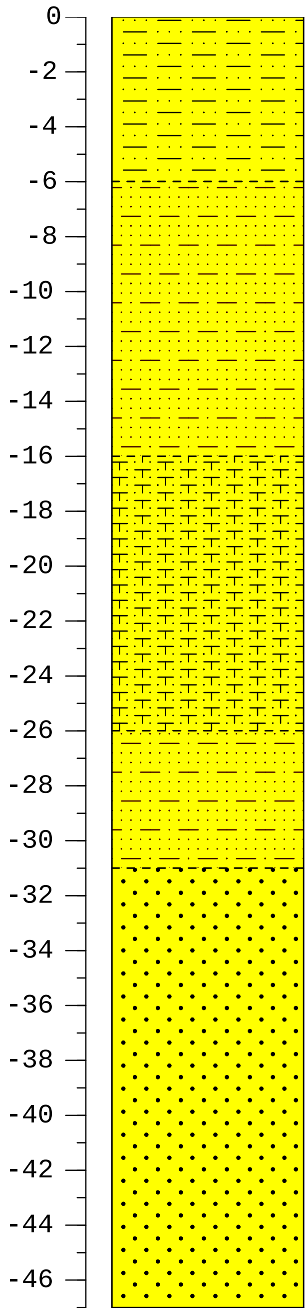
PROJECT INFORMATION	
PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**11/29/12 - 930**
WELL ID	**MW-9**

DRILLING INFORMATION	
DRILLER:	**Brian Thomas**
BORING DEPTH:	**47.29 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES



Sandy SILT, fine grained, tan, non-plastic, damp. ML

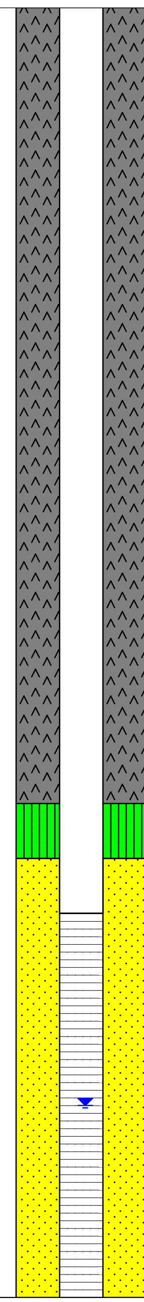
SILT and SAND, fine grained, sub angular to angular, red to tan, quartz and hornblende minerals seen. ML

Silty SAND, fine grainded, sub-angular to angular trace gravel composed of quartz, feldspar, hornblende, and muscovite. SM

SAND and SILT, fine grained, sub-angular to rounded, massive bedding, sapprolite.

SAND, fine grained, composed of rock frags of quartz, felspar, and hornblende, dry, very stiff, thinly bedded with foiliated texture. sapprolite.
Auger Refusal @ 47'

NOTES (bls):
3-3-4-6
3-4-4-5
5-6-5-7
5-9-10-13
9-13-16-15
15/30-50/5
48-50/3
45-50/3
50/4



WELL MATERIAL NOTES:

Boring diameter 6"

PVC Casing: 0' - 33' below grade

Grout: 0'-29' below grade

Bentonite Seal: 29'-31' below grade

Flush Joint, ATSM F480-88 2 thread

PVC Screen 10- slot screen: 33'-47' below grade

Sand Pack DSI #2: 31'-47' below grade

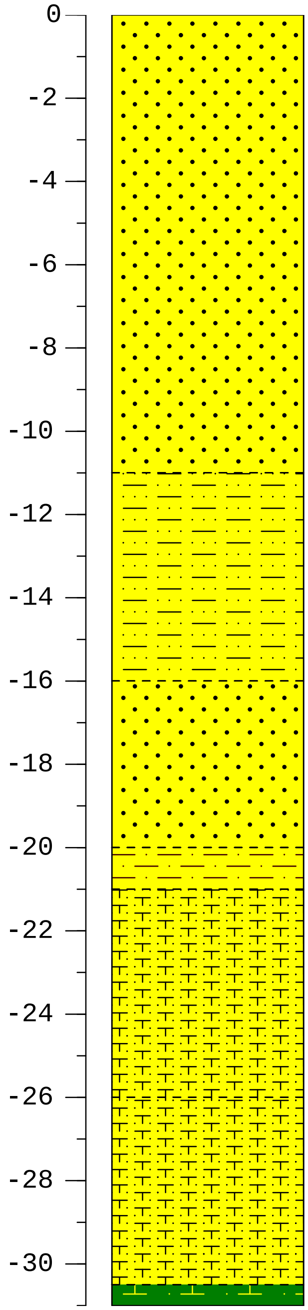
Well Construction Log

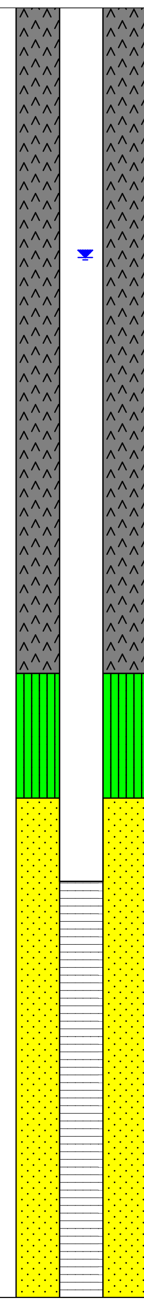
Well ID: MW-10

PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**31.15 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**HSA**
DATES DRILLED:	**11/27/12 -1030**	SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
WELL ID	**MW-10**	HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable





