COAL COMBUSTION RESIDUALS LANDFILL RUN-ON & RUN-OFF CONTROL SYSTEM PLAN

NRG BRANDYWINE COAL ASH MANAGEMENT SITE

Prepared for

NRG MD Ash Management LLC
25100 Chalk Point Road
Aquasco, MD. 20608

October 17, 2016

12420 Milestone Center Drive, Suite 150
Germantown, MD 20876
Job No: 60494429

NRG Brandywine Ash Management Site
Coal Combustion Residuals (CCR) Landfill
Run-on & Run-off Control System Plan

Revision Register

CCR Landfill Run-on & Run-off Control System Plan Revision Cycle	Date	Revision No.
Initial CCR Landfill Run-on & Run-off Control System Plan	October 17, 2016	Rev 0

Professional Engineering Certification

I have visited the NRG Brandywine Ash Management Site located in Brandywine, Maryland, and I hereby certify that this initial CCR Landfill Run-on and Run-off Control System Plan meets the requirements of the Code of Federal Regulations (CFR), 40 CFR Part 257 (Subpart D—Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments) §257.81 Run-on and run-off controls for CCR landfills. Any subsequent amendments to this Plan will be reviewed by a Professional Engineer to ensure that it meets the requirements of 40 CFR §257.81.

Name of Registered Professional Engineer: Jeffrey Hutchins

Registration Number: MD PE 13186

Expiration Date: October 10, 2016

Signature and Seal:

Date: 9/30/16

9/30/16

Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This *Run-on and Run-off Control System Plan* is prepared for the Brandywine Ash Management Site (Brandywine Ash Site), owned and operated by NRG MD Ash Management LLC (NRG), as required under the Code of Federal Regulations (CFR) under 40 CFR §257 Subpart D – Standards for Disposal of Coal Combustion Residuals (CCR) in Landfills and Surface Impoundments, §257.81 for run-on and run-off controls.

The Brandywine Ash Site is operated as a management facility for CCRs (also referred to as coal fly ash and bottom ash), produced at NRG's Morgantown and Chalk Point Generating Stations. The Brandywine Ash Site is located at the intersection of North Keys Road and Gibbons Church Road in the town of Brandywine in Prince George's County, Maryland (see Figure 1). The street address for the Brandywine Facility is:

NRG MD Ash Management LLC
Brandywine Ash Management Site
11710 North Keys Road
Brandywine, MD. 20613

1.1 REGULATORY BASIS

Since December 1, 2008 the Brandywine Ash Site has been regulated for CCRs by the Maryland Department of the Environment (MDE) under the Code of Maryland (COMAR) §26.04.10 (Management of Coal Combustion Byproducts) and §26.04.07 (Solid Waste Management), and related sections.

As of April 17, 2015, the Brandywine Ash Site has also been regulated by 40 CFR Part 257, and more specifically, by §257.81 that requires owners and operators of CCR units to prepare a written *Run-on and Run-off Control System Plan* for entry into NRG's operating record for the Brandywine Ash Site. 40 CFR §257.81(c) requires these plans to be completed and placed in the facility's operating record by October 17, 2016.

40 CFR §257.81(b) requires runoff from the active portion of the CCR unit to be controlled in accordance with the surface water requirements of §257.3-3 (Surface Water).

Additionally, §257.81(d) makes reference to requirements for recordkeeping, notification, and public accessibility to this Plan via the internet as established in §257.105(g), §257.106(g), and §257.107(g) respectively. See Section 6.0 for additional details.

1.2 DOCUMENT INFORMATION

This *Run-on and Run-off Control System Plan* provides the required information for run-on and run-off control for the Brandywine Ash Site under §257.81. This *Run-on and Run-off Control System Plan* was prepared on behalf of NRG and will be accepted into the NRG operating record in accordance with 40 CFR §257.105(g)(3) by October 17, 2016.

A Register of Revisions and Amendments to this *Run-on and Run-off Control System Plan* is presented on Page i of the Plan. Any Revisions or Amendments to the Plan are included in Appendix D with a statement of certification by a licensed professional engineer and placed into the NRG operating record in accordance with 40 CFR §257.105(g). A plan update or revision is required every five years subsequent to completion of the initial plan in accordance with §257.81(c)(4).

1.3 REGULATORY CROSSWALK TABLE

A regulatory crosswalk table mapping the required plan elements under 40 CFR §257.81 against the elements of this Plan is presented in Table 1 below.

Table 1 Regulatory Crosswalk Table

40 CFR 257 Citation	Description of Rule	Run-on & Run-off Control System Plan Section
81(a)(1)	Run-on control for the 24-hour, 25-year storm for the active portion of the CCR unit	4.0
81(a)(2)	Run-off control for the 24-hour, 25-year storm for the active portion of the CCR unit	5.0
81(b)	Compliance with 40 CFR §257.3-3 (Surface Water), and §402 and §4004 of the Clean Water Act regarding the National Pollutant Discharge Elimination System (NPDES)	5.0
81(c)(1)	Documentation of design and construction of run-on and run-off controls	3.0, 4.0, 5.0
81(c)(2)	Amendment of the Plan	1.2
81(c)(3)	Timeframe for preparing the initial Plan	1.2
81(c)(4)	Frequency for revising the Plan	1.2
81(c)(5)	Engineer's certification	1.4
81(d)	Recordkeeping, notification, and internet availability requirements	6.0

1.4 CERTIFICATION

A statement of certification by a licensed professional engineer that this initial *Run-on and Run-off Control System Plan* meets the requirements of 40 CFR §257.81 is presented on Page ii of this Plan.

2.0 BACKGROUND

The Brandywine Ash Site is located at the intersection of North Keys Road and Gibbons Church Road in the town of Brandywine in Prince George's County, Maryland (see Figure 1). The facility receives and stores CCRs produced at NRG's Morgantown and Chalk Point Generating Stations. The Brandywine facility was initially constructed in 1971 and has received ash in four cells since that time, including Phase 1, Phase 2, and two historical areas. Phase 1 and the two historical areas have been closed for many years and are capped with a soil layer and stabilized with heavy vegetation. Figure 2 shows an aerial photograph of the Brandywine site and the various inactive and active cells. Figure 3 shows the Brandywine site layout consisting of the three closed cells (Phase 1 and the two Historical Areas) and the active cell (Phase 2).

Phase 1 and the two historical areas are scheduled to be permanently capped with an engineered capping system, approved by MDE, under a Consent Decree with MDE. NRG commenced the construction phase of this project to permanently close Phase 1 and the two Historical Areas with a low permeability geosynthetic closure cap in May 2016.

Phase 2, which is the currently operational cell at the site, encompasses approximately 33 acres. It is located south of Phase 1, the two historical areas, and the main access road into the site. Phase 2 is subdivided into the current operational Phase 2A (approximately 8.5 acres) which is currently receiving CCRs, and Phase 2B (approximately 24.5 acres) which has reached final design elevation and has been fully stabilized with a soil cover layer and vegetation.

3.0 PHASE 2 STORMWATER MANAGEMENT CONTROLS

Because Phase 2 is the only operational cell at the site, this Plan specifically addresses run-on and run-off management controls for Phase 2. The stormwater controls described in this Plan have been designed and constructed to be consistent with recognized and accepted good engineering practices and with the requirements for CCR landfills under 40 CFR §257.81.

Phase 2 is typical of many municipal and CCR landfills in that it is an artificially constructed local topographic high, with its highest elevation approximately 40 feet higher than the surrounding elevations. Phase 2 is surrounded by the main access road into the Brandywine site to the west and north, and by wooded low lands to the east and south. The main access road into the site effectively separates Phase 2 from the rest of the Brandywine site to the west and north. Any stormwater runoff beyond the limits of Phase 2 to the north and west is captured by drainage channels at the base of Phase 1 along the access road and is directed away from Phase2. To the east of Phase 2, the land drops away steeply into the forested areas with streams. To the south of Phase 2, the land also drops away to wooded and vegetated areas. Consequently, stormwater falling on the east and south sides of Phase 2 flows downgradient away for Phase 2.

As shown in Figure 4, all stormwater falling onto the Phase 2 area is captured by the cell's internal drainage system and is directed to Pond 006 for storage and detention. Pond 006 is Phase 2's leachate storage pond, but it has been designed to capture and effectively store stormwater and leachate from Phase 2. Phase 2's internal drainage system consists of (1)

stabilized and vegetated slopes and reverse benches, (2) chimney drains in the Phase 2A CCR placement area, (3) a stabilized perimeter drainage channel, and (4) Pond 006.

Discharges of surface water from the Brandywine site are regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by MDE. Consequently, discharges from Pond 006 are permitted under the site's NPDES permit.

3.1 POND 006

Pond 006 was designed by GAI Consultants of Homestead, Pa. in the mid-2000's to capture and store leachate and stormwater from the Phase 2A and 2B CCR expansion area. Pond 006 was designed, sized, and approved by the Prince George's Soil Conservation District as a pond to treat stormwater run-off coming from any disturbed area resulting from CCBs placement in the Phase 2 area.

Pond 006 is designed with (1) a forebay connected to the main pond with a grouted rip rap weir (invert elevation 198.8), (2) main pond pool with an embankment (elevation 205), (3) 63-inch HDPE riser structure (crest elevation 199.25), and (4) 36-inch HDPE outfall barrel that discharges flows that exceed the riser crest elevation to the stream network east of Pond 006. Exhibits 1 and 2 in Appendix A provide details for the Pond 006 forebay, principal outfall structure (riser structure and outfall pipe barrel), and embankment prepared by GAI Consultants and subsequently constructed by NRG. Exhibit 3 presents a photograph showing the various elements of Pond 006. Exhibit 4 presents a photograph showing the various elements of the Pond 006 forebay and emergency spillway.

Phase 2A and 2B have engineered leachate collection systems, consisting of geosynthetic liners installed on prepared subgrades, and a leachate collection pipe system installed in an 18-inch layer of pervious granular material (or bottom ash) on the liner. Leachate from both Phase 2A and 2B is captured within the leachate collection system at the base of each cell and is then transferred by way of three leachate collection pipelines to the Pond 006 forebay for storage and detention. Exhibits 3 and 4 in Appendix A show the Pond 006 forebay and the leachate transmission pipelines discharging into the forebay.

The Pond 006 forebay also contains an emergency spillway (see Exhibit 4) that is at an elevation of 201.7, which is 2.9 feet higher than the weir (elevation 198.8) from the forebay into the main pool of Pond 006 and 2.45 feet higher than the crest of the main outfall structure (199.25) from Pond 006. Flows can safely pass from the forebay into the main pond and occupy the additional storage volume in the main pond before flowing out of the principal outfall structure (elevation 199.25) and then, if necessary, the emergency spillway at elevation 201.7. The engineering calculations presented in Section 5.0 and Appendix C show that Pond 006 can effectively collect, store, and control the stormwater runoff from the 2-, 10-, and 25-year, 24-hour storm events in accordance with local and State requirements and the requirements of CFR §257.81 and the surface water requirements in §257.3-3.

4.0 PHASE 2 RUN-ON CONTROL SYSTEM

As was discussed in Section 3.0, the CCR unit designated as Phase 2 is topographically isolated from the remaining portions of the Brandywine site and is topographical high point. Phase 2 has stabilized and vegetated side slopes around its entire perimeter and all stormwater falling onto the Phase 2 area is contained within the Phase 2 internal drainage system, while all stormwater falling beyond the limits of Phase 2 drains away from Phase 2 due to the presence of the vegetated side slopes and drainage channels that surround Phase 2.

As shown in Figure 4, Phase 2 is surrounded by (1) the main access road into the Brandywine site to the west and north, and (2) wooded low lands to the east and south. Consequently, Phase 2 is hydrologically isolated from the adjacent areas of the Brandywine site.

- The access road is at an elevation significantly downgradient from the top of the vegetated side slopes of Phase 2 to the west and north. The elevation at the top of the Phase 2 vegetated slopes range from 8 to 32 feet above the elevation of the access road.

- All runoff from Phase 1, west and north of the access road, is captured in the drainage channel at the base of Phase 1 along the access road and is carried to the south and to the east of the site.

- To the east of the CCR placement area of Phase 2A, stormwater falls on the vegetated side slopes with top elevations of 238 down to the vegetated perimeter channel, and below the channel, flows on vegetated slopes downgradient into the vegetated forested area with elevations ranging from 200 to 190 in the stream channel.

- To the south Phase 2B, stormwater falls on the vegetated side slopes with top elevations of 252 down to the vegetated perimeter channel, and below the channel, flows on vegetated slopes downgradient into the vegetated areas with elevations ranging from 220 to 200 in the low areas.

All stormwater falling on the vegetated side slopes of Phase 2 drain down to the perimeter drainage channel and around Phase 2 to Pond 006. Any stormwater falling on the site beyond the Phase 2 perimeter drainage channel and side slopes, including stormwater from a 2-, 10-, and 25-year, 24-hour storm event, cannot flow past these impediments upgradient into the active Phase 2 area.

4.1 CONCLUSION

Based on the topographic and hydrologic isolation of the active Phase 2 area from the rest of the Brandywine site, stormwater runoff cannot discharge onto any of the operational areas of Phase 2 during a 24-hour, 25-year storm event.

5.0 CELL B RUN-OFF CONTROL SYSTEM

The objective of the Phase 2 run-off control plan is to ensure that stormwater from active CCR placement areas of Phase 2 (contact water) is contained within the active areas and directed into the leachate collection system, and does not become run-off into non-active areas of the site or run off from the site.

As discussed in Section 2.0, Phase 2 is subdivided into the current operational Phase 2A (approximately 8.5 acres) which is currently receiving CCRs, and Phase 2B (approximately 24.5 acres) which has reached final design elevation and has been fully stabilized with a soil cover layer and vegetation.

5.1 PHASE 2 LEACHATE COLLECTION SYSTEM

Phase 2A and 2B were constructed with engineered leachate collection systems, consisting of geosynthetic liners installed on prepared subgrades, and leachate collection and transmission pipelines installed in an 18-inch layer of pervious granular material (or bottom ash) on the liner. Exhibit 5, Detail 1 in Appendix A presents a detail of the Phase 2 designed leachate collection system. Leachate from both Phase 2A and 2B is captured within the leachate collection system at the base of each cell and is then transferred by way of the three leachate collection pipelines to the Pond 006 forebay for storage and detention. Exhibits 3 and 4 in Appendix A show the leachate pipes emanating from Phase 2A and 2B into Pond 006. The two smaller leachate transmission pipes (located to the south of the Phase 2A/2B transition) drain leachate from Phase 2B while the larger, 8-inch leachate transmission pipe to the north drains leachate from Phase 2A into the Pond 006 forebay (see Exhibit B-1 in Appendix B). This pipe is an 8-inch HDPE pipe as was documented by an as-built survey of the Pond 006 forebay.

Because Phase 2B is at design elevation, covered with soil and heavily vegetated, the leachate production that is discharged to Pond 006 is significantly less than when Phase 2B was receiving CCR. Two of the leachate transmission pipes in Exhibit 2 Because Phase 2A is currently receiving CCR, the leachate production is at design flows as discussed in Section 5.3.1.

5.2 PHASE 2A CHIMNEY DRAIN SYSTEM

As Phase 2A was constructed and CCR received and placed, the CCR was constantly compacted and graded toward the center of the Phase 2A area, where several chimney drains were installed in low-point sumps created by grading the CCR. The chimney drains were constructed vertically in the center of these low-point sumps and are connected to the leachate collection system on top of the Phase 2A liner. The chimney drains allow stormwater drainage collected within the low-point sumps to drain downward into leachate collection system and discharge to Pond 006 by way of the main leachate transmission pipeline. All stormwater falling on the Phase 2A CCR area drains by gravity toward the center of Phase 2A where the chimney drains and low-point sumps collect and discharge the stormwater to the leachate collection system, thus never allowing the contact water to leave the limits of the Phase 2A area.

The chimney drains, shown in Exhibit 6 in Appendix A, consist of an inner perforated collection pipe, surrounded by an envelope of washed gravel, inside of a larger geotextile-wrapped perforated infiltration pipe, which is surrounded by a mound of bottom ash (which is coarser than fly ash). The inner collection pipe is directly connected to the existing leachate collection and transmission pipe network. During periods of low to moderate rainfall, stormwater infiltrates into the chimney drain through the layers of porous media. However, the top of the collection pipe is open above the infiltration media, so that in periods of high flow (i.e., 24-hour, 25-year storm event), or when the porous media is already saturated, contact water can directly enter the top of the collection pipe and drain into the leachate collection system. As new lifts of CCR are constructed, the chimney drains are designed to be extended upward so that the top of the drain would always be higher than the current lift of CCR.

Because there is no stormwater run-on into Phase 2 from offsite areas, only the rain falling on the top of Phase 2A (and a small portion of Phase 2B) accumulates in the low-point sumps of Phase 2A where the chimney drains allow the accumulated stormwater to flow downward into the leachate collection system. This drainage system is not overtaxed by runoff from offsite areas.

5.3 HYDROLOGY AND HYDRAULICS OF PHASE 2

All of the stormwater falling on Phase 2 is contained within Phase 2 and discharges to Pond 006. The stormwater runoff from Phase 2 is comprised of two components:

- Stormwater falling on Phase 2A which drains to the low-point sumps and chimney drains, and then to Pond 006 by way of the 8-inch leachate transmission pipeline.

- Stormwater falling on Phase 2B that drains to Pond 006 by way of the vegetated slopes, benches and perimeter drainage channel.

5.3.1 Stormwater Runoff from Phase 2A

All stormwater falling on Phase 2A drains on the graded CCR to the chimney drains by way of the low-point sumps. There is no offsite runoff flowing onto the Phase 2A area and there is no offsite runoff from the working surface of Phase 2A (see Figure 4). The peak stormwater discharge from Phase 2A is controlled by the discharge capacity of the 8-inch leachate transmission pipeline that was installed in the granular leachate collection layer (or bottom ash) on top of the liner. The 8-inch leachate main slopes at approximately 1.8-percent from the west side of Phase 2A approximately 1,110 feet to the east to its discharge point into the Pond 006 forebay (see Exhibit B-1 in Appendix B). Because the maximum capacity of the 8-inch pipe is determined by its slope, roughness and cross-sectional area, Manning's equation is used to determine the maximum capacity of the 8-inch pipe.

