

COAL COMBUSTION RESIDUALS LANDFILL CLOSURE AND POST- CLOSURE CARE PLAN

NRG BRANDYWINE COAL ASH
MANAGEMENT SITE



Prepared for

NRG MD Ash Management LLC

25100 Chalk Point Road
Aquasco, MD. 20608

October 17, 2016



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**NRG Brandywine Ash Management Site
Coal Combustion Residuals (CCR) Landfill
Closure and Post-Closure Care Plan**

Revision Register

CCR Landfill Closure & Post-Closure Care Plan Revision Cycle	Date	Revision No.
Initial CCR Landfill Closure & Post-Closure Care 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 Closure & Post Closure-Care 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, §257.100 to §257.104 – Closure and Post-Closure Care). Any subsequent amendments to this Plan will be reviewed by a Professional Engineer to ensure that it meets the requirements of 40 CFR §257.102 and §257.104.

Name of Registered Professional Engineer: Jeffrey Hutchins

Registration Number: MD PE 13186

Expiration Date: October 10, 2016

Signature and Seal: 

Date: 9/30/16



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1.0 INTRODUCTION

This *Closure & Post-Closure Care Plan* is prepared for the Brandywine Coal 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, Sections §257.100 to §257.104 for Closure and Post-Closure Care.

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. The street address of the Brandywine Facility is:

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

Maps showing the location of the Brandywine Ash Site and NRG's Morgantown and Chalk Point Generating Stations are presented in Appendix A.

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) §26.04.10.01 through .04 and related sections (Management of Coal Combustion Products). Closure and Post-Closure Monitoring and Maintenance requirements for CCR facilities are regulated under COMAR §26.04.10.04 (4) and (5), and by reference, under COMAR §26.04.07.21 (Closure) and §26.04.07.22 (Post-Closure Monitoring and Maintenance) for Industrial Waste Landfills.

As of April 17, 2015, the Brandywine Ash Site has also been regulated by 40 CFR Part 257, and more specifically, by §257.100 to §257.104 that requires owners and operators of CCR units to prepare a written *Closure Plan* and a written *Post-Closure Care Plan* for entry into NRG's operating record for the Brandywine Ash Site. 40 CFR §257.102(b)(2) and §257.104(d)(2) requires these plans to be completed and placed in the facility's operating record by October 17, 2016.

Additionally, §257.102(b)(2)(iii) and §257.104(f) makes reference to requirements for recordkeeping, notification, and public accessibility to this Plan via the internet as established in §257.105(i), §257.106(i), and §257.107(i). See Section 5.0 for additional details.

1.2 DOCUMENT INFORMATION

This combined *Closure & Post-Closure Care Plan* provides the required information for the proper closure and post-closure care of the Brandywine Ash Site under §257.102 and §257.104 in one document. This *Closure & Post-Closure Care Plan* was prepared on behalf of NRG and will be accepted into the NRG operating record in accordance with 40 CFR §257.105(i)(4) and (12) by October 17, 2016.

A Register of Revisions and Amendments to this *Closure & Post-Closure Care Plan* is presented on Page i of the Plan. Any Revisions or Amendments to the Plan are included in Appendix B with a statement of certification by a licensed professional engineer and placed into NRG operating record in accordance with 40 CFR §257.105(i)(4).

1.3 FEDERAL AND STATE REGULATORY CROSSWALK TABLES

A regulatory crosswalk table mapping the required plan elements under 40 CFR §257.102 and §257.104 against the elements of this Plan is presented in Table 1 below.

Table 1 Federal Regulatory Crosswalk Table

40 CFR 257 Citation	Description of Rule	CCR Landfill Closure & Post-Closure Care Plan Section
102(b)(1)(i)	Narrative description of how the CCR unit will be closed.	3.0, 3.2, 3.3
102(b)(1)(ii)	Closure by removal of the CCR – not applicable	n/a
102(b)(iii)	Closure in place. Description of final cover system, methods used to install final cover, how it will achieve the performance standards.	3.2
102(b)(iv)	Estimate of maximum inventory of CCR on-site	3.1
102(b)(v)	Estimate of the largest area of the CCR unit	3.1
102(b)(vi)	Schedule for completing all closure activities	3.3
104(d)(1)(i)	Description of the monitoring and maintenance activities	4.4 - 4.9
104(d)(1)(ii)	NRG contact information during the post-closure period	4.1
104(d)(1)(iii)	Description of the planned uses of the site during the post-closure period.	4.3

For MDE and COMAR, a regulatory crosswalk table mapping the required plan elements under COMAR §26.04.10 (Management of Coal Combustion Byproducts), §26.04.07.21 (Closure) and §26.04.07.22 (Post-Closure Monitoring and Maintenance) against the elements of this Plan is presented in Table 2 below.