DEPTH	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL MATERIAL NOTES
0	SAND with trace silt, fine grained, well sorted, red to tan, moist. SW			Boring diameter 6"
-2 to -4				PVC Casing: 0' - 21' below grade
-6			3-2-1-3	Grout: 0'-17' below grade
-8				Bentonite Seal: 17'-19' below grade
-11	Silty SAND, fine grained, med sorted, thinly bedded		2-2-1-2	
-14				Sand Pack DSI #2: 19'-31' below grade
-16	SAND with trace silt, coarse grained, saturated. SW		1-1-1	
-20	SILT with sand, black, slightly plastic. ML			
-21	Silty SAND with mica and rock frags, fine grained, poorly sorted, wet. SM		3-3-6-8	Flush Joint, ATSM F480-88 2 thread
-26	Silty SAND with rock frags, coarse grained, poorly sorted, hard, wet. SM		2-1-2-3	PVC Screen 10- slot screen: 21'-31' below grade
-30	CLAY and SILT with rock frags and pebbles. SM			

Well Construction Log

Well ID: MW-11

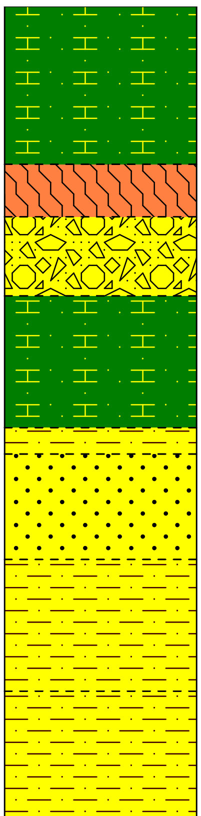
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**49.27 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**HSA**
DATES DRILLED:	**11/28/12 -1350**	SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
WELL ID	**MW-11**	HAMMER:	**140 LBS**

Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES

DEPTH: 0, -2, -4, -6, -8, -10, -12, -14, -16, -18, -20, -22, -24, -26, -28, -30, -32, -34, -36, -38, -40, -42, -44, -46, -48



SOIL DESCRIPTION

Clayey SILT, slightly plastic. ML

High relic structure of parent rock, foliated layers, non-plastic, dense.

Granodiorite rock frags, angular.

Clayey SILT, red to tan, non-plastic, dry, phylitic texture, hard. ML

SILT with fine grains of quartz, feldspar, and mica, non-plastic, moist. ML

SAND, fine to medium grained, sub-angular to rounded, poorly sorted, quartz, hornblende, muscovite, and feldspar minerals present. SP
*Gravel Layer @ 20.8'

SILT with mica and trace rock frags, red/tan to dark grey, banded foliation. ML

SILT with trace sand and rock frags, non-plastic, dry, foliated. ML

Dence material, saturated. No recovery.

NOTES (bls)

7-27-36-43

5-20-16-17

9-16-17-23

10-13-11-7

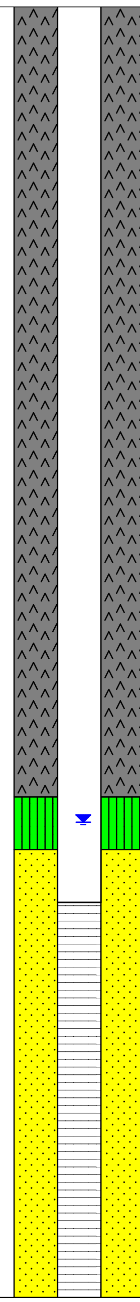
9-12-16-15

16-50/4

16-50/4

16-50/4

WELL CONSTRUCTION



WELL MATERIAL NOTES

Boring diameter 6"

PVC Casing: 0' - 34' below grade

Grout: 0'-30' below grade

Bentonite Seal: 30'-32' below grade

Flush Joint, ATSM F480-88 2 thread

PVC Screen 10- slot screen: 34'-49' below grade

Sand Pack DSI #2: 32'-49' below grade

Well Construction Log

Well ID: MW-12

PROJECT INFORMATION

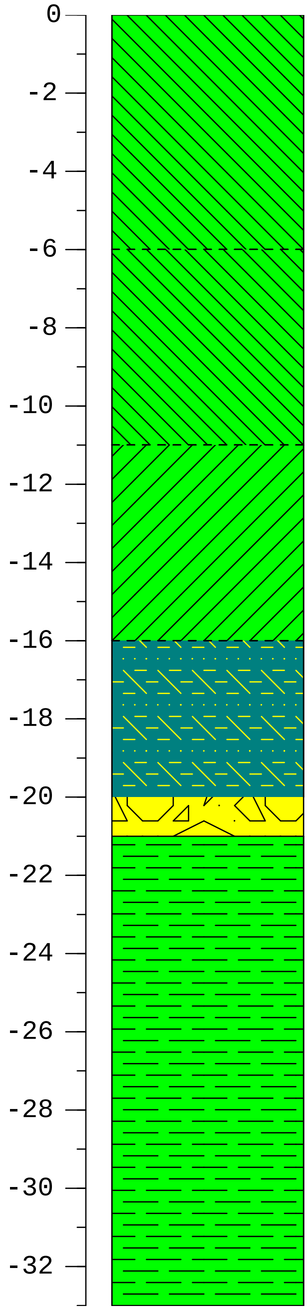
PROJECT:	**1201828**
SITE LOCATION:	**Bremo Bluff, VA**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**
LOGGED BY:	**Seth Christman**
PROJECT MANAGER:	**Tim Davis**
DATES DRILLED:	**12/4/12 -900**
WELL ID	**MW-12**