Appendix B contains the stormwater calculations for the 8-inch pipe. Based on the calculations, the 8-inch leachate transmission pipeline has a maximum discharge of 2 cubic foot per second (cfs) flowing full. The 25-year, 24-hour storm for Prince George's County has a rain depth of 6.1 inches based on the latest NOAA Atlas 14 rainfall database (see Exhibit C-1 in Appendix C). The calculations in Exhibit B-2 in Appendix B show that the 6.1 inches of rain falling on Phase

2A is discharged by the 8-inch pipe at approximately 2 cfs over a period of approximately 25.3 hours. During that time, the water would be detained in the low-point sumps and chimney drains, being slowly released by the 8-inch pipe into Pond 006. This flow is comingled with the flows from Phase 2B, but it is relatively small and has no significant effect on the storage capacity of Pond 006 (see Section 5.3.2 below). The 6.1 inches of rain on Phase 2A would never be able to leave the physical boundaries of the Phase 2A area because the CCR surface is graded toward the low-point sumps.

5.3.2 Stormwater Runoff from Phase 2B

The runoff from a 24-hour, 25-year storm event on the Phase 2 area was analyzed using the Soil Conservation Service TR-55 methodology as presented in Appendix C. The methodology consists of the following analyses:

- Determining the drainage areas with Phase 2A and 2B to Pond 006 (Appendix C, Figure C-1).

- Determining the Time of Concentration (Tc) of rainfall from the hydrologically most remote location within the drainage area.

- Determining the watershed Curve Number based on soil type and land use.

- For Pond 006, determining the elevation/storage relationship (Stage/Storage) based on the 2015 topography of the site (Appendix C: Exhibit C-2 and Pond 006 Storm Calculations Report, Page 6).

- For Pond 006, based on the elevation of the principal outfall structure and the emergency spillway, determining the Stage/Storage/Discharge relationship (Appendix C: Pond 006 Storm Calculations Report, Page 6). This determines the peak discharge that can be released from the pond's outfall structure and emergency spillway based on the elevation of water in the pond during the duration of the 24-hour storm event.

The results of the TR-55 hydrologic analysis for Phase 2B are presented in Appendix C. The results demonstrate the following:

- The flows into Pond 006 from the from the 2- and 10-year, 24-hour storms fill the forebay and pass over the weir into the main pond pool, but never reach the elevation of the main outfall structure riser pipe (Appendix C: Pond 006 Storm Calculations Report, Page 2).

- The 25-year, 24-hour peak discharge from Phase 2B into Pond 006 is 64.04 cubic feet per second (cfs) at 12.2 hours into the 24-hour storm hydrograph (Appendix C: Pond 006 Storm Calculations Report, Page 4).

- The flows into Pond 006 from the from the 25-year, 24-hour storm fill the forebay and the main pond pool, and reach a maximum elevation of 199.40, which is 0.15 feet (1.8 inches) higher than the crest of the outfall structure weir (Appendix C: Pond 006 Storm

Calculations Report, Page 3). At an elevation of 199.40, the water level never reaches the elevation of the emergency spillway (201.7), and thus is contained within Pond 006. The peak discharge detained in Pond 006 flows out of the main outfall structure at elevation 199.40 at a controlled flow rate of approximately 5 cfs during hour 14.0 of the storm hydrograph (Appendix C: Pond 006 Storm Calculations Report, Page 5).

- Releasing the 24-hour, 25-year peak flow into Pond 006 at this small, controlled rate prevents the pond from filling and discharging larger, uncontrolled flows over the emergency spillway. The Pond 006 system effectively collects and controls the water volume resulting from the 24-hour, 25-year storm event from Phase 2B.

- The addition of the approximate 2 cfs of leachate from the Phase 2A leachate collection system to the Pond 006 system during a 25-year, 24-hour storm event produces a 0.10 foot rise in the water surface elevation from 199.40 to 199.50 (see Appendix B, Exhibit B-2). This elevation is still well below the emergency spillway elevation of 201.7, and thus all flows from Phase 2 are collected and controlled within the storage capacity of Pond 006. The 0.10 foot rise in water elevation results in a peak discharge of approximately 9 cfs flowing from the main outfall structure.

    - The incremental storage volume in Pond 006 between elevation 199.4 and 199.6 is 7,412 cubic feet (Appendix C: Pond 006 Storm Calculations Report, Page 7).
    - The peak flow from Phase 2B during the main hydrograph occurs between hour 12 and 12.5, or for approximately 30 minutes. The addition of 2 cfs from Phase 2A during that same time period in the hydrograph equals approximately 3,600 cubic feet of additional water which would raise the elevation in the pond by 0.10 feet (Appendix B, Exhibit B-2).
    - This 0.10 foot rise in water elevation would result in a peak discharge of approximately 9 cfs flowing from the main outfall structure.

The Pond 006 system effectively collects and controls the water volume resulting from the 24-hour, 25-year storm event from Phases 2A and 2B. Moreover, discharges from Pond 006 are permitted in accordance with the NPDES permit issued by MDE for the Brandywine site.

5.4 CONCLUSION

All stormwater falling on Phase 2 drains to Pond 006, either by way of the vegetated slopes, benches and the perimeter drainage channel, or by way of the low point sumps, chimney drains and leachate piping in the Phase 2 leachate collection system. Pond 006 was designed, sized, and approved by the Prince George's Soil Conservation District to treat stormwater run-off coming from any disturbed area resulting from CCBs placement in the Phase 2 area.

Pond 006 has the capacity to retain the stormwater runoff from the 2- and 10-year, 24-hour storm events, and to adequately collect, control, and safely discharge the runoff from a 24-hour, 25-year storm event, meeting the requirements of local and State regulatory agencies and with 40 CFR §257.81 and §257.3-3. Surface water discharges for the Brandywine site are regulated

under the NPDES permit issued by MDE, and by extension, discharges from Pond 006 are regulated under the site's NPDES permit.

The stormwater run-off controls described in this Plan have been designed and constructed to be consistent with recognized and accepted good engineering practices and to meet the requirements for CCR landfills under 40 CFR §257.81 and §257.3-3.

6.0 RECORDS, NOTIFICATIONS, AND INTERNET ACCESS

6.1 RECORDKEEPING REQUIREMENTS

In accordance with 40 CFR §257.105, a written operating record will be maintained for the Westland Ash Site CCR facility. As specified in §257.105(g)(3) this operating record will include the most recent version of this *Run-on and Run-off Control System Plan* and any subsequent revisions or amendments.

Each file will be retained for at least five years following the date of each occurrence, maintenance, report, record, or study. The written record will also be maintained as computer files.

6.2 NOTIFICATION REQUIREMENTS

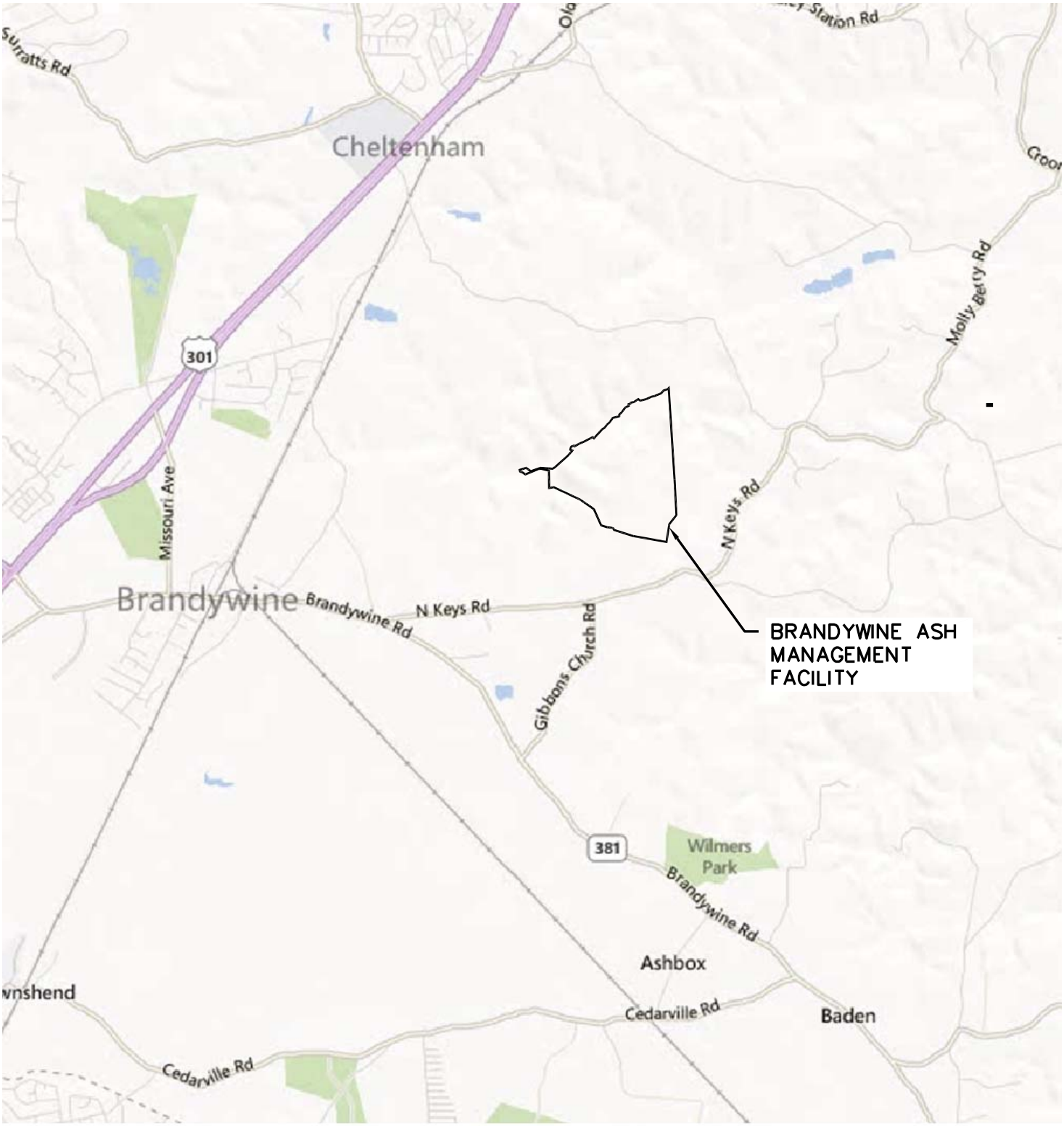
In accordance with 40 CFR §257.106 NRG will notify the Director of the MDE Solid Waste Program whenever information has been placed in the facility's operating record and/or posted to the CCR website. Copies of such information will be provided to MDE as required. As specified in §257.106(g)(3), NRG will provide notification to MDE of the availability of the initial *Run-on and Run-off Control System Plan* and any subsequent revisions or amendments.

6.3 PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS

In accordance with 40 CFR §257.107, NRG will maintain a publicly accessible internet website entitled "CCR Rule Compliance Data and Information". The most recent version of the *Run-on and Run-off Control System Plan*, along with any revisions or amendments will be maintained on this website in accordance with §257.107(g)(3).

Required information must be posted to the CCR website within 30 days of being entered into the facility's operating record, and must be available to the public for a minimum of five years.

Figures



N

0 2000' 4000'

SCALE: 1"= 4000'

OWNER: nrg

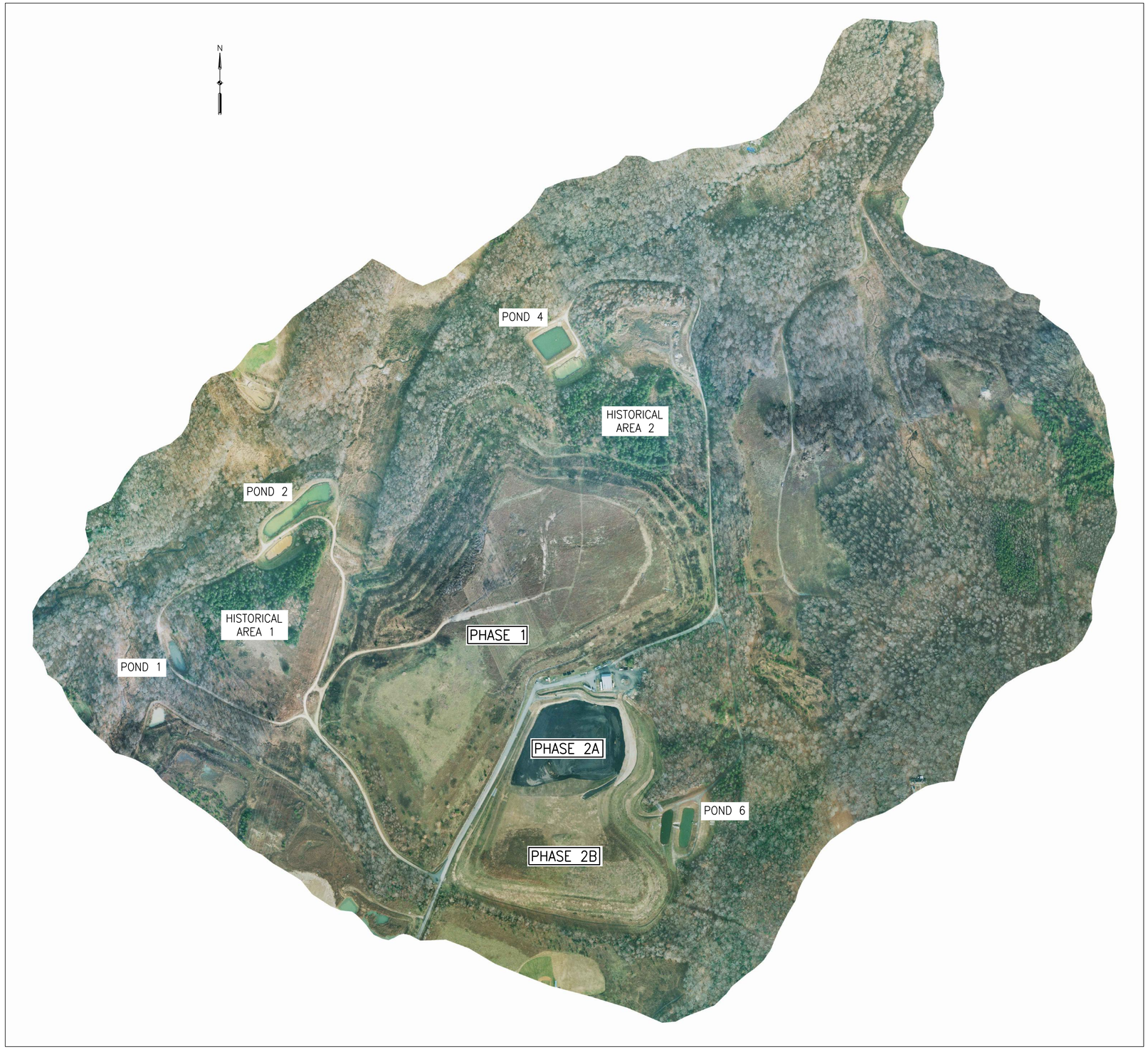
BRANDYWINE ASH MANAGEMENT FACILITY

SITE LOCATION MAP

PREPARED BY: AECOM

12420 MILESTONE CENTER DRIVE, SUITE 150
GERMANTOWN, MD 20876
TEL: 301.820.3000 FAX: 301.820.3009

	CHECKED BY:	PROJECT No.:	DATE:	FIGURE No.:
	JRH	60429240	09/2016	1



SITE LOCATION MAP
SCALE: NTS

OWNER:

NRG MD ASH MANAGEMENT LLC
25100 CHALK POINT ROAD
AQUASCO MD, 20608

ISSUED FOR BIDDING — DATE — BY

ADDENDUM REVISIONS

ADDENDUM NO	ADDENDUM DATE	BY

ISSUED FOR CONSTRUCTION — DATE — BY

CONSTRUCTION REVISIONS

NO.	DESCRIPTION	DATE	BY

RECORD DRAWINGS — DATE — BY

PREPARED BY:

URS

12420 MILESTONE CENTER DRIVE
SUITE 150
GERMANTOWN, MD 20876
301-820-3000

DRAWN BY: OS	DATE SEP-2016
CHECKED BY: JRH	JOB #
APPROVED BY: JRH	SCALE:

GRAPHIC SCALE

NRG MD ASH MANAGEMENT LLC. BRANDYWINE ASH STORAGE SITE

SHEET TITLE
BRANDYWINE SITE AERIAL PHOTOGRAPH

DRAWING No.	PGSCD SHEET No.:
FIGURE-2	SHEET OF
	MDE SHEET No.:
	SHEET OF

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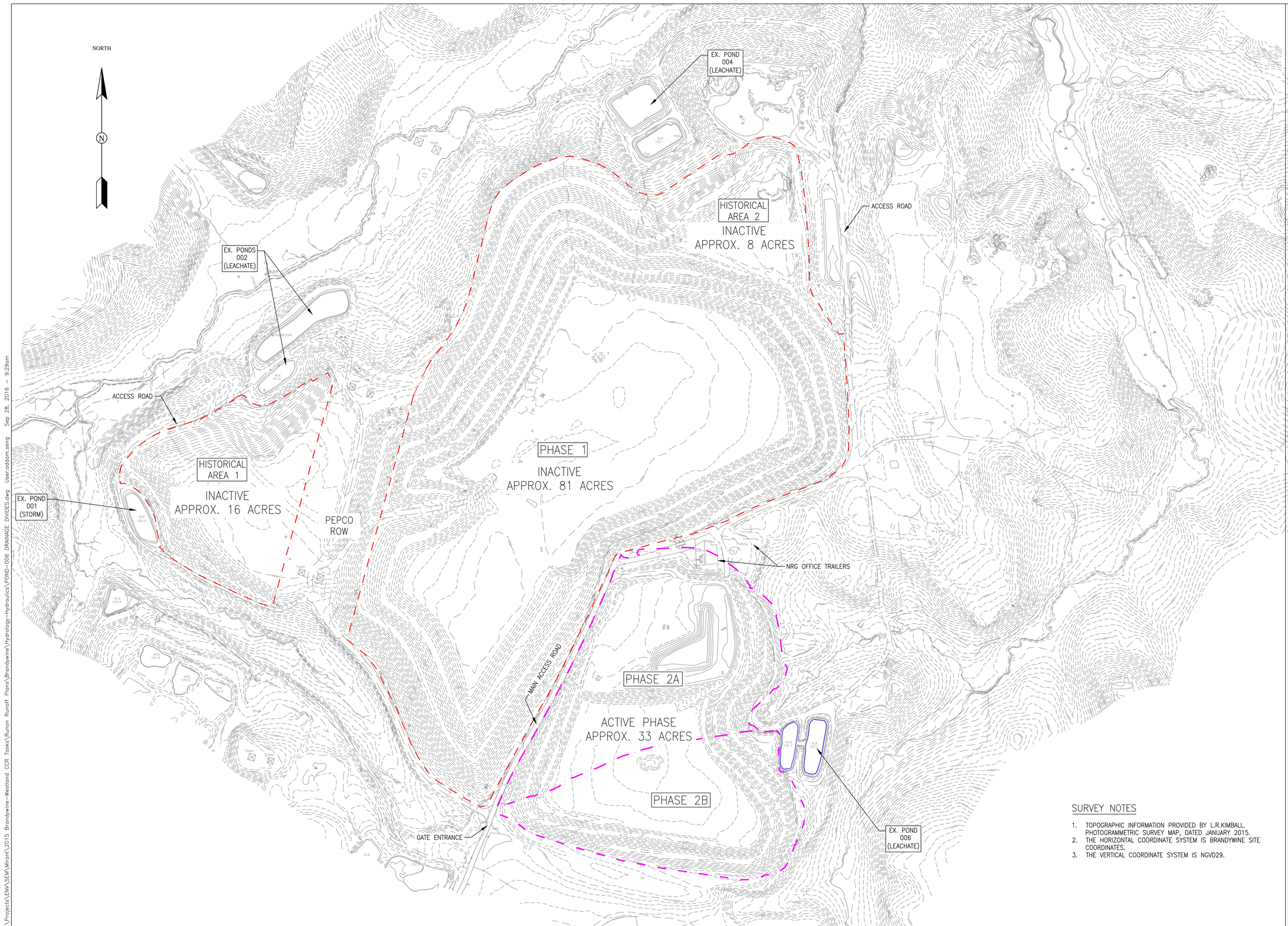

SURVEY NOTES

1. TOPOGRAPHIC INFORMATION PROVIDED BY L.R.KIMBALL. PHOTOGRAMMETRIC SURVEY MAP, DATED JANUARY 2015.
2. THE HORIZONTAL COORDINATE SYSTEM IS BRANDYWINE SITE COORDINATES.
3. THE VERTICAL COORDINATE SYSTEM IS NGVD29.