Table 2 Maryland Regulatory Crosswalk Table

COMAR 26.04.07/.10 Citation	Description of Rule	CCR Landfill Closure & Post- Closure Care Plan Section
26.04.07.21.H	Closure cap requirements for Industrial Waste and CCR Landfills	3.2
26.04.07.22.A	Post-closure monitoring and maintenance period not less than 5 years	4.2
26.04.07.22.B	Post-closure monitoring and maintenance inspections.	4.4
26.04.07.22.C	Post-closure maintenance.	4.6, 4.7, 4.8
26.04.07.22.D	Post-closure monitoring and maintenance recordkeeping.	4.5
26.04.10.04.C(3)	CCR closure requirements referenced to COMAR 26.04.07.21.	3.0
26.04.10.04.C(4)	CCR post-closure monitoring and maintenance requirements referenced to COMAR 26.04.07.22.	4.0

1.4 CERTIFICATION

A statement of certification by a licensed professional engineer that this initial *Closure & Post-Closure Care Plan* meets the requirements of 40 CFR §257.102(b)(4) and §257.104(d)(4) is presented on Page ii of this Plan.

2.0 BACKGROUND

The Brandywine Ash Storage 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. 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. These three cells are scheduled to be final capped with an engineered capping system under a Consent Decree with the MDE. NRG commenced the construction phase of the project to permanently close Phase 1 and the two Historical Areas with a low permeability geosynthetic cap – approved by MDE – 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. Because Phase 2 is the operational cell at the site, this *Closure Plan* specifically addresses the future closure of Phase 2.

3.0 PHASE 2 CLOSURE PLAN

This portion of the *Closure Plan* describes the steps necessary to close the Phase 2 portion of the Brandywine Ash Site consistent with recognized and accepted good engineering practices and with the requirements of MDE for CCR landfills (COMAR 26.04.10.04 – Management of Coal Combustion Byproducts and by reference COMAR §26.04.07.21 for Industrial Waste Landfills). With respect to the closure requirements under 40 CFR Part 257, because the Phase 2 cell will be closed in-place with a low permeability geosynthetic cap, this *Closure Plan* will also follow the requirements of §257.102(b)(iii) and 102(d).

3.1 PHASE 2 CELL GEOMETRY AND CAPACITY

The Phase 2 operational cell consists of approximately 35 areas and it is the shape of a closed polygon. It is surrounded by access roads to the west, north, and east, and by private property to the south. All runoff from Phase 2 drains to perimeter drainage channels that surround Phase 2 and drain to Pond 006, which is located to the east of Phase 2. The approximate 35 acres of Phase 2 is the largest area of CCR that will require a final cover capping system.

Based on the original design documents for Phase 2, it has an estimated CCR capacity of approximately 1,468,300 cubic yards. Based on annual aerial photography of the site, Phase 2 has an estimated in-place volume of CCR of approximately 1,300,000 cubic yards. A rough estimate of the remaining air space in Phase 2 would be approximately 170,000 cubic yards based on those two estimates. NRG estimates that Phase 2 has recently received in the order of 30,000 to 50,000 cubic yards per year for the last few years. Consequently, if Phase 2 continues to receive approximately 30,000 to 50,000 cubic yards per year over the next few years, then Phase 2 has approximately 3 to 6 years of capacity remaining. Based on the more conservative six-year timeframe, Phase 2 would require closure activities to commence in approximately 2022.

3.2 PHASE 2 FINAL CLOSURE CAP

The Phase 2 CCR landfill cell of the Brandywine Ash Site will be closed in-place with a low permeability geosynthetic cap. Because the Brandywine Ash Site is regulated for CCRs by MDE under COMAR 26.04.07.21 for Industrial Waste Landfills, the final closure capping of Phase 2 must be closed in accordance with the requirements of COMAR 26.04.07.21(E), which states that industrial waste landfills (including CCR landfills) must be designed with the following minimum closure cap requirements:

- A low permeability cap shall be emplaced over the final layer of CCR. The cap material may consist of synthetic materials with a minimum thickness of 20 mil and a maximum permeability of 1×10^{-10} centimeters/second. The cap shall be installed with a minimum slope of 4 percent to facilitate drainage of percolate. This MDE requirement exceeds the §257.102(d)(3)(i)(A) criteria of 1×10^{-5} centimeters/second.
- A drainage layer with a minimum thickness of 6 inches of fine grained material shall be emplaced immediately above the low permeability cap. Commercially available filter fabrics, when used in conjunction with synthetic drainage blankets, may serve instead of

the fine material, provided that MDE reviews and approves the selected materials and design configuration. MDE has approved NRG's use of a synthetic, geocomposite drainage layer above the 40-mil geomembrane for the Phase 1 closure cap.