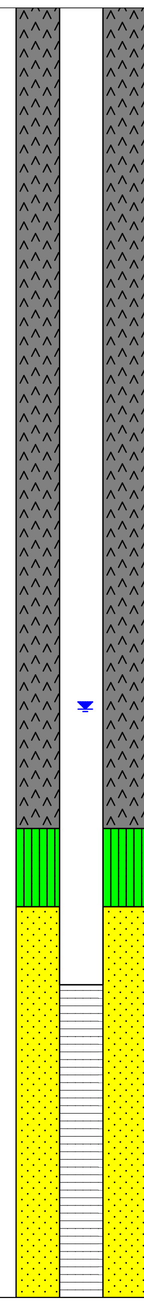
DRILLING INFORMATION

DRILLER:	**Brian Thomas**
BORING DEPTH:	**33.23 feet below grade**
DRILLING CO.:	**Geologic Exploration**
RIG TYPE:	**D-120**
DRILLING METHOD:	**HSA**
SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
HAMMER:	**140 LBS**

▼ Observed Water Level

N/A = Not Applicable





DEPTH	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL MATERIAL NOTES
0	CLAY, tan to grey moltled, non-plastic, dry. CL			Boring diameter 6"
-6	SAA, slightly plastic, moist.CL		2-3-5-5	Grout: 0'-21' below grade
-11	Silty CLAY, tan, slightly plastic, wet. CL		3-4-5-7	PVC Casing: 0' - 25' below grade
-16	Clayey SAND, fine to medium grained, sub angular to rounded, poorly sorted. SC		3-3-2-2	
-20	Alluvium deposit of sub rounded gravel 1cm to 1" in diameter. GP			
-21	Weathered SLATE with small garnet crystals, "Arrovian Slate", dry.		1-2-19-20	Bentonite Seal: 21'-23' below grade
-25			9-50/2	Flush Joint, ATSM F480-88 2 thread
-30			50/6	Sand Pack DSI #2: 23'-33' below grade

Well Construction Log

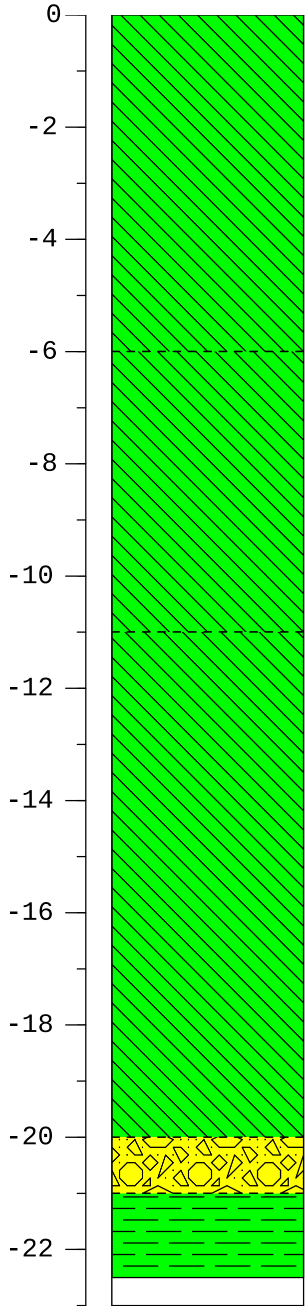
Well ID: MW-13

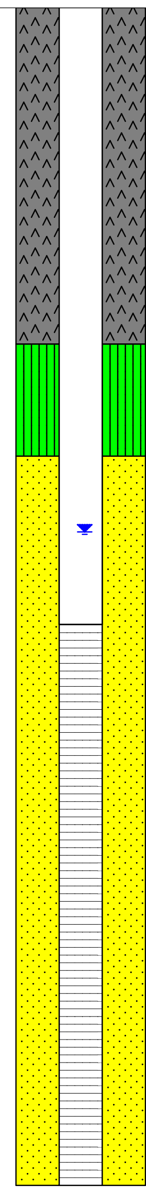
PROJECT INFORMATION		DRILLING INFORMATION	
PROJECT:	**1201828**	DRILLER:	**Brian Thomas**
SITE LOCATION:	**Bremo Bluff, VA**	BORING DEPTH:	**22.41 feet below grade**
JOB NAME:	**Dominion - Bremo Bluff Pwr Stn**	DRILLING CO.:	**Geologic Exploration**
LOGGED BY:	**Seth Christman**	RIG TYPE:	**D-120**
PROJECT MANAGER:	**Tim Davis**	DRILLING METHOD:	**HSA**
DATES DRILLED:	**11/29/12 -925**	SAMPLING METHODS:	**2ft Spit-Spoon Macrocores**
WELL ID	**MW-13**	HAMMER:	**140 LBS**