OWNER:

NRG MD ASH MANAGEMENT LLC
25100 CHALK POINT ROAD
AQUASCO MD, 20608

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ADDENDUM NO	ADDENDUM DATE	BY

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CONSTRUCTION REVISIONS

NO.	DESCRIPTION	DATE	BY

RECORD DRAWINGS — DATE — BY

PREPARED BY:

12420 MILESTONE CENTER DRIVE
SUITE 150
GERMANTOWN, MD 20876
301-820-3000

DRAWN BY: OS	DATE SEP-2016
CHECKED BY: JRH	JOB #
APPROVED BY: JRH	SCALE:

0 200 400
GRAPHIC SCALE 1"= 200'

NRG MD ASH MANAGEMENT LLC. BRANDYWINE ASH STORAGE SITE

SHEET TITLE
BRANDYWINE SITE LAYOUT PLAN

DRAWING No.
FIGURE-3

PGSCD SHEET No.: SHEET OF

MDE SHEET No.: SHEET OF

NORTH

PERIMETER DITCH

PHASE 1

ACTIVE CCR FILLING AREA

PHASE 2A
8 ACRES

MAIN ACCESS ROAD

STABILIZED AREA

PHASE 2B
25 ACRES

PERIMETER DITCH

PERIMETER DITCH

PERIMETER DITCH

POND 006
W.E. 198.3
W.E. 197.1

SECURITY GATE

Gate

Gate

Wall

Wall

Parking

Parking

Deck

Steps

W.E. 212.0

LEGEND

DRAINAGE FROM PHASE 1

DRAINAGE FLOW PATH BEYOND PHASE 2

OWNER:

nrg®

NRG MD ASH MANAGEMENT LLC
25100 CHALK POINT ROAD
AQUASCO MD, 20608

ISSUED FOR BIDDING	DATE	BY

ADDENDUM REVISIONS

ADDENDUM NO	ADDENDUM DATE	BY

ISSUED FOR CONSTRUCTION	DATE	BY

CONSTRUCTION REVISIONS

NO.	DESCRIPTION	DATE	BY

RECORD DRAWINGS	DATE	BY

PREPARED BY:

URS

12420 MILESTONE CENTER DRIVE
SUITE 150
GERMANTOWN, MD 20876
301-820-3000

DRAWN BY: OS	DATE SEP-2016
CHECKED BY: JRH	JOB #
APPROVED BY: JRH	SCALE:

0 80 160
1"= 80'
GRAPHIC SCALE

NRG MD ASH MANAGEMENT LLC. BRANDYWINE ASH STORAGE SITE

SHEET TITLE

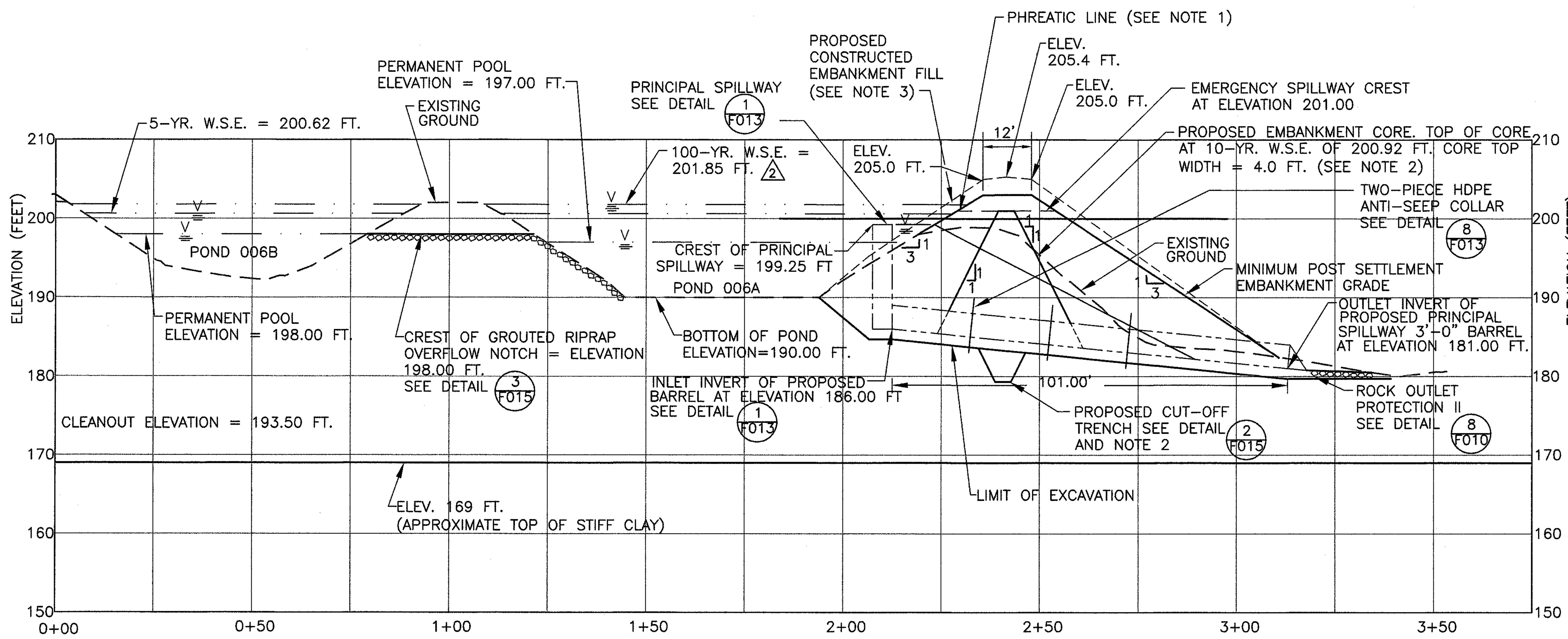
PHASE 2 SITE CONTOURS AND FEATURES

DRAWING No.	PGSCD SHEET No.: SHEET OF
FIGURE-4	MDE SHEET No.: SHEET OF

Q:\Projects\ENV\SEM\Mirant\2015 Brandywine-Westland CCR Tasks\Runon Runoff Plans\Brandywine\Hydrology-Hydraulics\POND-006 DRAINAGE DIVIDES.dwg Usercoddam.sering Sep 29, 2016 - 10:36am

Appendix A

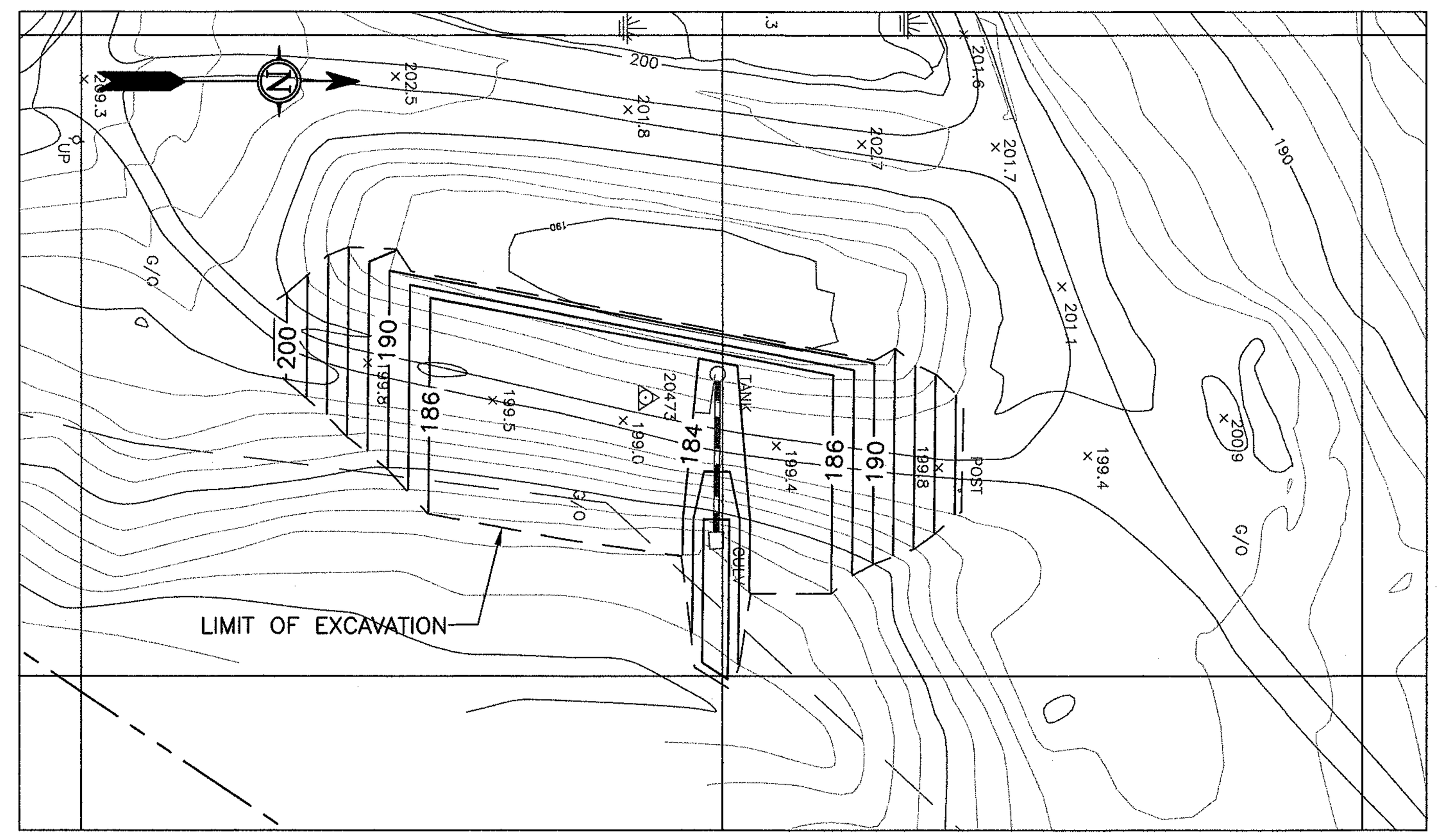
Stormwater Management Exhibits



SECTION A/F012

VERT: SCALE 1"=10' 10 0 10

HORZ: SCALE 1"=20' 20 0 20



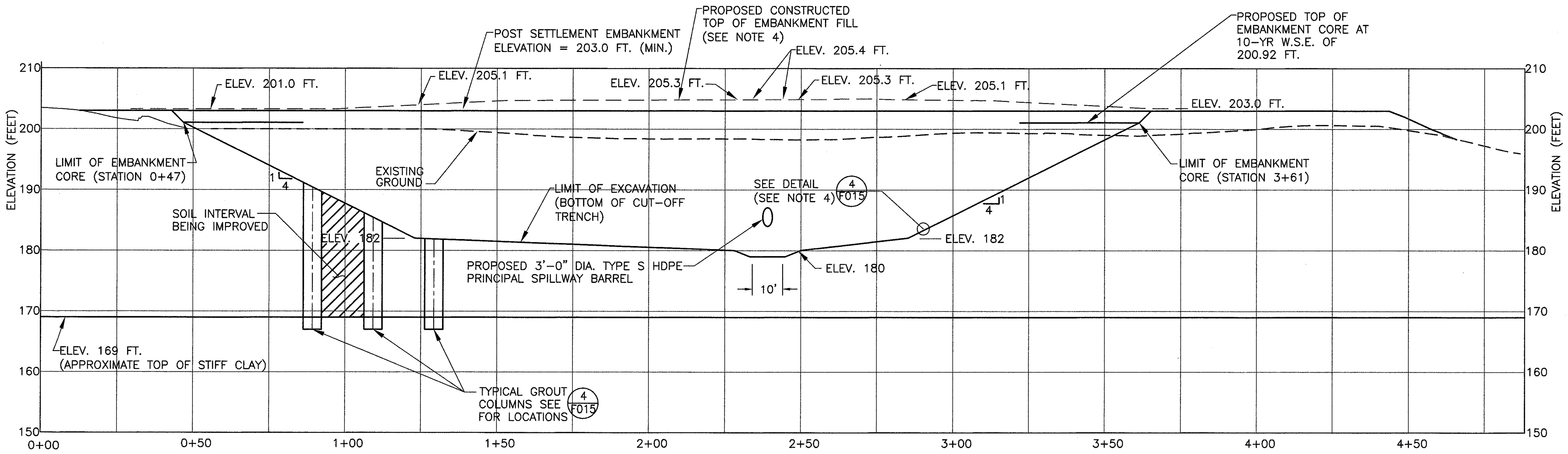
DETAIL 1/F015

PLAN OF PROPOSED EMBANKMENT EXCAVATION

SCALE 1"=50' 50 0 50 100

GENERAL NOTES:

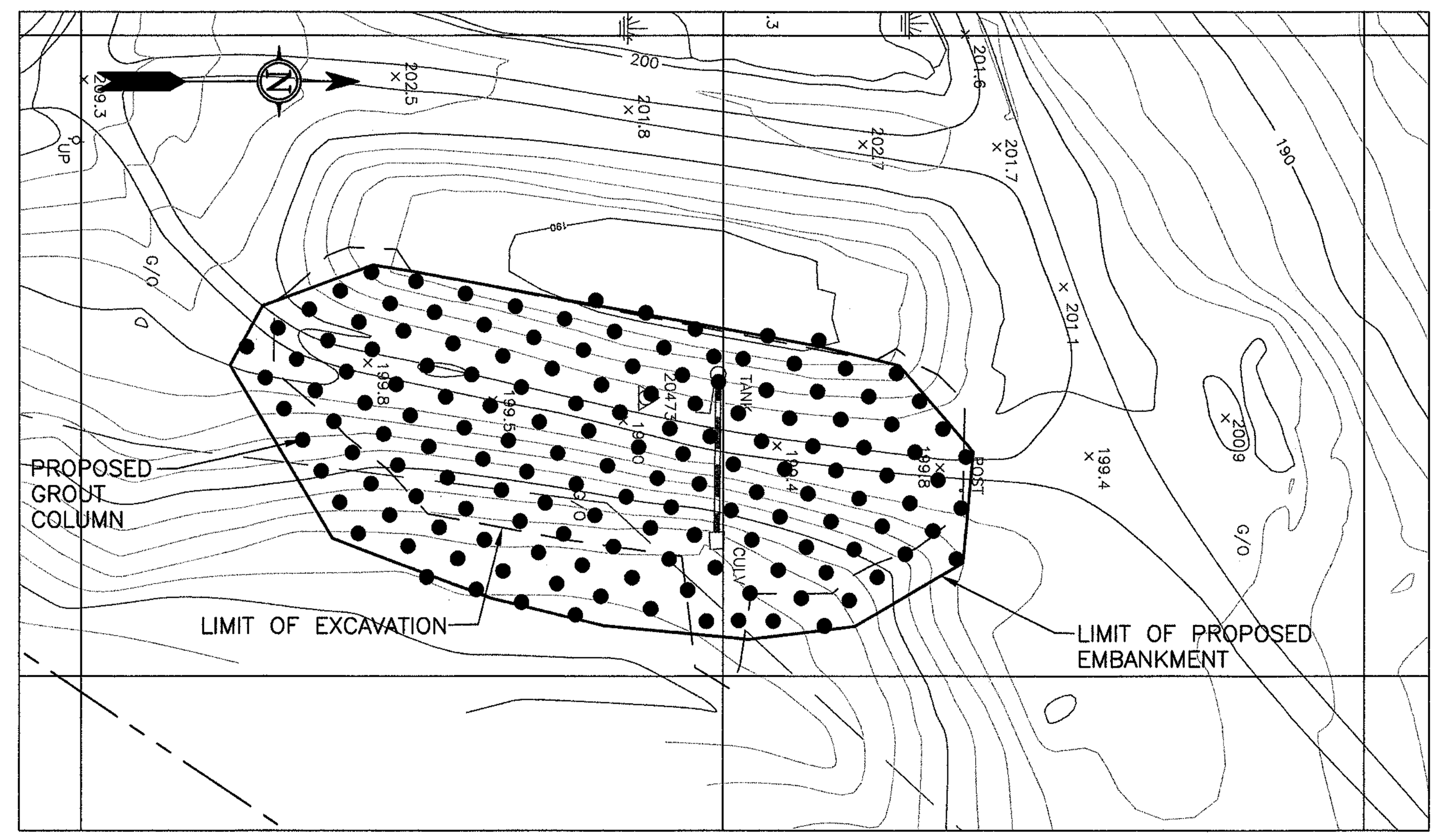
1. PHREATIC LINE BASED ON SATURATION ZONE LENGTH DETERMINED IN ANTI-SEEP COLLAR DESIGN CALCULATIONS.
2. THE CUT-OFF TRENCH AND EMBANKMENT CORE SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWING, AND SHALL CONSIST OF SOIL CONFORMING TO UNIFIED SOIL CLASSIFICATION GC, SC, CH, OR CL, AND HAVE AT LEAST 30% PASSING THE #200 SIEVE.
3. THE ADDITIONAL/REPLACEMENT EMBANKMENT FILL SHALL BE PLACED 10 PERCENT HIGHER THAN THE MINIMUM DESIGN EMBANKMENT ELEVATION OF 203.0 TO ALLOW FOR SETTLEMENT.
4. THE EMBANKMENT FILL SHALL BE KEYED INTO THE EXCAVATED SIDESLOPES ON 4-FOOT WIDE BENCHES.