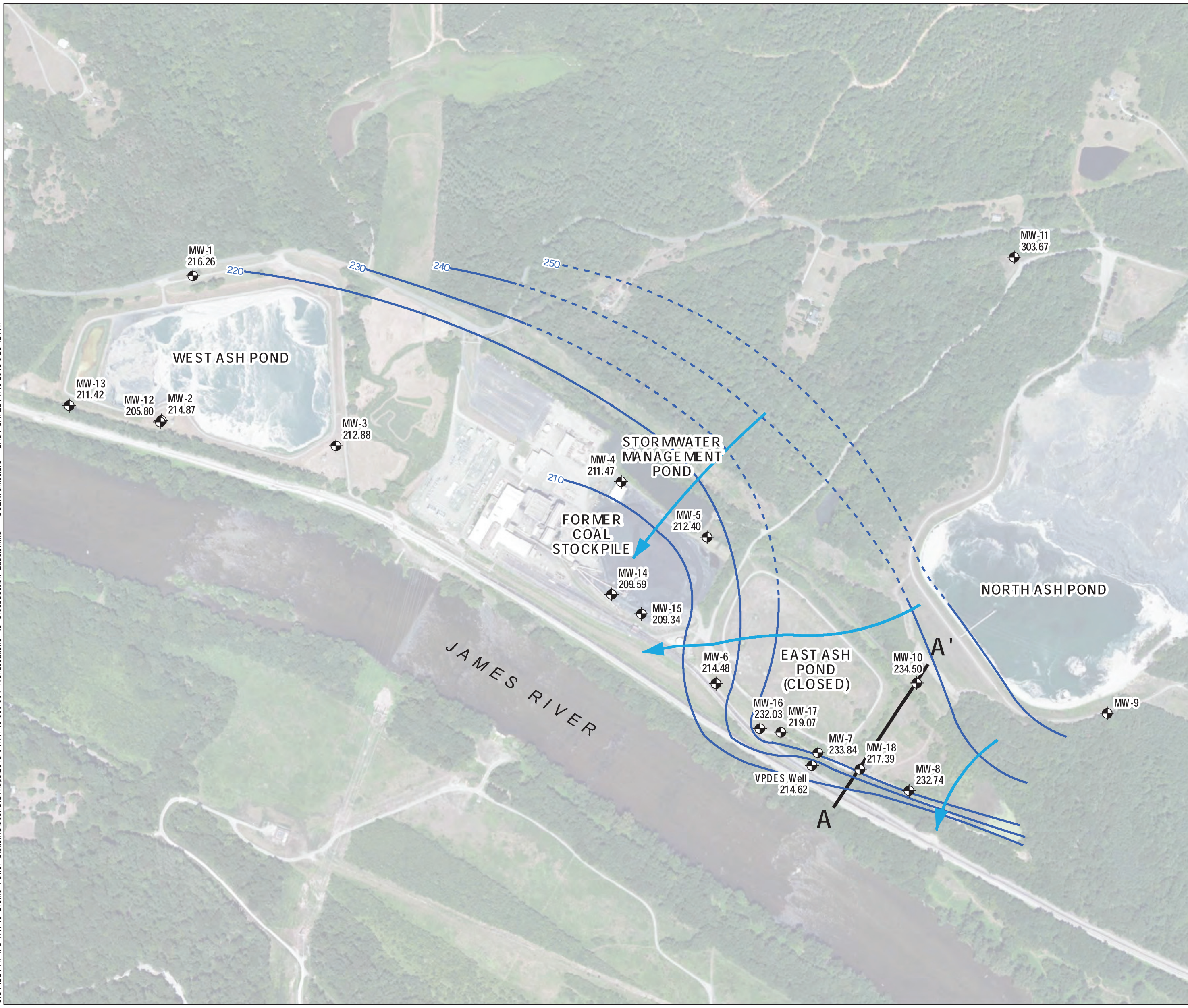
Observed Water Level

N/A = Not Applicable

DEPTH	SOIL SYMBOLS	SOIL DESCRIPTION	PID (ppm)	NOTES (bls)	WELL CONSTRUCTION	WELL MATERIAL NOTES
0		CLAY, tan to grey moltled, non-plastic, dry. CL				Boring diameter 6"
-2						
-4						PVC Casing: 0' - 11' below grade
						Grout: 0'-7' below grade
-6		CLAY, slightly plastic, moist.CL		4-6-6-9		
-8						Bentonite Seal: 7'-9' below grade
-10						
-12		CLAY, wet, plastic. CH		3-3-4-5		Flush Joint, ATSM F480-88 2 thread
-14						Sand Pack DSI #2: 9'-21' below grade
-16				3-3-3-3		
-18						PVC Screen 10- slot screen: 11'-21' below grade
-20		Alluvium, gravel composed of rounded to angular quartz sand, poorly sorted. GP				
-22		Partially weathered slate, foliated with garnet porhyroblast. "Arovian Slate"		2-2-10-43		







LEGEND

- MONITORING WELL WITH GROUNDWATER ELEVATION INDICATED IN FEET
- GOUNDWATER CONTOUR, 10-FT INTERVAL, DASHED WHERE INFERRED
- CROSS SECTION LOCATION
- DIRECTION OF GROUNDWATER FLOW

NOTES

1. AERIAL IMAGERY SOURCE: ESRI
2. WATER LEVELS COLLECTED ON 19 MARCH 2015
3. GROUNDWATER ELEVATIONS FROM MW-12, MW-17 AND MW-18 NOT USED FOR CONTOURING PURPOSES AS THESE WELLS ARE SCREENED IN THE DEEP AQUIFER

WORK PRODUCT
PRIVILEGED & CONFIDENTIAL

HALEY ALDRICH

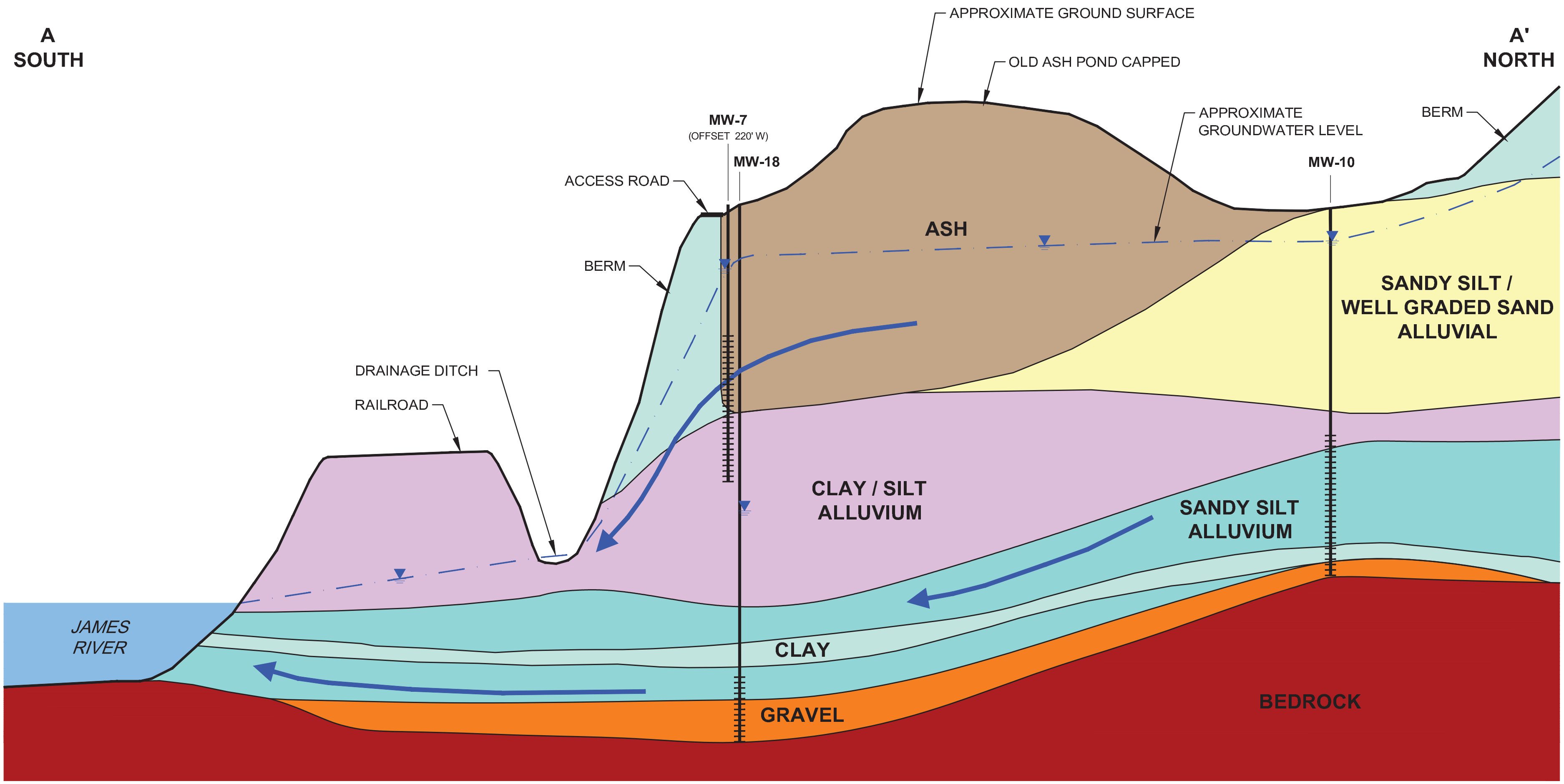
BREMO POWER STATION
BREMO BLUFF, VIRGINIA

WELL LOCATIONS AND GROUNDWATER CONTOURS

APRIL 2015

FIGURE 3

GIS FILE PATH: G:\41740_Bremo_Power_Station\Global\GIS\Maps\2015-04\41740-000-001_WellLocations_No_CrossSection_Labels.mxd — USER: amcclure — LAST SAVED: 4/10/2015 9:28:12 AM



LEGEND

MW-18 WELL DESIGNATION

GROUNDWATER ELEVATION

WELL SCREEN

GROUNDWATER FLOW

NOTE

SUBSURFACE GEOLOGIC CROSS SECTION DEPICT THE GENERAL GEOLOGIC CONDITIONS AT THE SITE AND ARE BASED ON INTERPRETATION OF DATA ENCOUNTERED IN THE EXPLORATIONS. LINES REPRESENTING INTERFACES BETWEEN STRATA ON THE PROFILE ARE BASED UPON INTERPOLATION BETWEEN ADJACENT EXPLORATIONS. ACTUAL SOIL CONDITIONS AND INTERFACES BETWEEN SUBSURFACE EXPLORATIONS MAY VARY SIGNIFICANTLY FROM THOSE INDICATED ON THE PROFILES.

WORK PRODUCT
PRIVILEGED & CONFIDENTIAL

HALEY ALDRICH

BREMO POWER STATION
BREMO BLUFF, VIRGINIA

CONCEPTUAL
GEOLOGIC CROSS SECTION A-A'

SCALE: NONE
APRIL 2015

FIGURE 4

APPENDIX A

Field Data Records

TEST BORING REPORT

HALEY ALDRICH

Boring No. MW-16

Project	BREMO POWER STATION, BREMO BLUFF, VIRGINIA	File No.	41740-000
Client	DOMINION RESOURCE SERVICES, Inc.	Sheet No.	1 of 2
Contractor	FISHBURNE DRILLING	Start	January 29, 2015
		Finish	January 29, 2015
		Driller	J. Rausio
		H&A Rep.	R. Mayer
		Elevation	229.3
		Datum	NAVD 88
		Location	See Plan N 3780772.566 E 11545581

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HSA	S	-	Rig Make & Model: CME 55
Inside Diameter (in.)	4 1/4	1 3/8	-	Bit Type: Cutting Head; Drill Mud: None
Hammer Weight (lb)	-	140	-	Casing: HSA Spun to
Hammer Fall (in.)	-	30	-	Hoist/Hammer: Cat-Head Safety Hammer; PID Make & Model: MiniRAE 2000