SECTION B/F012

VERT: SCALE 1"=10' 10 0 10

HORZ: SCALE 1"=20' 20 0 20



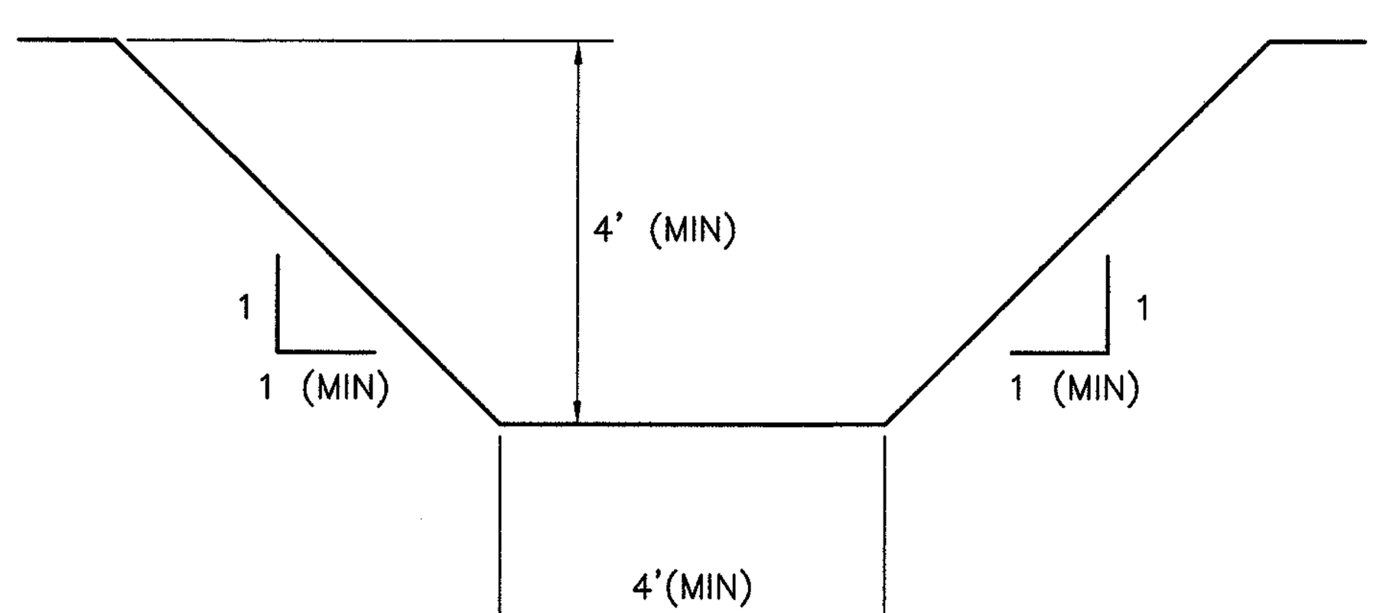
DETAIL 4/F015

PLAN OF PROPOSED GROUT COLUMNS

SCALE 1"=50' 50 0 50 100

NOTE:

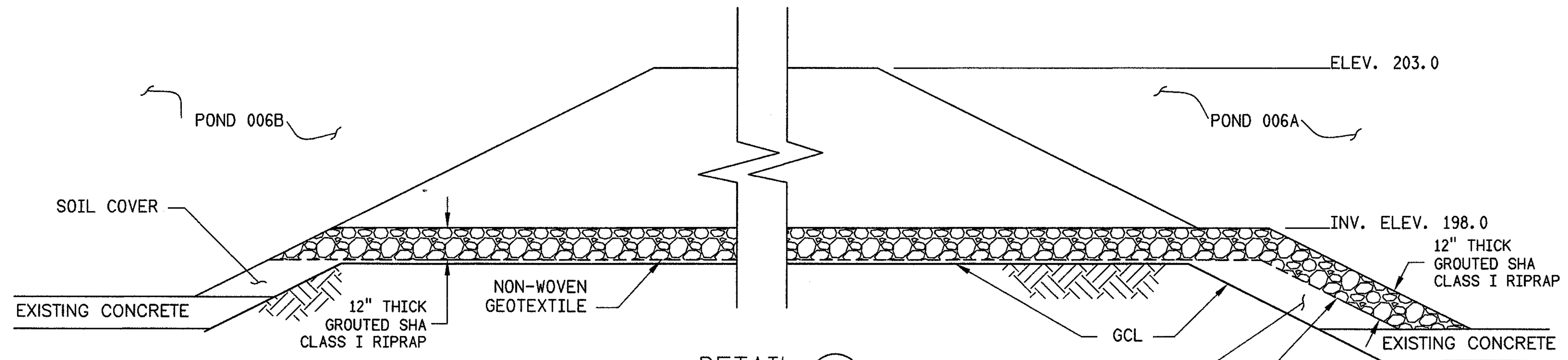
REFER TO DRAWING F017 FOR GROUT COLUMN CONSTRUCTION SPECIFICATIONS.



DETAIL 2/F015

CUT-OFF TRENCH

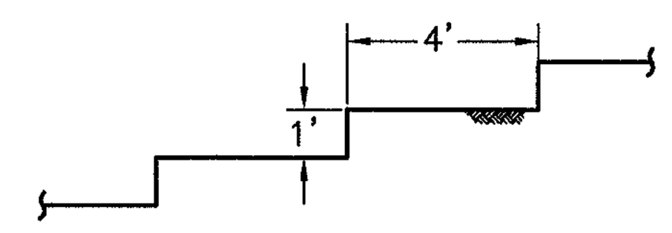
SCALE: 1"=2'



DETAIL 3/F012, F015

POND 006 OVERFLOW NOTCH

SCALE: N.T.S.



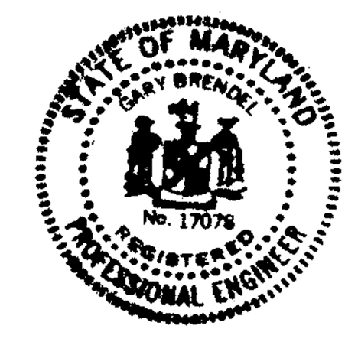
DETAIL 4/F015

BENCH KEY

SCALE: 1"=4'

EXHIBIT 1

This drawing was produced with computer aided drafting technology and is supported by electronic drawing files. Do not revise this drawing via manual drafting methods.



NO.	DATE	DWN	CHKD	APPVD	DESCRIPTION
2	10/29/09	IP	ALD	MRL	REVISIONS DUE TO REVISED PRINCIPAL SPILLWAY RISER
1	8/24/09	JAR	ALD	MRL	REVISED LIMITS OF EXCAVATION, ADDED LIMIT OF EMBANKMENT CORE LOCATIONS AND DETAIL 4.

REVISIONS

SEDIMENTATION POND 006 MODIFICATION PLAN
GRADING, EROSION AND SEDIMENT CONTROL PLAN
BRANDYWINE POZZOLAN STORAGE SITE PHASE 2 EXPANSION
BRANDYWINE, MARYLAND

MIRANT MARYLAND ASH MANAGEMENT, LLC
LANDOVER, MARYLAND

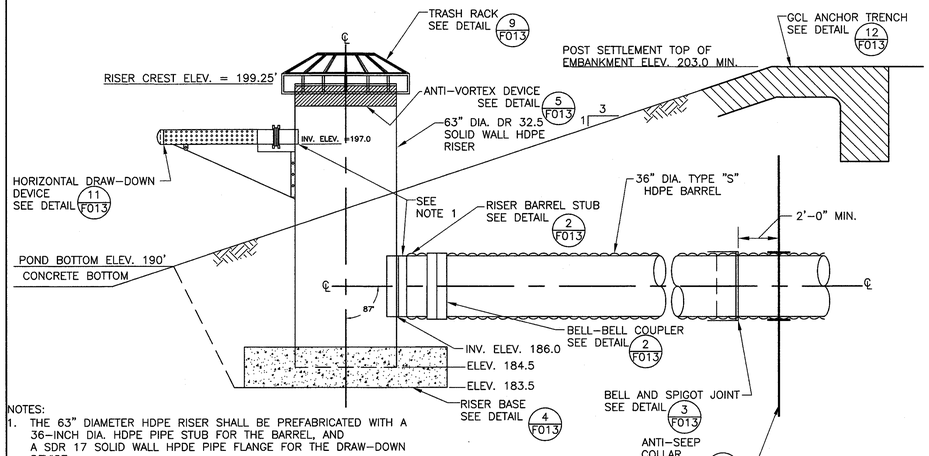
gai consultants

DRAWN JCN | APPROVED MRL
CHECKED AMH | DATE 8/5/09
TASK NO. 000
PROJECT NO./DASH NO. C040495-80
DRAWING NO. E-F015
SCALE: AS SHOWN SHT. NO. 13 OF 17 REV 2

PITTSBURGH OFFICE • 385 EAST WATERFRONT DRIVE, HOMESTEAD, PA 15120-5005

GAI DRAWING FILE NO. C040495-80-000-00-E-F015

GAI CAD FILE: P:\PIT\2004\2004-495\D80\CAD\C040495-80-000-00-E-F015.dwg 3/17/2009

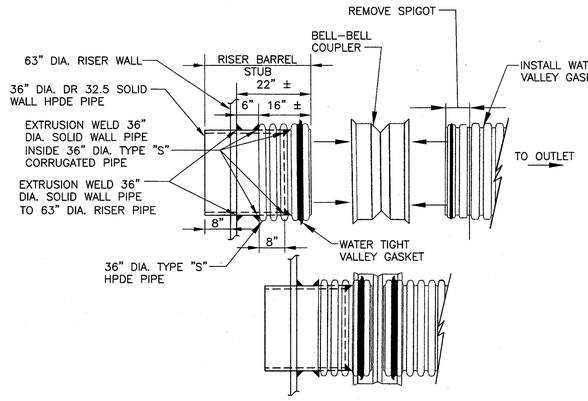


NOTES:
1. THE 63" DIAMETER HDPE RISER SHALL BE PREFABRICATED WITH A 36-INCH DIA. HDPE PIPE STUB FOR THE BARREL, AND A SDR 17 SOLID WALL HPDE PIPE FLANGE FOR THE DRAW-DOWN DEVICE.
2. CONSTRUCTION SPECIFICATIONS FOR THE PREFABRICATED RISER STRUCTURE, THE HORIZONTAL DRAW-DOWN DEVICE, AND THE BARREL INSTALLATION ARE IN THE PRINCIPAL SPILLWAY CONSTRUCTION SPECIFICATION ON DRAWING F014.

DETAIL 1 F015

PRINCIPAL SPILLWAY 3

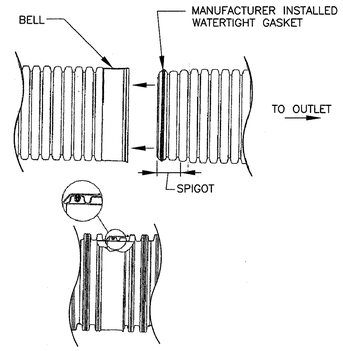
SCALE: N.T.S.



DETAIL 2 F013

RISER BARREL STUB AND BELL-BELL COUPLER 3

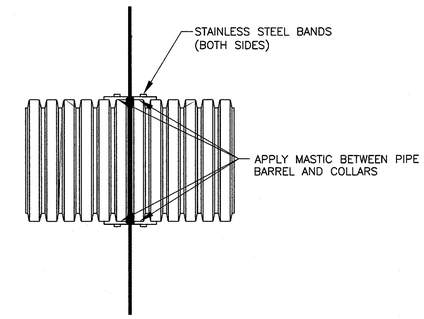
SCALE: N.T.S.



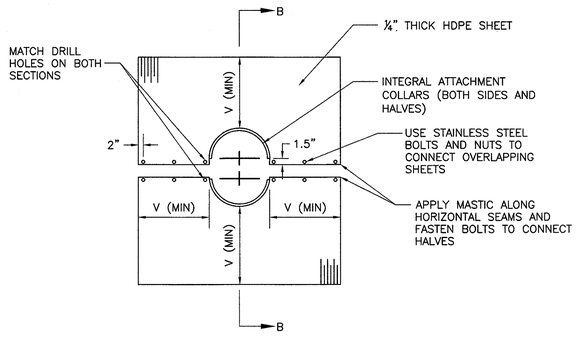
DETAIL 3 F013

BELL AND SPIGOT JOINT

SCALE: N.T.S.



SECTION B-B



NOTES:
1. COLLARS SHALL BE PLACED TO INCREASE THE SEEPAGE LENGTH ALONG THE CONDUIT BY A MINIMUM OF 15% OF THE PIPE LENGTH LOCATED WITHIN THE SATURATION ZONE.
2. COLLAR SPACING SHALL BE BETWEEN 5 AND 14 TIMES THE VERTICAL PROJECTION OF EACH COLLAR.
3. COLLARS SHOULD BE PLACED WITHIN THE SATURATION ZONE. IN CASES WHERE SPACING LIMIT WILL NOT ALLOW THIS, AT LEAST ONE COLLAR SHALL BE PLACED IN THE SATURATION ZONE.
4. APPLY TAR OR MASTIC TO BOTTOM HALF OF COLLAR AND LAY BARREL ON COLLAR. APPLY MASTIC TO TOP HALF OF COLLAR AND SET IN PLACE AND BOLT HALVES TOGETHER. INSTALL STEEL BANDS ON SPLIT HALVES OF COLLAR. TIGHTEN BOLTS AND BANDS. APPLY MASTIC AS NEEDED TO ENSURE GOOD SEAL.
5. ANTI-SEEP COLLARS SHALL BE PLACED A MINIMUM OF 2' FROM PIPE JOINTS, AND 4' FROM RISER.
6. ANTI-SEEP COLLARS MUST HAVE 2' MINIMUM PROJECTION.

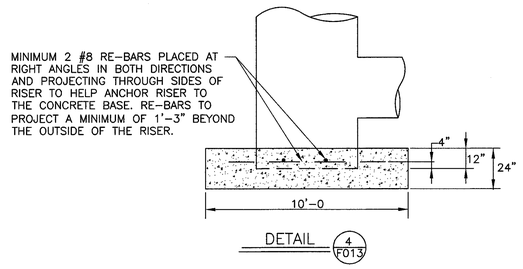
POND	Ls (PI)	VERTICAL PROJECTION V (FT.)	NUMBER	SPACING (FT.)
006A	77	2	3	10 TO 28

Ls IS THE LENGTH OF PIPE WITHIN SATURATION ZONE MEASURED FROM RISER.

DETAIL 8 F013, F015

TWO-PIECE HPDE ANTI-SEEP COLLAR 3

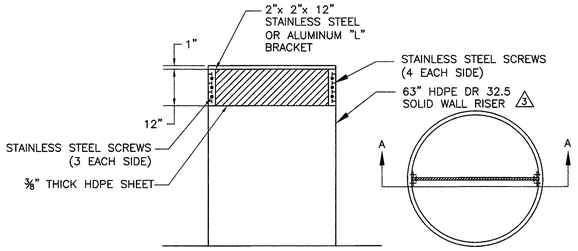
SCALE: N.T.S.



DETAIL 4 F013

RISER BASE

SCALE: N.T.S.

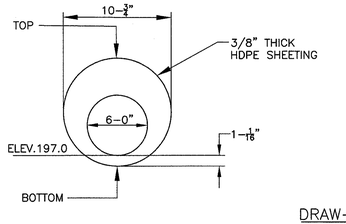


SECTION A-A

DETAIL 5 F013

ANTI-VORTEX DEVICE

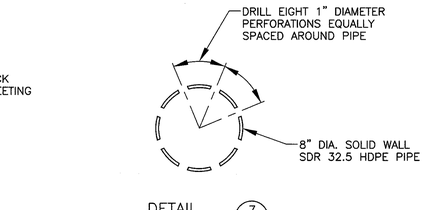
SCALE: N.T.S.



DETAIL 6 F013

HDPE ECCENTRIC ORIFICE PLATE

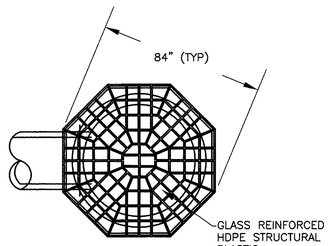
SCALE: N.T.S.



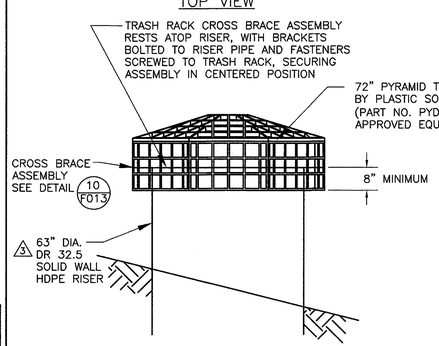
DETAIL 7 F013

DRAW-DOWN DEVICE PERFORATED SECTION 3

SCALE: N.T.S.



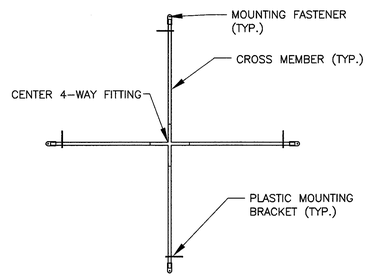
TOP VIEW



DETAIL 9 F013

72" PYRAMID TRASH RACK

SCALE: N.T.S.



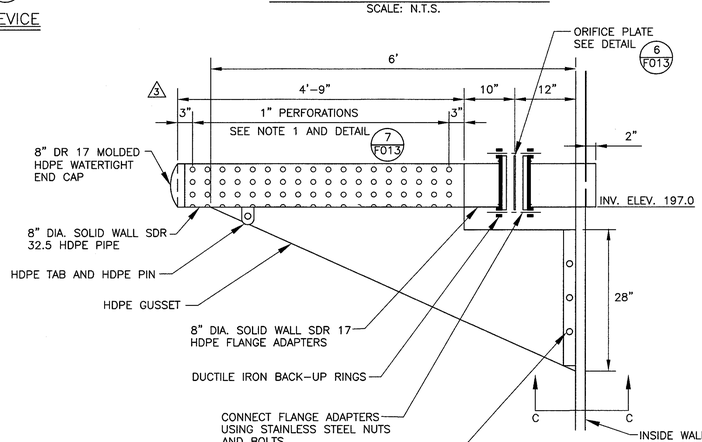
TRASH RACK INSTALLATION INSTRUCTIONS USING THE MANUFACTURER'S MOUNTING KIT

1. ASSEMBLE THE CROSS BRACE ASSEMBLY BY PLACING THE PLASTIC MOUNTING BRACKETS (4) ONTO THE CROSS MEMBERS.
2. ATTACH THE CROSS MEMBERS AND MOUNTING FASTENERS TO THE CENTER 4-WAY FITTING, AND TIGHTEN THE SET SCREWS.
3. MOUNT THE CROSS BRACE ASSEMBLY TO THE TRASH RACK USING THE PROVIDED 1/4"x20 SCREWS. SCREW THE MOUNTING FASTENERS TO THE TRASH RACK USING THE PRE-DRILLED HOLES ON THE SECOND GRID OF THE TRASH RACK FROM THE BOTTOM OF THE TRASH RACK SIDES.
4. CENTER THE TRASH RACK ON THE RISER PIPE WITH THE BOTTOM OF THE CROSS MEMBERS SITTING ON THE TOP OF THE PIPE.
5. SECURE THE MOUNTING BRACKETS TO THE OUTSIDE OF THE PIPE (A PILOT HOLE MAY BE REQUIRED) USING THE (8) PROVIDED LAG BOLTS.

DETAIL 10 F013

CROSS BRACE ASSEMBLY

SCALE: N.T.S.

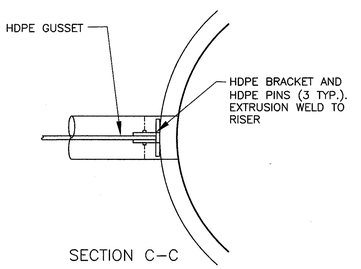


NOTES:
1. DRILL 18 ROWS OF 1 INCH DIAMETER HOLES SPACED AT 3 INCHES CENTER TO CENTER. EACH ROW WILL HAVE 8 PERFORATIONS SPACED EQUALLY AROUND THE PIPE.

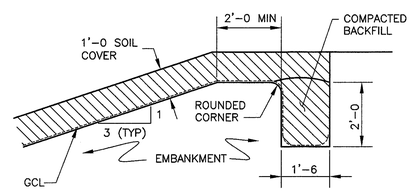
DETAIL 11 F013

HORIZONTAL DRAW-DOWN DEVICE 3

SCALE: N.T.S.



SECTION C-C



DETAIL 12 F013

GCL ANCHOR TRENCH

SCALE: N.T.S.

This drawing was produced with computer aided drafting technology and is supported by electronic drawing files. Do not revise this drawing via manual drafting methods.

EXHIBIT 2

NO.	DATE	DWN	CHKD	APPVD	DESCRIPTION
3	10/29/09	IP	ALD	MRL	REVISED DETAILS
2	8/5/09	JCN	AMH	MRL	REVISED DETAILS AND ADDED NEW DETAILS. REVISED TOTAL NUMBER OF SHEETS.
1	3/6/09	EJM	MRL	GFB	MISC. REVISIONS MADE TO DRAWING

REVISIONS

STATE OF MARYLAND — GARY F. BRUNDAGE — No. 17074 — REGISTERED PROFESSIONAL ENGINEER

Gary F. Brundage 10/29/09

SEDIMENTATION POND 006 MODIFICATION DETAILS
GRADING, EROSION AND SEDIMENT CONTROL PLAN
BRANDYWINE POZZOLAN STORAGE SITE PHASE 2 EXPANSION
BRANDYWINE, MARYLAND

MIRANT MARYLAND ASH MANAGEMENT, LLC
UPPER MARLBORO, MARYLAND

gai consultants

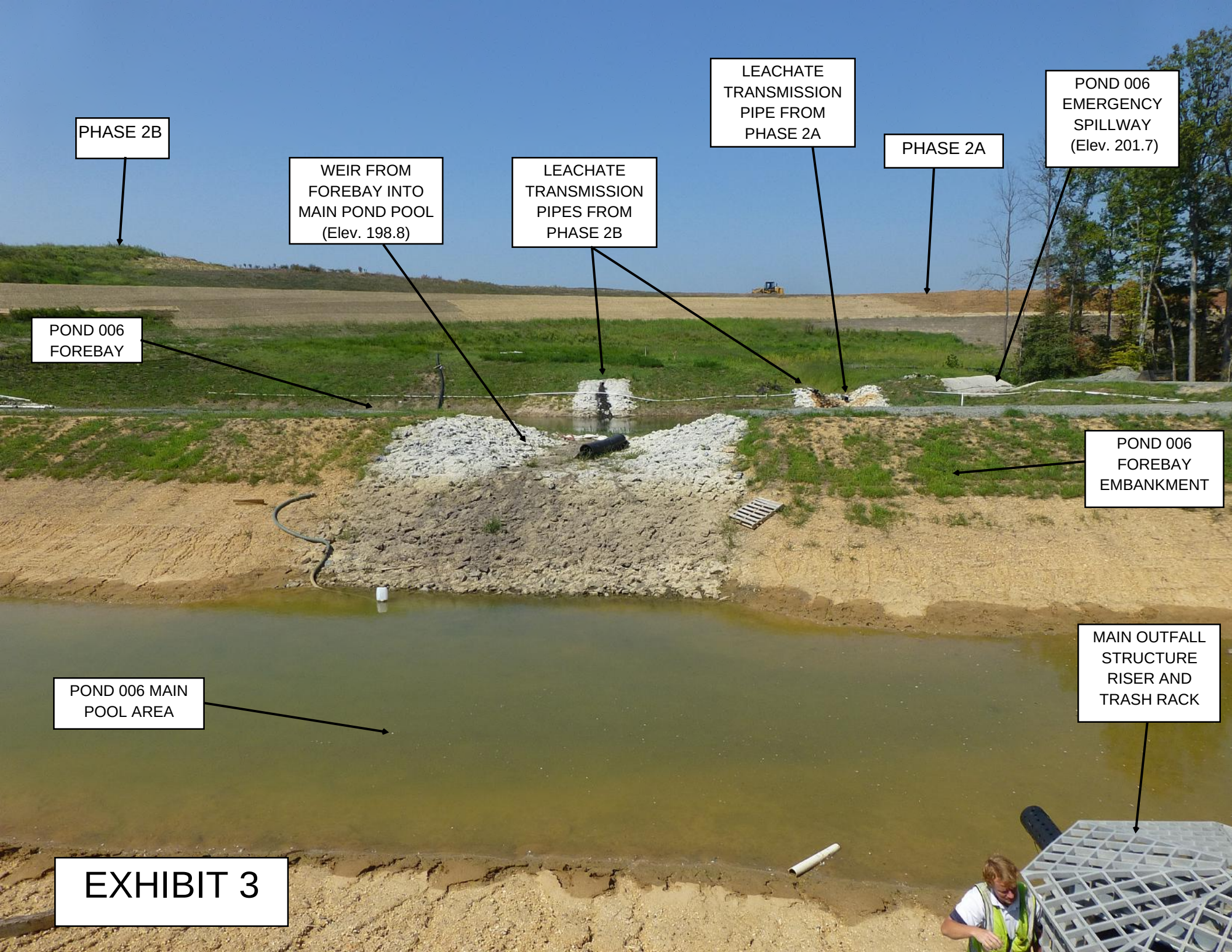
DRAWN AMT | APPROVED GFB
CHECKED MRL | DATE 1/13/09
TASK NO. 000
PROJECT NO./DASH NO. C040495-80
DRAWING NO. E-F013 | 3 REV
SCALE: AS SHOWN | SHT. NO. 14 OF 17

PITTSBURGH OFFICE • 385 EAST WATERFRONT DRIVE, HOMESTEAD, PA 15120-5005

GAI DRAWING FILE NO. C040495-80-000-00-E-F013

PLOTTER FILE: DATE/MONTH/DAY, COLOR.CTB

GAI CAD FILE: P:\PIT\2004\2004-495\DBD\CADD\C040495-80-000-00-E-F013.dwg 8/13/2008


PHASE 2B
WEIR FROM FOREBAY INTO MAIN POND POOL (Elev. 198.8)
LEACHATE TRANSMISSION PIPES FROM PHASE 2B
LEACHATE TRANSMISSION PIPE FROM PHASE 2A
PHASE 2A
POND 006 EMERGENCY SPILLWAY (Elev. 201.7)
POND 006 FOREBAY
POND 006 FOREBAY EMBANKMENT
POND 006 MAIN POOL AREA
MAIN OUTFALL STRUCTURE RISER AND TRASH RACK
EXHIBIT 3

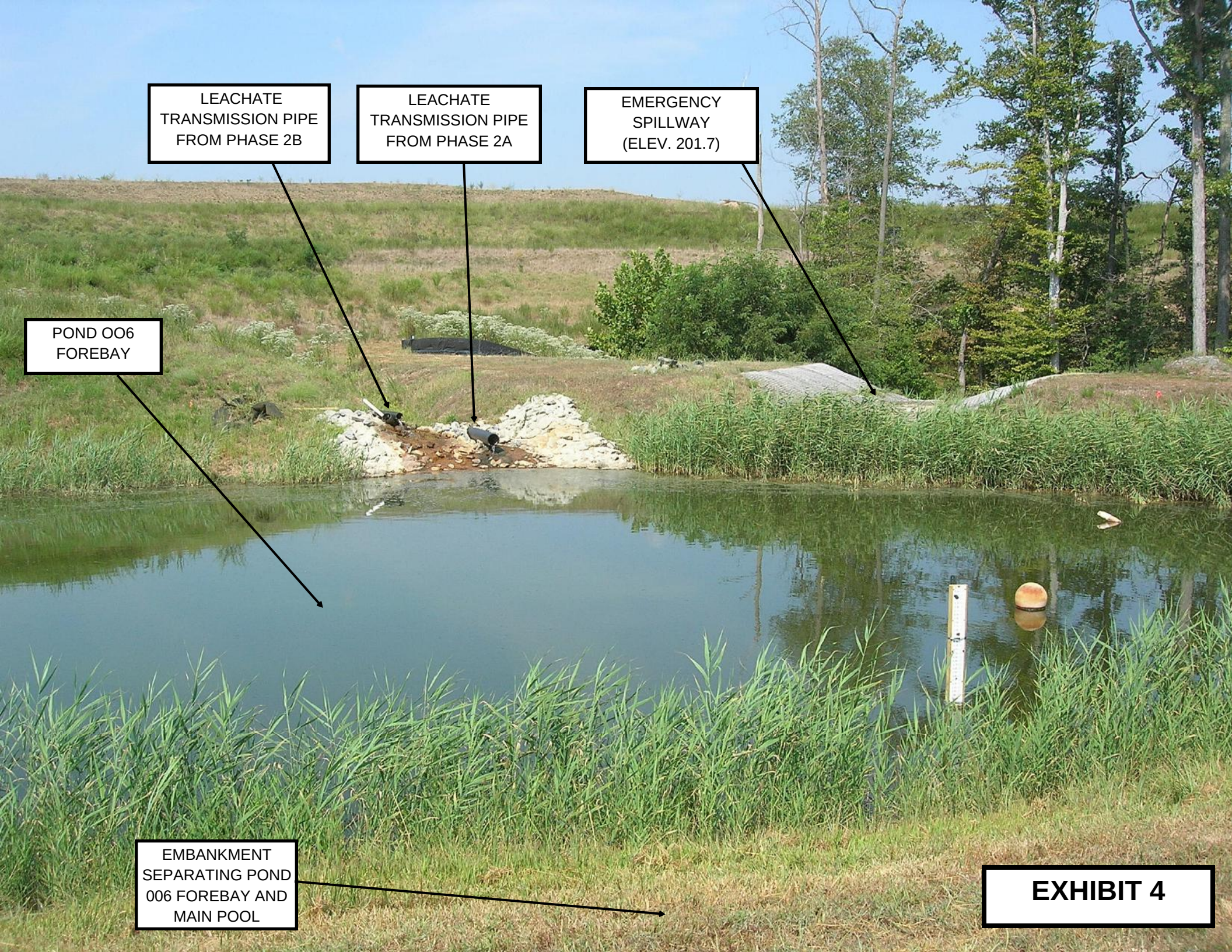
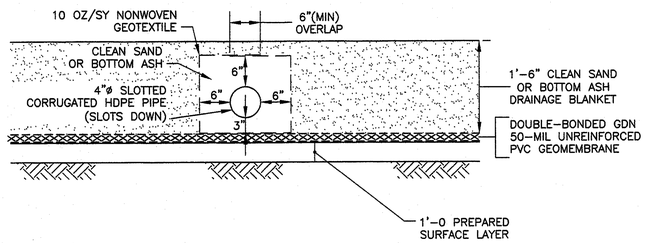

LEACHATE TRANSMISSION PIPE FROM PHASE 2B
LEACHATE TRANSMISSION PIPE FROM PHASE 2A
EMERGENCY SPILLWAY (ELEV. 201.7)
POND OO6 FOREBAY
EMBANKMENT SEPARATING POND 006 FOREBAY AND MAIN POOL

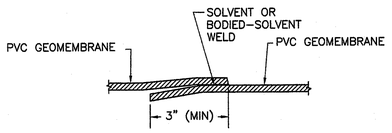
EXHIBIT 4



DETAIL 1 F003,F006

PHASE 2 LINER SYSTEM

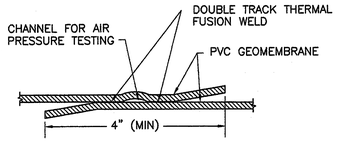
SCALE: N.T.S



DETAIL 2 F007

PVC GEOMEMBRANE LAP WELD

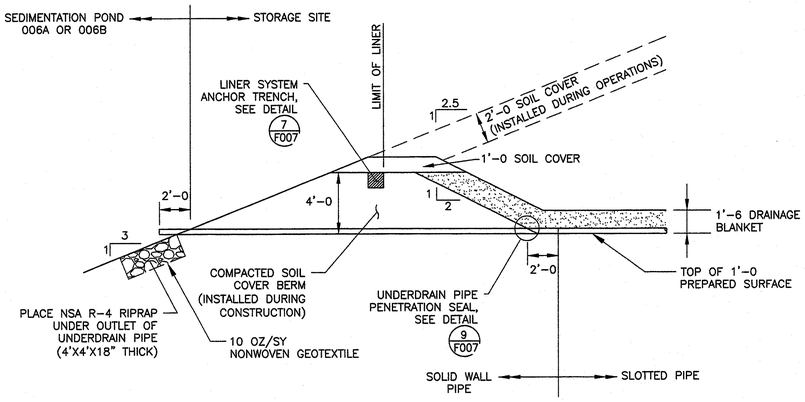
SCALE: N.T.S



DETAIL 3 F007

PVC GEOMEMBRANE DOUBLE WEDGE WELD

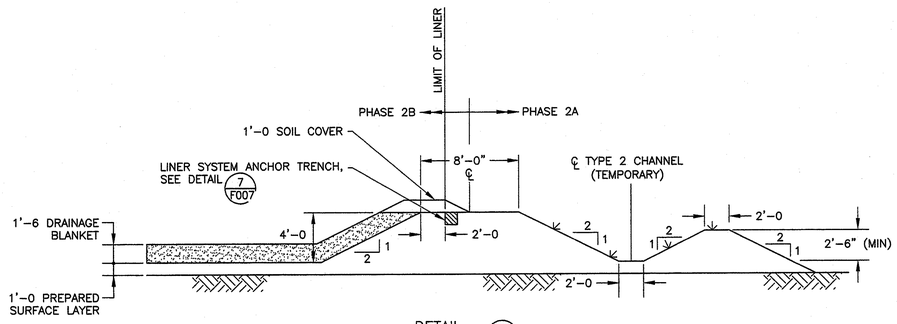
SCALE: N.T.S



DETAIL 4 F003,F004

PHASE 2 TOE DETAIL (AT UNDERDRAIN PIPE OUTLET LOCATIONS)

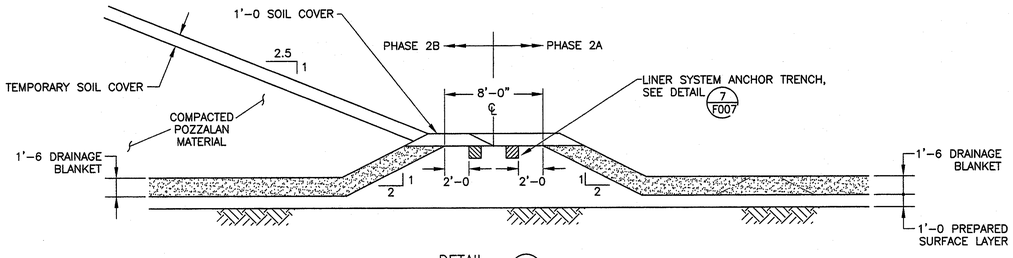
SCALE: 1"=4'



DETAIL 5 F003,F006

PHASE 2A/2B SEPARATOR BERM (DURING PHASE 2B CONSTRUCTION)

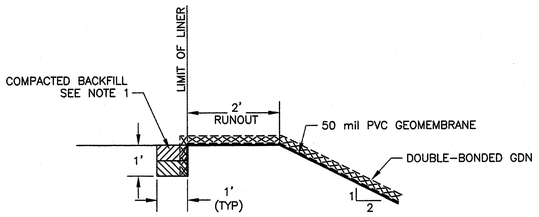
SCALE: 1"=5'



DETAIL 6 F004,F006

PHASE 2A/2B SEPARATOR BERM (DURING PHASE 2A CONSTRUCTION)

SCALE: 1"=5'



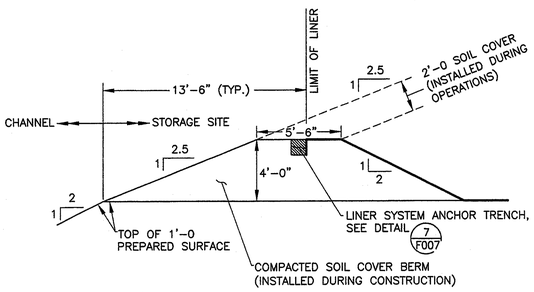
NOTES:

1. PLACE COMPACTED BACKFILL IN TWO 6- INCH LIFTS AND COMPACT TO (MIN) 93% MAXIMUM DRY DENSITY (ASTM D698)
2. CONTRACTOR TO CONSTRUCT "DAYLIGHT TRENCHES" TO PREVENT ANCHOR TRENCHES FROM FILLING WITH WATER DURING GEOMEMBRANE INSTALLATION.