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
0							Hand, clear to 4.0 ft, GRAVEL to 1.0 ft										
	3 4	S1 12	4.0 5.0	CH			Medium stiff brown fat CLAY (CH), mps 2 mm, no structure, no odor, moist -FILL-										
5						223.3 6.0											
	2 3 4 4	S2 20	8.0 10.0	CL			Medium stiff gray silty CLAY (CL), mps 10 mm, no structure, no odor, moist to wet, trace roots, and angular quartz fragments		5	5	5	15	70				
10																	
	2 2 7 4	S3 12	13.0 15.0	CL			Similar to S2 except, stiff -ALLUVIUM-										
15						213.3 16.0											
				ML			Medium stiff gray sandy SILT (ML), mps 10 mm, no structure, no odor, wet -ALLUVIUM-			5	15	20	60				
	1 1 2 3	S4 8	18.0 20.0														
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
1/29/15	1700	0	0	24.8	18.0
1/30/15	1200	24	24.8	24.8	1.5

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 24.8
Rock Cored (ft) -
Samples 5S

Boring No. MW-16

Field Tests: **Dilatancy**: R - Rapid S - Slow N - None **Plasticity**: N - Nonplastic L - Low M - Medium H - High
Toughness: L - Low M - Medium H - High **Dry Strength**: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY ALDRICH

Boring No. MW-16
File No. 41740-000
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20																	
	3 4 6 7	S5 22	23.0 25.0	SM		206.8 22.5	Medium dense gray silty SAND (SM), mps 10 mm, no structure, no odor, wet -ALLUVIUM-		5	5	10	40	40				
						204.5 24.8	BOTTOM OF EXPLORATION 24.8 FT										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-16

HALEY ALDRICH

TEST BORING REPORT

Boring No. MW-17

Project	BREMO POWER STATION, BREMO BLUFF, VIRGINIA	File No.	41740-001
Client	DOMINION RESOURCES SERVICES	Sheet No.	1 of 2
Contractor	TERRA SONIC INTERNATIONAL	Start	March 17, 2015
		Finish	March 17, 2015
		Driller	G. Sealey
		H&A Rep.	R. Mayer

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type			Sonic	Rig Make & Model: 150 CC Sonic
Inside Diameter (in.)			6	Bit Type:
Hammer Weight (lb)	-		-	Drill Mud: None
Hammer Fall (in.)	-		-	Casing: Sonic
				Hoist/Hammer:
				PID Make & Model:

Elevation 239.7
Datum NAVD 88
Location
N 3780754.94
E 11545686.07

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0		S1 108	0.0 10.0	GM			Hand clear to 4 ft which sampled as dark gray silty GRAVEL with sand (GM), mps 20mm, no stucture, no odor, moist -FILL-	20	20	5	5	10	40				
				CL		235.2 4.5	Red-brown and dark gray sandy lean CLAY (CL), mps 2 mm, no structure, no odor, moist -FILL-										
5				ML		233.7 6.0	Black and dark gray sandy SILT (ML), mps 2 mm, interbedded laminae 1 to 5 mm thick, no odor, moist to wet -ASH-				10	20	70				
10		S2 96	10.0 20.0	ML			Similar to above except with trace roots										
15				ML			Similar to above										
				CL		221.7 18.0	Gray and tan mottled lean CLAY (CL), mps 3 mm, blocky, no odor, moist -ALLUVIUM-			5	10	15	70				
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/17/2015	10:00	0	45.59	45.59	35
3/18/2015	10:00	24	45.59	45.59	21

Sample ID
O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary
Overburden (ft) 45.59
Rock Cored (ft) 0
Samples 5 Sonic

Boring No. MW-17

Field Tests:
Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY ALDRICH

Boring No. MW-17
File No. 41740-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20		S3 120	20.0 30.0														
				CL													
25				CH		214.7 25.0	Red-brown and yellow-brown fat CLAY (CH), mps 2 mm, blocky, no odor, dry -ALLUVIUM										
				CH													
30		S4 120	30.0 40.0														
				CH			Similar to above										
35				CL		204.7 35.0	Brown red-brown gray (mottled) sandy lean CLAY (CL), mps 5 mm, fine sand partings, no odor, moist to wet -ALLUVIUM-			5	5	15	75				
40		S5 60	40.0 45.5	ML		199.7 40.0	Gray sandy SILT (ML), mps 5 mm, no structure, no odor, wet, micaceous -ALLUVIUM-										
				GP		196.2 43.5	Gray poorly graded GRAVEL with sand (GP), mps 60 mm, no structure, no odor, wet, well rounded river bed gravel -FLUVIAL-	25	50	5	5	10	5				
45						194.1 45.6	BOTTOM OF EXPLORATION 45.59 Boring terminated on top of competent bedrock.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-17

HALEY ALDRICH

TEST BORING REPORT

Boring No. MW-18

Project	BREMO POWER STATION, BREMO BLUFF, VIRGINIA
Client	DOMINION RESOURCES SERVICES
Contractor	TERRA SONIC INTERNATIONAL

File No.	41740-001
Sheet No.	1 of 2
Start	March 17, 2015
Finish	March 17, 2015
Driller	G. Sealey
H&A Rep.	R. Mayer
Elevation	236.3
Datum	NAVD 88
Location	N 3780569.89 E 11546080.64

	Casing	Sampler	Barrel
Type			Sonic
Inside Diameter (in.)			6
Hammer Weight (lb)	-		-
Hammer Fall (in.)	-		-

Drilling Equipment and Procedures

Rig Make & Model: 150 CC Sonic
Bit Type:
Drill Mud: None
Casing: Sonic
Hoist/Hammer:
PID Make & Model:

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0		S1 72	0.0 10.0	GM			Hand clear to 4 ft which sampled as dark gray silty GRAVEL with sand (GM), mps 15 mm, no structure, no odor, moist	20	20	5	5	10	40				
							-FILL-										
				ML		232.3 4.0	Black and gray sandy SILT (ML), mps 5 mm, interbedded laminae 1 to 5 mm thick, no odor, wet, micaceous				10	20	70				
5							-ASH-										
10		S2 102	10.0 20.0														
15				ML			Similar to above except with trace roots at 16 to 17 feet										
				CL		219.3 17.0	Red-brown and yellow-brown mottled lean CLAY (CL), mps 3 mm, blocky, no odor, moist			5	10	15	70				
							-ALLUVIUM-										
20																	

Water Level Data

Date	Time	Elapsed Time (hr.)	Depth (ft) to: Bottom of Casing	Bottom of Hole	Water
3/17/2015	16:00	0	43.5	43.5	29
3/18/2015	16:00	24	43.5	43.5	19

Sample ID

O - Open End Rod
T - Thin Wall Tube
U - Undisturbed Sample
S - Split Spoon Sample

Well Diagram

Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary

Overburden (ft) 43.5
Rock Cored (ft) 0
Samples 5 Sonic

Boring No. MW-18

Field Tests:
Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

†**Note: Maximum particle size is determined by direct observation within the limitations of sampler size.**

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

HALEY ALDRICH

Boring No. MW-18
File No. 41740-001
Sheet No. 2 of 2

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Test Dilatancy	Field Test Toughness	Field Test Plasticity	Field Test Strength
20		S3 120	20.0 30.0	CL			Similar to above except with trace roots and wood fragments										
				CH		212.3 24.0	Red-brown and yellow-brown fat CLAY (CH), mps 2 mm, blocky, no odor, dry -ALLUVIUM-				5	10	85				
25																	
				CL		208.3 28.0	Dark gray sandy lean CLAY (CL), mps 5 mm, blocky, no odor, moist, trace roots -ALLUVIUM-		5	5	10	15	65				
30		S4 120	30.0 40.0	CL			Similar to above except wet										
				ML		202.3 34.0	Gray silty SAND (ML), mps 2 mm, no structure, no odor, wet -ALLUVIUM-										
35																	
				CL		199.3 37.0	Brown red-brown gray (mottled) sandy lean CLAY (CL), mps 5 mm, fine sand partings, no odor, moist -ALLUVIUM			5	5	15	75				
				ML		197.3 39.0	Gray sandy SILT (ML), mps 5 mm, no structure, no odor, wet, micaceous -ALLUVIUM-										
40		S5 39	40.0 43.5														
				GP		194.3 42.0	Gray poorly graded GRAVEL with sand (GP), mps 60 mm, no structure, no odor, wet, well rounded river bed gravel -FLUVIAL-	25	50	5	5	10	5				
						192.8 43.5	BOTTOM OF EXPLORATION 43.5 FT Boring terminated on top of competent bedrock.										

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. MW-18

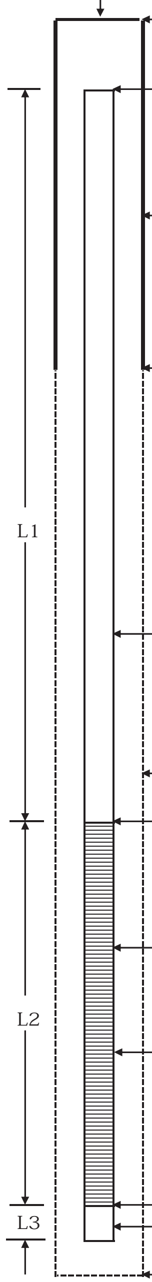
HALEY ALDRICH	# OBSERVATION WELL INSTALLATION REPORT	Well No. MW-16 / Boring No. MW-16

PROJECT	BREMO POWER STATION	**H&A FILE NO.**	41740-001
LOCATION	BREMO BLUFF, VIRGINIA	**PROJECT MGR.**	R. MAYER
CLIENT	DOMINION RESOURCES SERVICES	**FIELD REP.**	R. MAYER
CONTRACTOR	FISHBURNE DRILLING	**DATE INSTALLED**	1/29/2015
DRILLER	J. RAUSIO	**WATER LEVEL**	0.50

Ground El. 229.33 ft	**Location** 3780772.566 N	☑ **Guard Pipe**	
El. Datum NAVD 88	11545581.000 E	☐ **Roadway Box**	

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
CH -FILL-	CONCRETE
CL, ML -ALLUVIUM-	GROUT
	BENTONITE
SM -ALLUVIUM-	GP #2 SAND
24.80	24.80

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



(Not to Scale)

Type of protective cover/lock	Steel	
Height of top of guard pipe/roadway box above ground surface	3.20	ft
Height of top of riser pipe above ground surface	2.98	ft
Type of protective casing:	Steel	
Length	5.0	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe/roadway box	1.80	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Grout	1.0	10.0
Bentonite Seal	11.0	2.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite/Grout	
Diameter of borehole	8.25	in
Depth to top of well screen	14.50	ft
Type of screen	PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	GP #2 Sand	
Depth of bottom of well screen	24.50	ft
Bottom of Silt trap	24.80	ft
Depth of bottom of borehole	24.80	ft

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
14.50 ft	+	10.0 ft	+	0.30 ft	=	24.80 ft

COMMENTS:

Form 2007

HALEY ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No. **MW-17**
Boring No. **MW-17**