DETAIL 7 F007

LINER SYSTEM ANCHOR TRENCH

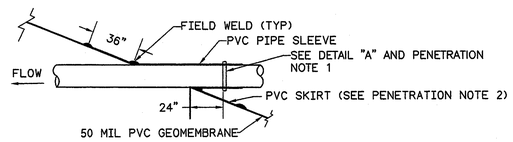
SCALE: N.T.S



DETAIL 8 F003,F004

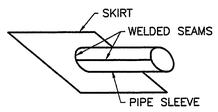
LINER TERMINATION IN AREAS WITH NO BERM

SCALE: 1"=4'

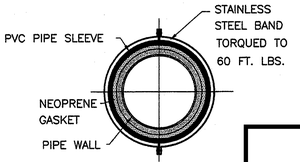


PENETRATION NOTES:

1. USE ONE STAINLESS STEEL BAND PER PIPE PENETRATION SEAL.
2. SKIRT IS TO EXTEND 36 INCHES BEYOND PIPE IN ALL DIRECTIONS.



ISOMETRIC VIEW



DETAIL "A"

DETAIL 9 F007

UNDERDRAIN PIPE PENETRATION SEAL

SCALE: N.T.S

EXHIBIT 5

This drawing was produced with computer aided drafting technology and is supported by electronic drawing files. Do not revise this drawing via manual drafting methods.

LINER SYSTEM DETAILS
BRANDYWINE POZZOLAN STORAGE SITE PHASE 2 EXPANSION
BRANDYWINE, MARYLAND

MIRANT MID-ATLANTIC, LLC
UPPER MARLBORO, MARYLAND

STATE OF MARYLAND — GARY F. BOUNDEL — No. 17076 — REGISTERED PROFESSIONAL ENGINEER — 6/14/07

NO.	DATE	DWN	CHKD	APPVD	DESCRIPTION
1	6/14/07	MAM	RH	GFB	REVISED DETAILS 4, 5, 6 AND 8 TO REFLECT PHASE 2B CONSTRUCTION FIRST

REVISIONS

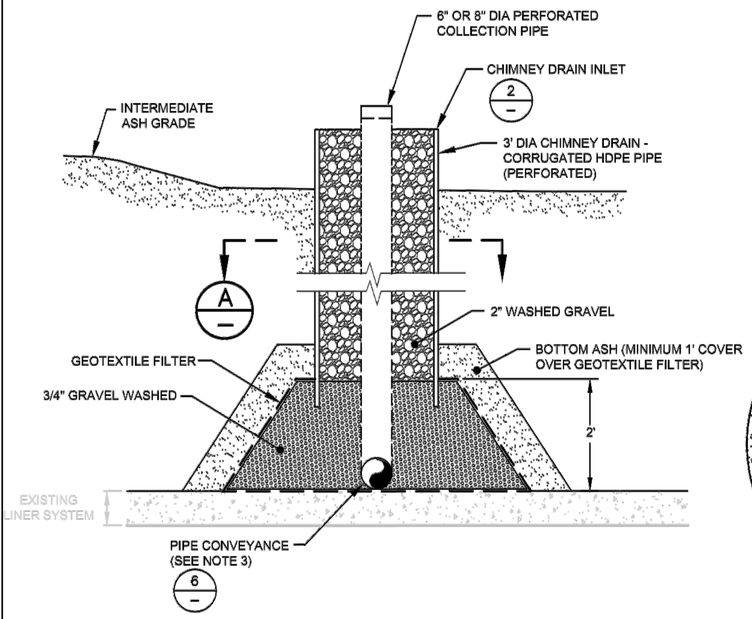
gai consultants

PITTSBURGH OFFICE • 385 EAST WATERFRONT DRIVE, HOMESTEAD, PA 15120-5005

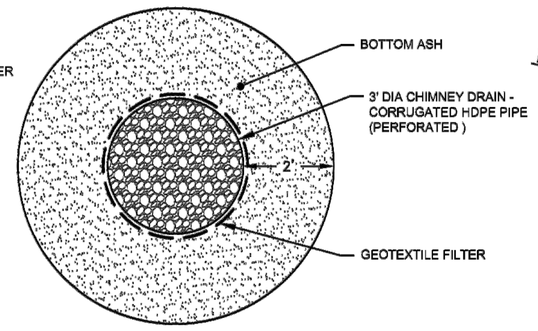
DRAWN EJM | APPROVED GFB
CHECKED RCB | DATE 7/26/06
TASK NO. 00
PROJECT NO./DASH NO. 2004-495-40
DRAWING NO. E-F007
SCALE: AS SHOWN | SHT. NO. 7 OF 9 | REV 1
GAI DRAWING FILE NO. 2004-495-40-E-F007

PLOTTER FILE: BRANDYWINE_COLOR.CTB

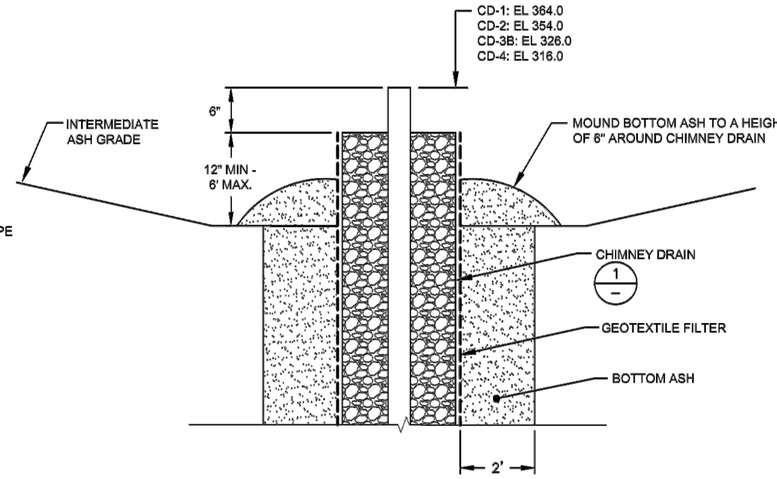
GAI CAD FILE: P:\2004\2004-495\640\BRANDYWINE\dwg\2004-495-40-00-E-F007 REV 1.dwg 6/28/2006



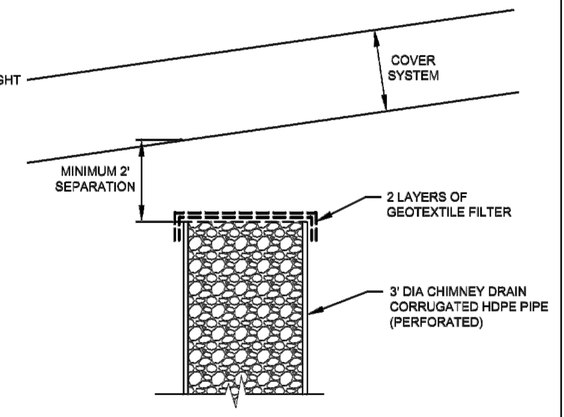
1 — SECTION
CHIMNEY DRAIN
SCALE: NTS
(NOTE 1)



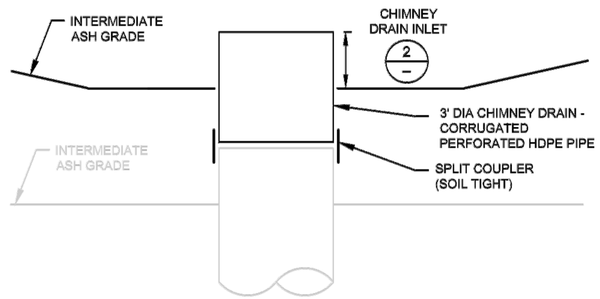
A — SECTION
CHIMNEY DRAIN
SCALE: NTS



2 — DETAIL (TYP)
CHIMNEY DRAIN INLET
SCALE: NTS



3 — DETAIL (TYP)
CHIMNEY DRAIN ABANDONMENT
SCALE: NTS
(NOTE 2)



5 — DETAIL
CHIMNEY DRAIN EXTENSION
SCALE: NTS
(NOTE 1)

EXHIBIT 6

Details by Geosyntec, Columbia, Maryland. Used with permission from NRG, 9/2016

Appendix B

Stormwater Management Supporting Calculations
Phase 2A Pipe Flow Calculations

N 377,000 | N 377,250 | N 377,500 | N 377,750 | N 378,000 | N 378,250 | N 378,500

E 1,367,750 | E 1,368,000 | E 1,368,250 | E 1,368,500 | E 1,368,750 | E 1,369,000

EXISTING PHASE 1 AREA

EXISTING HAUL ROAD

4"ø UNDERDRAIN PIPE

CHANNEL M

GROUNDWATER UNDERDRAIN PIPE SEE DETAIL 7/F010

INLET INV. EL. 232.0

CULVERT NO. 4 SEE DETAIL 10/F010

OUTLET INV. EL.231.0

ROCK OUTLET PROTECTION II SEE DETAIL 8/F010

2% (TYP.)

PHASE 2A

PHASE 2B

PHASE 2A DISTURBED AREA = 22.3 ACRES

BUILDINGS TO BE REMOVED BY OTHERS

CHANNEL P TYPE 3 CHANNEL SEE DETAIL 1/F010

ROCK OUTLET PROTECTION III SEE DETAIL 9/F010

RIP-RAP INFLOW PROTECTION SEE DETAIL 4/F010

CHANNEL N TYPE 3 CHANNEL RIP-RAP SECTION SEE DETAIL 2/F010

POND 006B

POND 006A

EXISTING SEDIMENTATION PONDS (SEE NOTE 2)

CHANNEL Q TYPE 3 CHANNEL SEE DETAIL 1/F010

NOTES:

1. PROPOSED CONTOURS SHOWN REPRESENT TOP OF 1-FOOT PREPARED SURFACE (PHASE 2A).
2. FULL PLAN VIEW OF THE EXISTING SEDIMENTATION PONDS AND THE PROPOSED POND MODIFICATIONS ARE SHOWN ON DETAIL 1/F012
3. FOR CHANNEL SCHEDULE, SEE DRAWING F010.

LEGEND

- 235 — EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- **235** — PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- UD — UNDERDRAIN PIPE
- UNDERDRAIN PIPE ENDCAP (TYP)
- RRP — RIP-RAP INFLOW PROTECTION
- GU — GROUND WATER UNDERDRAIN PIPE
- ROP — ROCK OUTLET PROTECTION
- PHASE 2A LIMIT OF DISTURBANCE
- SF — SILT FENCE 2/F007

MAP REFERENCES:

TOPOGRAPHIC MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS FROM AERIAL PHOTOGRAPHY EXPOSED 11/06/04. MAPPING PREPARED BY LAND AND MAPPING SERVICES, CLEARFIELD, PA IN APRIL 2005.

MAP CONTROL WAS DERIVED FROM CONVENTIONAL AND GLOBAL POSITION FIELD SURVEY TECHNIQUES PROVIDED BY LAND AND MAPPING SERVICES, CLEARFIELD, PA.

THE HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 83), MARYLAND, AND THE VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

EXISTING POND 006 TOPOGRAPHY HAS BEEN ADDED TO THE PLANS BASED ON SURVEY DATA RECEIVED FROM BEN DYER ASSOCIATES INC. VIA EMAIL ON NOVEMBER 14, 2008.

PROPERTY LINES WERE OBTAINED FROM SURVEY INFORMATION SUBMITTED BY BEN DYER ASSOCIATES INC. VIA EMAIL ON JULY 24, 2007

SCALE 1"=50'

50 0 50 100

This drawing was produced with computer aided drafting technology and is supported by electronic drawing files. Do not revise this drawing via manual drafting methods.

EXHIBIT B-1

NO.	DATE	DWN	CHKD	APPVD	DESCRIPTION
2	8/5/09	AMT	MRL	GFB	REVISED TOTAL NUMBER OF SHEETS AND REVISED LIMIT OF DISTURBANCE
1	3/6/09	EJM	MRL	GFB	ADDED PHASE 2A LIMIT OF DISTURBANCE AND LABELED CHANNEL M

REVISIONS

STATE OF MARYLAND — GARY F. BRENDEL — No. 17078 — REGISTERED PROFESSIONAL ENGINEER

Gary F. Brendel 8/5/09

PROPOSED PHASE 2A GRADING GRADING, EROSION AND SEDIMENT CONTROL PLAN BRANDYWINE POZZOLAN STORAGE SITE PHASE 2 EXPANSION BRANDYWINE, MARYLAND

MIRANT MARYLAND ASH MANAGEMENT, LLC LANDOVER, MARYLAND

gai consultants

DRAWN FJC | APPROVED GFB | CHECKED MRL | DATE 1/13/09 | TASK NO. 000 | PROJECT NO./DASH NO. C040495-80 | DRAWING NO. E-F004 | SCALE: 1"=50' | SHT. NO. 4 OF 17 | REV 2

PITTSBURGH OFFICE • 385 EAST WATERFRONT DRIVE, HOMESTEAD, PA 15120-5005

GAI DRAWING FILE NO. C040495-80-000-00-E-F004

PLOTTER FILE: D80SOMDA.ctb

GAI CAD FILE: P:\PITT\2004\2004-495\D80\CADD\C040495-80-000-00-E-F004.dwg 7/28/08

EXHIBIT B-2

PHASE 2A & POND 006 SUPPLEMENTAL CALCULATIONS

PHASE 2A LEACHATE FLOW INTO POND 006

24-Hr, 25-Yr Rainfall (in)(a)	Phase 2A Drainage Area (acres)(b)	Phase 2A Rainfall volume (CF)	Maximum Flow Rate (cfs)(c)	Time to Drain Rainfall Volume (min)	(hr) (d)
6.1	8.23	182,236.89	2	1,519	25.3

6.1/12 x 8.23 x 43,560 sf/acre = 182,236 cf
182,236/2 cfs = 91,218 sec
91,218 sec/ 60sec/min = 1,519 min /60 min/hr = 25.3 hr

1. Flow from the 8" leachate transmission main = 2 cfs ©
2. Peak flow from Phase 2B hydrograph = 12 to 12.5 hours = 30 min. increment
3. 2 cfs x 60 sec/min x 60 min/hour = 7,200 cf/hr
4. 7,200 cf/hr x 30 min. = 7,200/2 = 3,600 cfs during 30 min peak flow from Phase 2 hydrograph (e)

POND 006 STAGE STORAGE (g)

Stage	Storage	Delta	Phase 2A Discharge	Pond 006 Elevation	Flow at Outfall Structure
199.4 (f)	186720				5
		7412	3,600	199.5	9
199.6	194132				13.5

(a) NOAA Atlas 14, Prince George's County
(b) See Appendix C, Figure C-1
(c) From Manning's equation for full pipe flow, 8" dia. See Pipe Flow calculations.
(d) Approximate time to drain rainfall volume at 2 cfs
(e) The peak flow into Pond 066 from Phase 2B has a duration of less than 1 hour. Assume the Phase 2A contribution is one hour during the peak discharge from Phase 2B.
(f) Maximum pond elevation from Phase 2B at 64 cfs at hour 12.2.
(g) See Page 7 Pond 006 Storm Report

Channel Report

8 inch Leachate Pipe Flowing Half Full

Circular

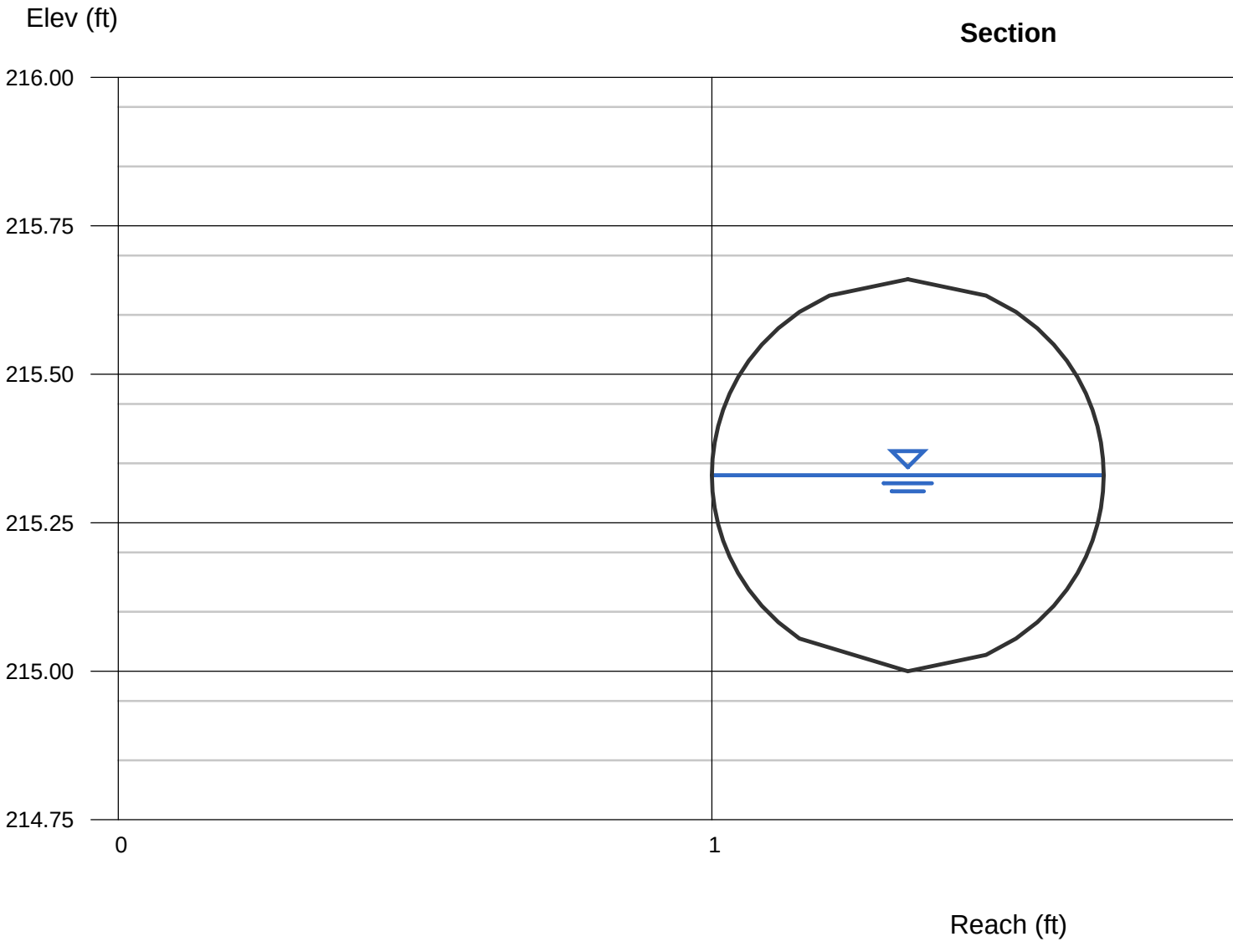
Diameter (ft)	= 0.66
Invert Elev (ft)	= 215.00
Slope (%)	= 1.80
N-Value	= 0.011

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.33

Highlighted

Depth (ft)	= 0.33
Q (cfs)	= 0.939
Area (sqft)	= 0.17
Velocity (ft/s)	= 5.46
Wetted Perim (ft)	= 1.04
Crit Depth, Yc (ft)	= 0.46
Top Width (ft)	= 0.66
EGL (ft)	= 0.79



Channel Report

8 inch Leachate Pipe FullFlow

Circular

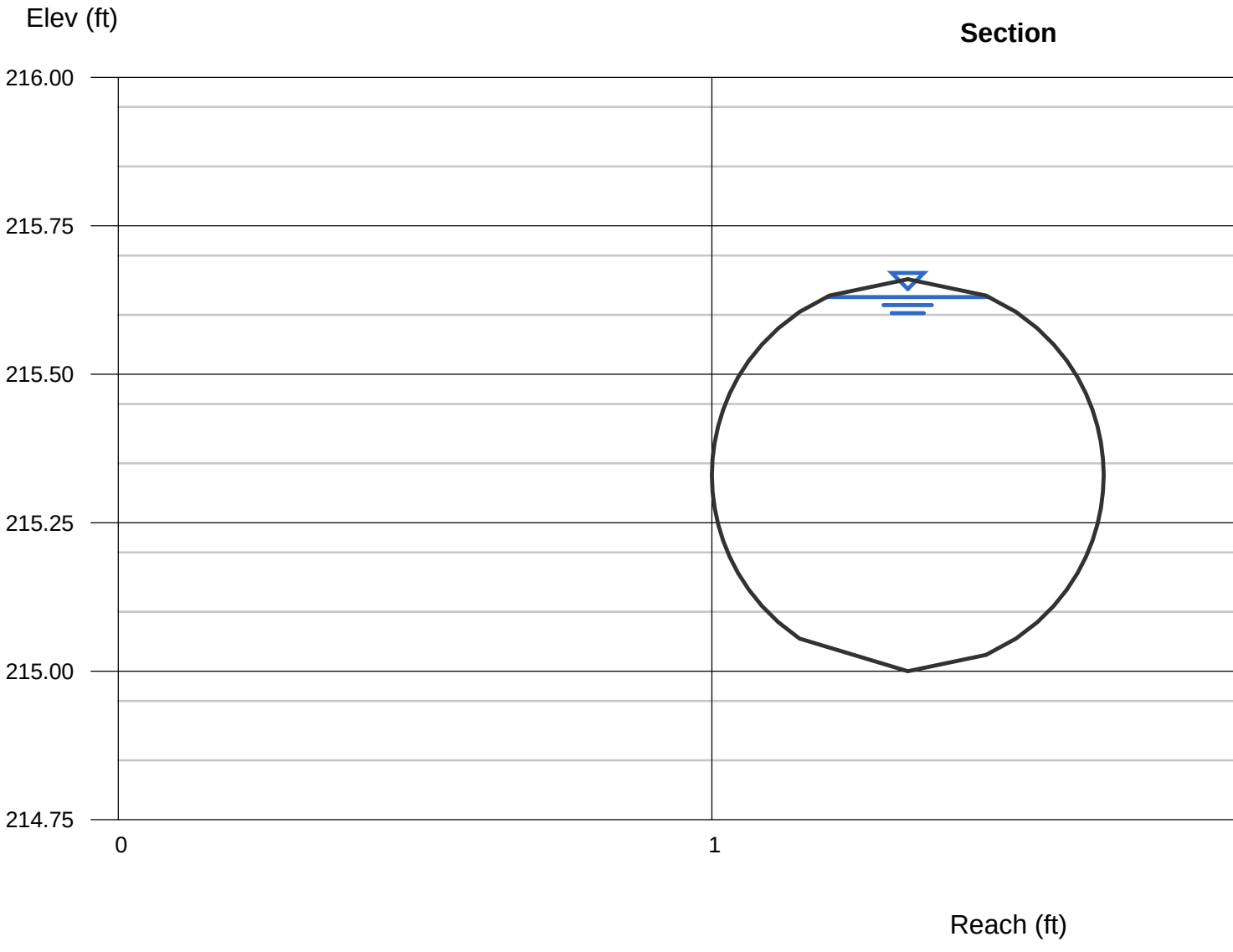
Diameter (ft)	= 0.66
Invert Elev (ft)	= 215.00
Slope (%)	= 1.80
N-Value	= 0.011

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 0.63

Highlighted

Depth (ft)	= 0.63
Q (cfs)	= 2.001
Area (sqft)	= 0.34
Velocity (ft/s)	= 5.94
Wetted Perim (ft)	= 1.79
Crit Depth, Yc (ft)	= 0.63
Top Width (ft)	= 0.27
EGL (ft)	= 1.18



Appendix C

Stormwater Management Supporting Calculations
Phase 2B Hydrologic and Hydraulic Calculations

EXHIBIT C-1

WinTR-20 Watershed Hydrology

short url for this page: http://go.usa.gov/cZeg9 . Material on this page relates to the latest version of WinTR-20, (ver 3.10). click here for version 1.11.

The Computer Program for Project Formulation Hydrology (WinTR-20) is a single event watershed scale runoff and routing model. It computes direct runoff and develops hydrographs resulting from any synthetic or natural rainstorm. Developed hydrographs are routed through stream and valley reaches as well as through reservoirs. Hydrographs are combined from tributaries with those on the main stream. Branching flow (diversion), and baseflow can also be accommodated. WinTR-20 may be used to evaluate flooding problems, alternatives for flood control (reservoirs, channel modification, and diversion), and impacts of changing land use on the hydrologic response of watersheds. The NRCS WinTR-20 version 3.10 computer program can be downloaded from this page.

A routine that allows the user to import NOAA Atlas 14 rainfall data for site-specific applications has been updated. The rainfall-frequency data will be used to develop site-specific rainfall distributions. The NOAA Atlas 14 text files and GIS data for selected states are available in the Support Materials for downloading and use in WinTR-20 Version 3.10. The NOAA Atlas 14 text files and supporting GIS files are packaged in a zip file for each state. An equivalent import program was developed to use rainfall-frequency data from the Northeast Regional Climate Center (NRCC). The NRCC has completed rainfall-frequency analyses for New York and New England states.

The WinTR-20 development team has appreciated all the testing and comments we have received to date. If you encounter any problems, or have comments on the version 3.10 computer program or enhancements to suggest please contact the WinTR-20 development team via e-mail to: WinTR-20 Team.

Download WinTR-20 installation file

Get download help here.

WinTR-20, Version 3.10, (for Windows7 and earlier operating systems)

WinTR-20 Support Materials

WinTR-20 Readme file
Latest version of the WinTR-20 User Documentation (under development)
Latest version of the WinTR-20 User Guide
References on Time of Concentration with Respect to Sheet Flow
NRCS Engineering Handbook Part 630 Chapter 4 Storm Rainfall Depth and Distribution draft (Sep 2015)

NOAA 14 Data: (data for states not listed is in development)
AL AK AR CA CO DE FL(DOC) FL(GIS) GA IA IN KY LA MD MN NE NJ NV OH PA SC TN VA WV

Powerpoint on downloading and preparing NOAA 14 GIS precipitation data

NRCC Data: CT MA ME NH NY RI VT

Point precipitation frequency estimates (inches)
NOAA Atlas 14 Volume 2 Version 3
Data type: Precipitation depth
Time series type: Partial duration
Project area: Ohio River Basin
Location name: Upper Marlboro, Maryland, US*
Station Name: MD Prince Georges County
Latitude: 38.7680°
Longitude: -76.8197°
Elevation: 222 ft*
* source: Google Maps

PRECIPITATION FREQUENCY ESTIMATES

by duratior	1	2	5	10	25	50	100	200	500	1000 years
5-min:	0.35	0.42	0.5	0.56	0.64	0.69	0.74	0.8	0.86	0.91
10-min:	0.56	0.68	0.81	0.9	1.01	1.1	1.18	1.26	1.36	1.44
15-min:	0.7	0.85	1.02	1.14	1.28	1.39	1.5	1.59	1.72	1.81
30-min:	0.97	1.17	1.45	1.65	1.9	2.1	2.29	2.48	2.73	2.93
60-min:	1.2	1.47	1.85	2.14	2.53	2.84	3.15	3.48	3.92	4.27
2-hr:	1.42	1.72	2.18	2.54	3.04	3.45	3.88	4.33	4.96	5.47
3-hr:	1.52	1.85	2.35	2.75	3.31	3.77	4.26	4.79	5.53	6.15
6-hr:	1.87	2.27	2.87	3.36	4.08	4.7	5.37	6.1	7.17	8.07
12-hr:	2.26	2.73	3.46	4.1	5.07	5.92	6.86	7.91	9.52	10.9
24-hr:	2.63	3.19	4.12	4.93	6.17	7.26	8.5	9.91	12.06	13.94
2-day:	3.05	3.69	4.76	5.68	7.06	8.27	9.61	11.12	13.4	15.37
3-day:	3.22	3.9	5.01	5.96	7.4	8.64	10.03	11.58	13.91	15.93
4-day:	3.39	4.1	5.26	6.25	7.74	9.02	10.45	12.04	14.43	16.48
7-day:	3.93	4.73	5.98	7.05	8.65	10.02	11.53	13.19	15.67	17.77
10-day:	4.47	5.38	6.71	7.82	9.43	10.78	12.23	13.8	16.09	17.98
20-day:	6.04	7.18	8.68	9.9	11.59	12.96	14.39	15.87	17.92	19.54
30-day:	7.45	8.83	10.5	11.85	13.7	15.16	16.66	18.18	20.27	21.89
45-day:	9.37	11.05	12.93	14.37	16.27	17.71	19.12	20.51	22.3	23.63
60-day:	11.14	13.11	15.16	16.7	18.68	20.14	21.53	22.87	24.55	25.77

Date/time (GMT): Wed Apr 8 23:53:11 2015
pyRunTime: 0.0396630764008

Pond Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4 — Thursday, 09 / 15 / 2016

Pond No. 1 - POND 006

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 190.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	190.00	4,333	0	0
2.00	192.00	8,747	12,823	12,823
4.00	194.00	15,986	24,370	37,192
6.00	196.00	24,626	40,298	77,491
7.00	197.00	28,699	26,634	104,124
8.00	198.00	32,773	30,710	134,835
10.00	200.00	41,529	74,122	208,957
11.00	201.00	45,938	43,711	252,668
12.00	202.00	49,844	47,873	300,540
13.00	203.00	53,792	51,800	352,341

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	8.00
Span (in)	= 36.00	0.00	0.00	8.00
No. Barrels	= 1	0	0	1
Invert El. (ft)	= 186.00	0.00	0.00	197.00
Length (ft)	= 101.00	0.00	0.00	2.25
Slope (%)	= 4.95	0.00	0.00	n/a
N-Value	= .011	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.50	6.50	0.00	0.00
Crest El. (ft)	= 199.25	201.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

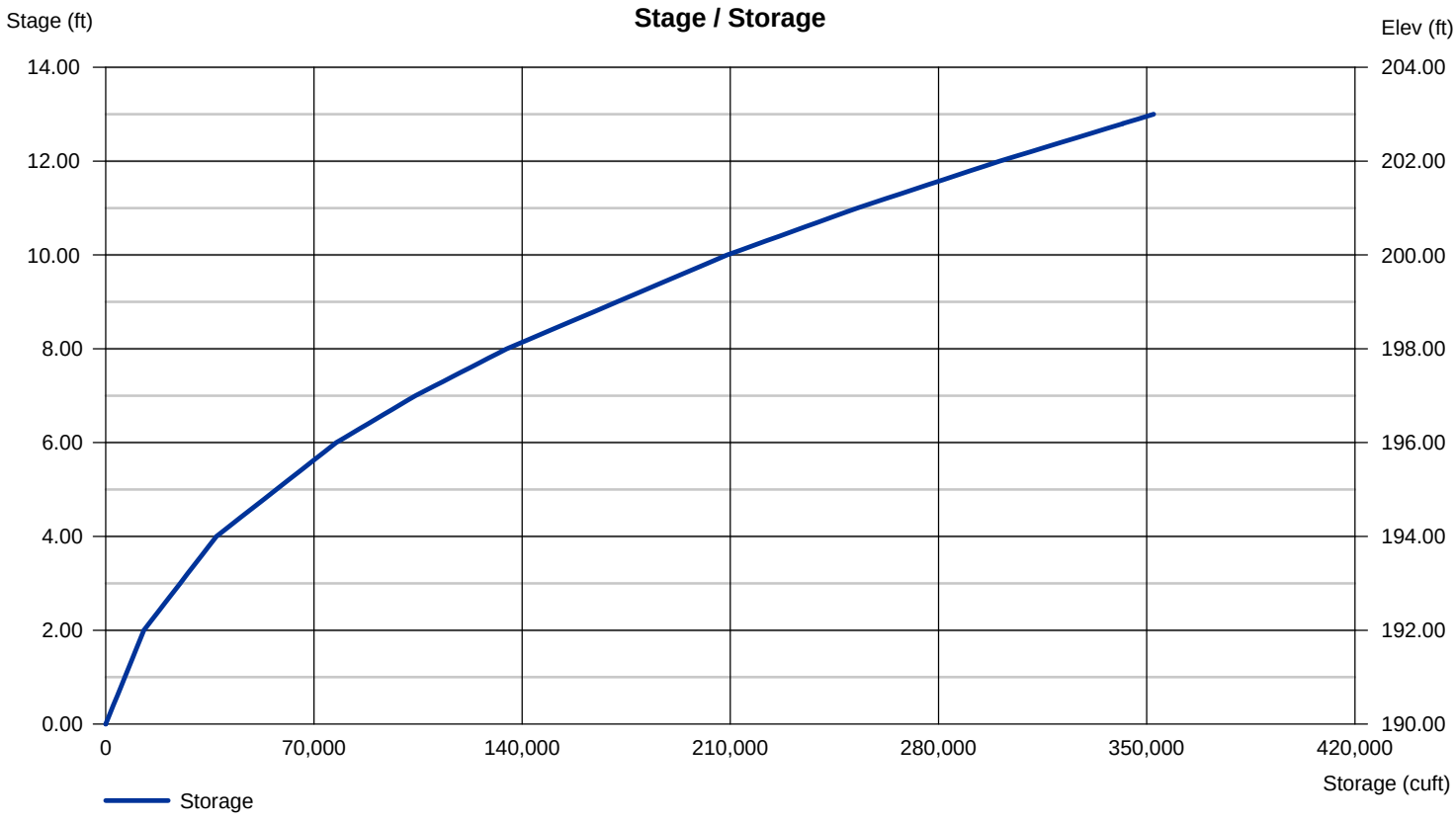


EXHIBIT C-2

NORTH

PHASE 2A
(ACTIVE CELL)

DRAINAGE
AREA-B
8.23 AC

100' SHEET FLOW
SLOPE 8.20%

220' SHALLOW CONC. FLOW
SLOPE 4.80%

Tc PATH

Tc PATH

3395' CHANNEL. FLOW
AVERAGE SLOPE 2.28%

A

B

C

D

PHASE 2B
(STABILIZED)

DRAINAGE AREA-B
24.50 AC
CN=75
TC= 24 min

EXISTING POND 006A

EXISTING POND 006B
(FOREBAY)

W.E.
198.3

W.E.
197.1

Wall

Parking

Deck

Steps

Gate

LEGEND

EXISTING TOPOGRAPHY

EXISTING TREE LINE

EXISTING SPOT SHOTS

DRAINAGE DIVIDE (DRAINAGE AREA A) EXCLUDING AREA OF PHASE 2A- ACTIVE CELL (TOPOGRAPHY 2015)

LIMIT OF ACTIVE CELL PHASE 2A (TOPOGRAPHY 2015)

DRAINAGE DIVIDE TO ACTIVE CELL PHASE 2A (TOPOGRAPHY 2015)

TIME OF CONCENTRATION (Tc) PATH

STABILIZED AREA (GREEN) IN PHASE 2B

ACTIVE CELL IN PHASE 2A

RUN OFF FROM STABILIZED (GREEN) AREA IS DRAINING TO ACTIVE CELL AREA

RUN OFF FROM ACTIVE CELL AREA IS DRAINING TO STABILIZED (GREEN) AREA

OWNER:

nrg®

NRG MD ASH MANAGEMENT LLC
25100 CHALK POINT ROAD
AQUASCO MD, 20608

ISSUED FOR BIDDING	DATE	BY

ADDENDUM REVISIONS

ADDENDUM NO	ADDENDUM DATE	BY

ISSUED FOR CONSTRUCTION	DATE	BY

CONSTRUCTION REVISIONS

NO.	DESCRIPTION	DATE	BY

RECORD DRAWINGS	DATE	BY

PREPARED BY:

URS

12420 MILESTONE CENTER DRIVE
SUITE 150
GERMANTOWN, MD 20876
301-820-3000

DRAWN BY: OS	DATE SEP-2016
CHECKED BY: JRH	JOB #
APPROVED BY: JRH	SCALE:

0 80 160
1"= 80'
GRAPHIC SCALE

NRG MD ASH MANAGEMENT LLC. BRANDYWINE ASH STORAGE SITE

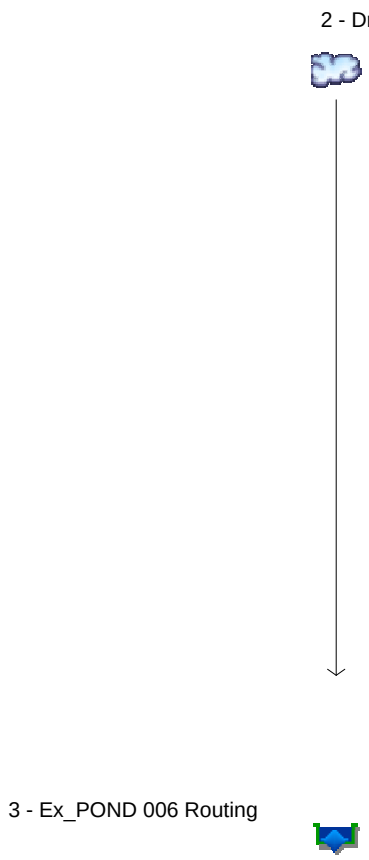
SHEET TITLE
PHASE 2 DRAINAGE AREAS

DRAWING No.	PGSCD SHEET No.:
C-1	SHEET OF
	MDE SHEET No.:
	SHEET OF

Q:\Projects\ENV\SEM\Mirant\2015 Brandywine-Westland CCR Tasks\Runon Runoff Plans\Brandywine\Hydrology-Hydraulics\POND-006 DRAINAGE DIVIDES.dwg Sep 28, 2016 - 9:25am Usercoddam.sersg

Hydraflow Table of Contents

Watershed Model Schematic



Legend

Hyd.	Origin	Description
2	SCS Runoff	Drainage Area A
3	Reservoir	Ex_POND 006 Routing

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cfs)							Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
2	SCS Runoff	------	12.16	19.20	-------	-------	-------	64.04	-------	102.38	Drainage Area A
3	Reservoir	2	0.000	0.000	-------	-------	-------	5.002	-------	54.00	Ex_POND 006 Routing