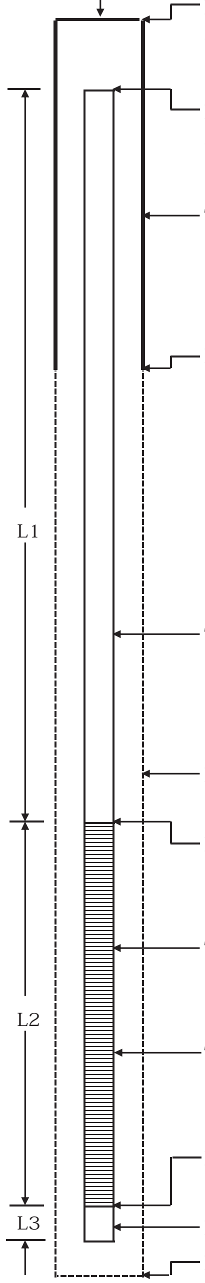
PROJECT	BREMO POWER STATION	**H&A FILE NO.**	41740-001
LOCATION	BREMO BLUFF, VIRGINIA	**PROJECT MGR.**	R. MAYER
CLIENT	DOMINION RESOURCES SERVICES	**FIELD REP.**	R. MAYER
CONTRACTOR	TERRA SONIC INTERNATIONAL	**DATE INSTALLED**	3/17/2015
DRILLER	G. SEALEY	**WATER LEVEL**	20.66

Ground El.	239.73 ft	**Location**	3780754.94 N
El. Datum	NAVD 88		11545686.07 E

☑ **Guard Pipe**
☐ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
	CONCRETE
GM -FILL-	GROUT
ML -ASH-	GROUT
ML, CL, CH -ALLUVIUM-	BENTONITE
ML, CL, CH -ALLUVIUM-	GP #2 SAND
GP -FLUVIAL-	GP #2 SAND
45.59	45.59

(Bottom of Exploration)
(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock	Steel	
Height of top of guard pipe/roadway box above ground surface	3.02	ft
Height of top of riser pipe above ground surface	2.82	ft
Type of protective casing:	Steel	
Length	5.0	ft
Inside Diameter	4.0	in
Depth of bottom of guard pipe/roadway box	1.98	ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Grout	1.0	35.5
Bentonite Seal	36.5	2.0

Type of riser pipe:	PVC	
Inside diameter of riser pipe	2.0	in
Type of backfill around riser	Bentonite/Grout	
Diameter of borehole	6.50	in
Depth to top of well screen	40.29	ft
Type of screen	PVC	
Screen gauge or size of openings	0.01	in
Diameter of screen	2.0	in
Type of backfill around screen	GP #2 Sand	
Depth of bottom of well screen	45.29	ft
Bottom of Silt trap	45.59	ft
Depth of bottom of borehole	45.59	ft

(Not to Scale)

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
40.29 ft	+	5.0 ft	+	0.30 ft	=	45.59 ft

COMMENTS:

Form 2007

HALEY ALDRICH

OBSERVATION WELL INSTALLATION REPORT

Well No.	MW-18
Boring No.	MW-18

PROJECT	BREMO POWER STATION	**H&A FILE NO.**	41740-001
LOCATION	BREMO BLUFF, VIRGINIA	**PROJECT MGR.**	R. MAYER
CLIENT	DOMINION RESOURCES SERVICES	**FIELD REP.**	R. MAYER
CONTRACTOR	TERRA SONIC INTERNATIONAL	**DATE INSTALLED**	3/17/2015
DRILLER	G. SEALEY	**WATER LEVEL**	18.92

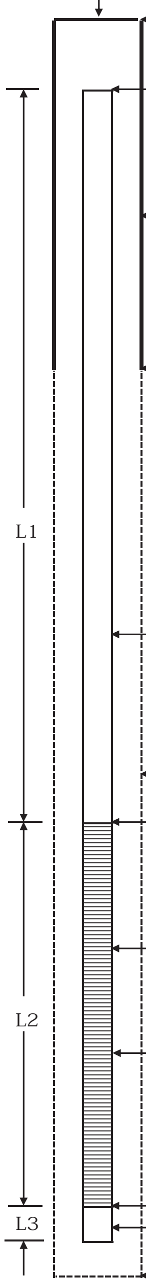
Ground El. 236.31 ft **Location** 3780569.89 N / 11546080.64 E ☑ **Guard Pipe**

El. Datum NAVD 88 ☐ **Roadway Box**

SOIL/ROCK CONDITIONS	BOREHOLE BACKFILL
GM -FILL-	CONCRETE
ML -ASH-	GROUT
ML, CL, CH -ALLUVIUM-	BENTONITE
GP -FLUVIAL-	GP #2 SAND
43.50	43.50

(Bottom of Exploration)

(Numbers refer to depth from ground surface in feet)



Type of protective cover/lock: Steel

Height of top of guard pipe/roadway box above ground surface: 3.05 ft

Height of top of riser pipe above ground surface: 2.91 ft

Type of protective casing: Steel

- **Length:** 5.0 ft
- **Inside Diameter:** 4.0 in

Depth of bottom of guard pipe/roadway box: 1.95 ft

Type of Seals	Top of Seal (ft)	Thickness (ft)
Concrete	0.0	1.0
Grout	1.0	32.0
Bentonite Seal	33.0	3.2

Type of riser pipe: PVC

- **Inside diameter of riser pipe:** 2.0 in
- **Type of backfill around riser:** Bentonite/Grout

Diameter of borehole: 6.50 in

Depth to top of well screen: 38.20 ft

Type of screen: PVC

- **Screen gauge or size of openings:** 0.01 in
- **Diameter of screen:** 2.0 in

Type of backfill around screen: GP #2 Sand

Depth of bottom of well screen: 43.20 ft

Bottom of Silt trap: 43.50 ft

Depth of bottom of borehole: 43.50 ft

(Not to Scale)

Riser Pay Length (L1)		Length of screen (L2)		Length of silt trap (L3)		Pay length
38.20 ft	+	5.0 ft	+	0.30 ft	=	43.50 ft

COMMENTS:

Form 2007