Hydrograph Summary Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2015 by Autodesk, Inc. v10.4

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to Peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph Description
2	SCS Runoff	64.04	12	732	285,763	------	------	------	Drainage Area A
3	Reservoir	5.002	12	840	181,443	2	199.40	186,632	Ex_POND 006 Routing

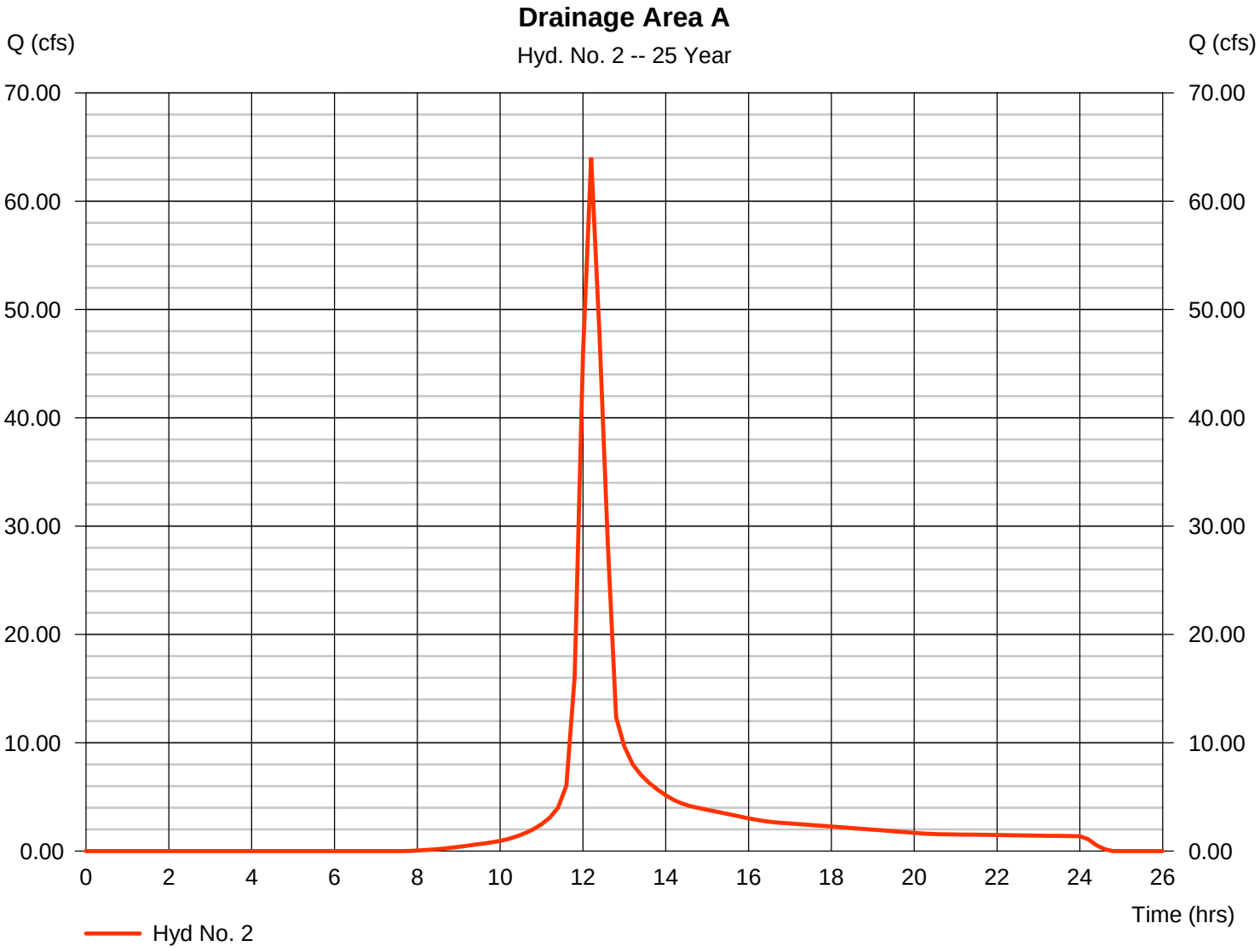
Hydrograph Report

Hyd. No. 2

Drainage Area A

Hydrograph type	=	SCS Runoff	Peak discharge	=	64.04 cfs
Storm frequency	=	25 yrs	Time to peak	=	12.20 hrs
Time interval	=	12 min	Hyd. volume	=	285,763 cuft
Drainage area	=	24.500 ac	Curve number	=	75*
Basin Slope	=	0.0 %	Hydraulic length	=	0 ft
Tc method	=	TR55	Time of conc. (Tc)	=	38.20 min
Total precip.	=	6.17 in	Distribution	=	Type II
Storm duration	=	24 hrs	Shape factor	=	484

* Composite (Area/CN) = [(23.140 x 74) + (1.360 x 85)] / 24.500



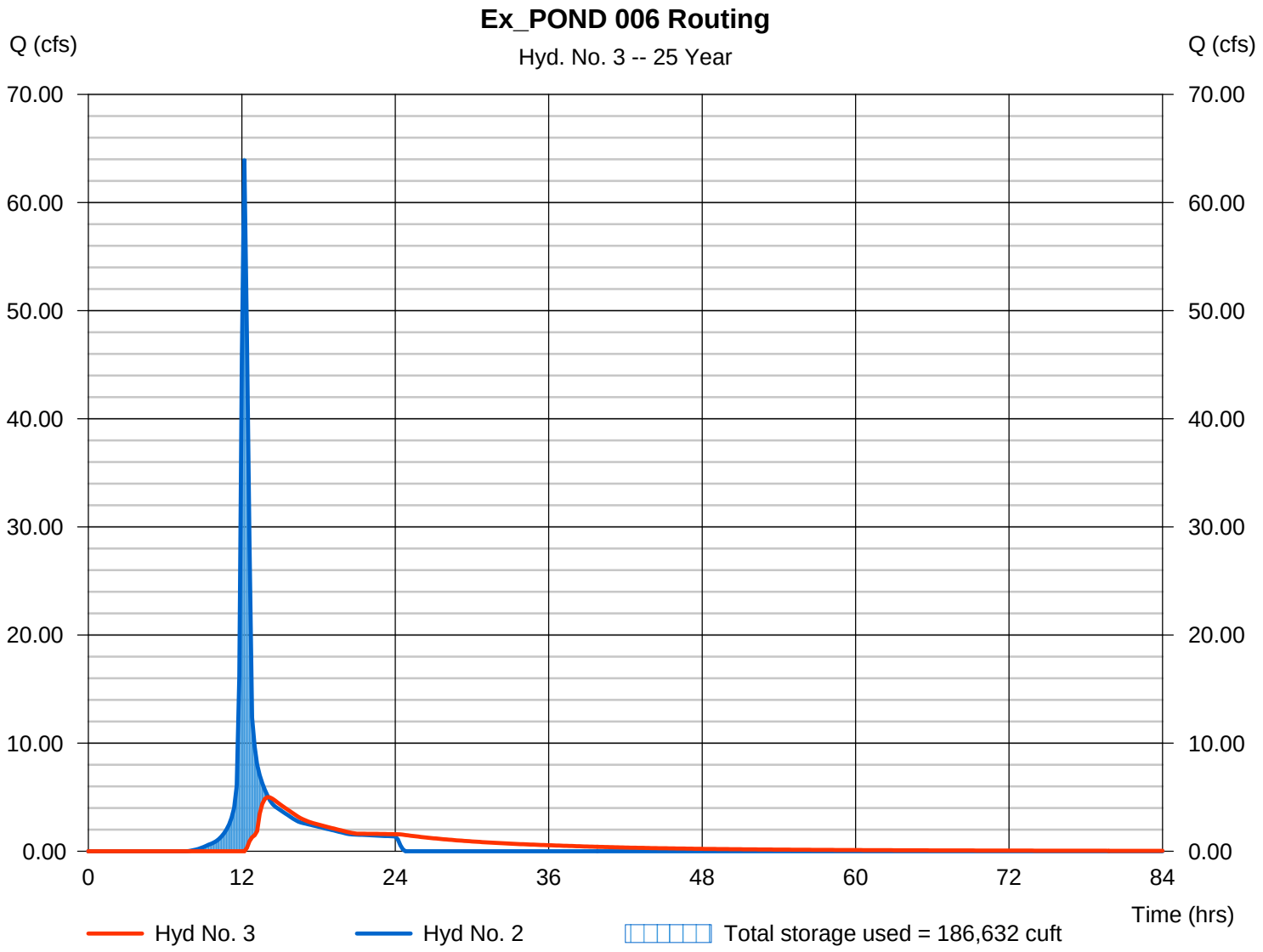
Hydrograph Report

Hyd. No. 3

Ex_POND 006 Routing

Hydrograph type	=	Reservoir	Peak discharge	=	5.002 cfs
Storm frequency	=	25 yrs	Time to peak	=	14.00 hrs
Time interval	=	12 min	Hyd. volume	=	181,443 cuft
Inflow hyd. No.	=	2 - Drainage Area A	Max. Elevation	=	199.40 ft
Reservoir name	=	POND 006	Max. Storage	=	186,632 cuft

Storage Indication method used.



Pond No. 1 - POND 006

Pond Data

Contours -User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 190.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	190.00	4,333	0	0
2.00	192.00	8,747	12,823	12,823
4.00	194.00	15,986	24,370	37,192
6.00	196.00	24,626	40,298	77,491
7.00	197.00	28,699	26,634	104,124
8.00	198.00	32,773	30,710	134,835
10.00	200.00	41,529	74,122	208,957
11.00	201.00	45,938	43,711	252,667
12.00	202.00	49,844	47,873	300,540
13.00	203.00	53,792	51,800	352,341

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	0.00	0.00	8.00
Span (in)	= 36.00	0.00	0.00	8.00
No. Barrels	= 1	0	0	1
Invert El. (ft)	= 186.00	0.00	0.00	197.00
Length (ft)	= 101.00	0.00	0.00	2.25
Slope (%)	= 4.95	0.00	0.00	n/a
N-Value	= .011	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	Yes

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 16.50	6.50	0.00	0.00
Crest El. (ft)	= 199.25	201.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= 1	Ciplti	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	190.00	0.00	---	---	0.00	0.00	0.00	---	---	---	---	0.000
0.20	1,282	190.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
0.40	2,565	190.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
0.60	3,847	190.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
0.80	5,129	190.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.00	6,411	191.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.20	7,694	191.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.40	8,976	191.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.60	10,258	191.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
1.80	11,541	191.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
2.00	12,823	192.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
2.20	15,260	192.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
2.40	17,697	192.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
2.60	20,134	192.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
2.80	22,571	192.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
3.00	25,008	193.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
3.20	27,445	193.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
3.40	29,882	193.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
3.60	32,319	193.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
3.80	34,756	193.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
4.00	37,192	194.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
4.20	41,222	194.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
4.40	45,252	194.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
4.60	49,282	194.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
4.80	53,312	194.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
5.00	57,342	195.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
5.20	61,371	195.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
5.40	65,401	195.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
5.60	69,431	195.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
5.80	73,461	195.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.00	77,491	196.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.10	80,154	196.10	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.20	82,817	196.20	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000

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POND 006

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
6.30	85,481	196.30	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.40	88,144	196.40	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.50	90,808	196.50	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.60	93,471	196.60	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.70	96,134	196.70	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.80	98,798	196.80	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
6.90	101,461	196.90	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
7.00	104,124	197.00	53.81 ic	---	---	0.00	0.00	0.00	---	---	---	---	0.000
7.10	107,195	197.10	53.81 ic	---	---	0.02	0.00	0.00	---	---	---	---	0.016
7.20	110,267	197.20	53.81 ic	---	---	0.04	0.00	0.00	---	---	---	---	0.045
7.30	113,338	197.30	53.81 ic	---	---	0.08	0.00	0.00	---	---	---	---	0.082
7.40	116,409	197.40	53.81 ic	---	---	0.13	0.00	0.00	---	---	---	---	0.126
7.50	119,480	197.50	53.81 ic	---	---	0.18	0.00	0.00	---	---	---	---	0.176
7.60	122,551	197.60	53.81 ic	---	---	0.23	0.00	0.00	---	---	---	---	0.231
7.70	125,622	197.70	53.81 ic	---	---	0.29	0.00	0.00	---	---	---	---	0.292
7.80	128,693	197.80	53.81 ic	---	---	0.36	0.00	0.00	---	---	---	---	0.356
7.90	131,764	197.90	53.81 ic	---	---	0.43	0.00	0.00	---	---	---	---	0.425
8.00	134,835	198.00	53.81 ic	---	---	0.50	0.00	0.00	---	---	---	---	0.498
8.20	142,247	198.20	53.81 ic	---	---	0.65	0.00	0.00	---	---	---	---	0.655
8.40	149,659	198.40	53.81 ic	---	---	0.82	0.00	0.00	---	---	---	---	0.825
8.60	157,071	198.60	53.81 ic	---	---	1.01	0.00	0.00	---	---	---	---	1.008
8.80	164,484	198.80	53.81 ic	---	---	1.20	0.00	0.00	---	---	---	---	1.202
9.00	171,896	199.00	53.81 ic	---	---	1.41	0.00	0.00	---	---	---	---	1.408
9.20	179,308	199.20	53.81 ic	---	---	1.62	0.00	0.00	---	---	---	---	1.625
9.40	186,720	199.40	53.81 ic	---	---	1.85	3.19	0.00	---	---	---	---	5.043
9.60	194,132	199.60	53.81 ic	---	---	2.09	11.38	0.00	---	---	---	---	13.46
9.80	201,545	199.80	53.81 ic	---	---	2.33	22.41	0.00	---	---	---	---	24.74
10.00	208,957	200.00	53.81 ic	---	---	2.59	35.69	0.00	---	---	---	---	38.28
10.10	213,328	200.10	53.81 ic	---	---	2.72	43.06	0.00	---	---	---	---	45.78
10.20	217,699	200.20	53.81 ic	---	---	2.85	50.88	0.00	---	---	---	---	53.73
10.30	222,070	200.30	62.10 ic	---	---	2.99	59.12	0.00	---	---	---	---	62.10
10.40	226,441	200.40	70.88 ic	---	---	3.12	67.76	0.00	---	---	---	---	70.88
10.50	230,812	200.50	80.05 ic	---	---	3.26	76.79	0.00	---	---	---	---	80.05
10.60	235,183	200.60	89.59 ic	---	---	3.40	86.19	0.00	---	---	---	---	89.59
10.70	239,554	200.70	99.48 ic	---	---	3.54	95.94	0.00	---	---	---	---	99.48
10.80	243,925	200.80	108.74 ic	---	---	2.70	106.03	0.00	---	---	---	---	108.74
10.90	248,296	200.90	117.02 ic	---	---	0.99	116.03 s	0.00	---	---	---	---	117.02
11.00	252,667	201.00	119.25 ic	---	---	0.67	118.58 s	0.00	---	---	---	---	119.25
11.10	257,455	201.10	120.81 ic	---	---	0.50	119.63 s	0.68	---	---	---	---	120.81
11.20	262,242	201.20	122.11 ic	---	---	0.37	119.80 s	1.94	---	---	---	---	122.11
11.30	267,029	201.30	123.23 ic	---	---	0.28	119.39 s	3.56	---	---	---	---	123.23
11.40	271,817	201.40	124.22 ic	---	---	0.22	118.53 s	5.48	---	---	---	---	124.22
11.50	276,604	201.50	125.11 ic	---	---	0.17	117.30 s	7.64 s	---	---	---	---	125.10
11.60	281,391	201.60	125.90 ic	---	---	0.13	116.41 s	9.35 s	---	---	---	---	125.89
11.70	286,178	201.70	126.61 ic	---	---	0.11	115.70 s	10.79 s	---	---	---	---	126.60
11.80	290,966	201.80	127.28 ic	---	---	0.09	115.10 s	12.08 s	---	---	---	---	127.27
11.90	295,753	201.90	127.90 ic	---	---	0.07	114.58 s	13.24 s	---	---	---	---	127.90
12.00	300,540	202.00	128.49 ic	---	---	0.06	114.12 s	14.31 s	---	---	---	---	128.49
12.10	305,720	202.10	129.06 ic	---	---	0.05	113.70 s	15.30 s	---	---	---	---	129.05
12.20	310,900	202.20	129.61 ic	---	---	0.04	113.34 s	16.22 s	---	---	---	---	129.60
12.30	316,080	202.30	130.15 ic	---	---	0.04	113.03 s	17.07 s	---	---	---	---	130.13
12.40	321,261	202.40	130.67 ic	---	---	0.03	112.74 s	17.87 s	---	---	---	---	130.63
12.50	326,441	202.50	131.17 ic	---	---	0.03	112.51 s	18.62 s	---	---	---	---	131.15
12.60	331,621	202.60	131.67 ic	---	---	0.02	112.30 s	19.33 s	---	---	---	---	131.65
12.70	336,801	202.70	132.16 ic	---	---	0.02	112.14 s	20.00 s	---	---	---	---	132.15
12.80	341,981	202.80	132.64 ic	---	---	0.02	111.96 s	20.62 s	---	---	---	---	132.60
12.90	347,161	202.90	133.11 ic	---	---	0.02	111.83 s	21.22 s	---	---	---	---	133.07
13.00	352,341	203.00	133.58 ic	---	---	0.01	111.75 s	21.80 s	---	---	---	---	133.56

...End

Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	--------
2	0.0000	0.0000	0.0000	--------
3	0.0000	0.0000	0.0000	--------
5	0.0000	0.0000	0.0000	--------
10	0.0000	0.0000	0.0000	--------
25	151.5236	19.6000	0.9185	--------
50	0.0000	0.0000	0.0000	--------
100	0.0000	0.0000	0.0000	--------

File name: PGCo_IDF-25Yr-24hr STRM.IDF

Intensity = B / (Tc + D)^E

Return Period (Yrs)	Intensity Values (in/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25	8.00	6.75	5.85	5.16	4.63	4.20	3.85	3.55	3.29	3.08	2.89	2.72
50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Tc = time in minutes. Values may exceed 60.

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Storm Distribution	Rainfall Precipitation Table (in)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	2.63	3.19	0.00	3.30	4.25	6.17	6.80	8.50
SCS 6-Hr	0.00	0.00	0.00	0.00	2.60	0.00	0.00	0.00
Huff-1st	0.00	0.00	0.00	2.75	4.00	0.00	6.50	0.00
Huff-2nd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-4th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Huff-Indy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Custom	0.00	0.00	0.00	2.80	3.90	0.00	6.00	0.00

Appendix D

Run-on & Run-off Control System Plan Revisions and Amendments