- Final earthen cover shall be placed over the drainage layer. Minimum cover thickness shall be 2 feet. Minimum cover slope shall be 4 percent to facilitate surface drainage from the site. The cover material shall contain sufficient organic material and nutrients to sustain a vegetative cover over time. The 24 inch cover soil layer is equivalent to the criteria in the §257.102(d)(3)(i)(B) & (C).
- Vegetative Stabilization. Within 30 days after the final earthen cover has been installed, the area shall be vegetatively stabilized using a perennial cover species as recommended by MDE and the County Soil Conservation District (SCD).

3.2.1 Phase 2 Closure Capping Materials

The proposed NRG-designed final closure cap for Phase 2 will exceed the minimum MDE requirements; it will be comprised of the following materials installed on top of the final layer of graded CCR:

- 40-mil double-sided textured HDPE geomembrane,
- 250-mil geocomposite drainage layer, consisting of two layers of 8 oz. geotextile thermally bonded to a geogrid drainage blanket,
- Two-foot layer of final earthen cover installed in two 12-inch lifts, and
- Vegetative stabilization consisting of SCD approved permanent seed mix, mulch and permanent soil stabilization matting.

NRG submitted this identical final capping configuration to MDE for the closure plans for Phase 1 and the two Historical Area which MDE approved and permitted.

3.2.2 Closure Cap Construction

To construct the final capping system on Phase 2, NRG will engage the services of a specialized construction contractor, with a specialty in capping municipal, industrial, and CCR landfills. The contractor will grade the final layer of CCR on the side slopes of Phase 2 to approximately 3 horizontal to 1 vertical (3:1) and to 4-percent on the top of Phase 2. The contractor will ensure that intermediate benches, a minimum of 12 feet wide, would be graded into the side slopes at approximate 20-foot vertical changes to manage the stormwater runoff on the slopes. Once graded and compacted, the ash would be covered with the 40-mil HDPE geomembrane from the top to the bottom of the side slopes. Once the installation of the 40-mil geomembrane is complete and approved by NRG and the MDE inspectors, the contractor will install the 250-mil geocomposite on top of the 40-mil geomembrane. Once completed and approved by NRG and the MDE inspectors, the contractor would install the 24-inch final soil cover layer in two 12-inch lifts, each lift installed with low ground pressure equipment (LGP) and tracked with LGP vehicles to compact the soil and make it ready for installation of the vegetation. The contractor will then install the permanent vegetative seed mix and mulch on the final cover soil layer, and then install permanent soil stabilization matting on top of the grass seed and mulch. At that point, the capped slopes would be considered "final stabilized" and MDE approval of the closure cap would be requested by NRG.

3.2.3 Closure Cap Performance Standards

The final closure capping system proposed by NRG exceeds the requirements of MDE and has been demonstrated that it can be approved by MDE. The proposed closure capping system will meet or exceed the closure performance standards contained in §257.102(d)(i) when leaving CCR in place. As described below, the final closure capping system is designed to minimize infiltration and erosion and exceeds the requirements of §257.102(d)(3) for closing a CCR unit by leaving the CCR in place.

- *Control, minimize, or eliminate to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate or contaminated runoff to the ground or surface waters:* The components of the final closure cap – consisting of the permanent vegetation, 2-foot layer of cover soil, and the 250-mil geocomposite drainage layer – is designed to promote drainage of virtually all stormwater runoff from the landfill. The 4-percent grades on top of Phase 2 and the 3:1 side slopes promote the drainage of stormwater off of the cap to the perimeter drainage channels at the toe of the landfill. The 40-mil HDPE geomembrane, with an infiltration rate less than 1×10^{-10} centimeters/second, virtually eliminates the possibility of infiltration of stormwater through the geomembrane into the emplaced ash. Accordingly, the 40-mil geomembrane virtually eliminates any stormwater from coming into contact with the CCR and generating new leachate.
- *Preclude the probability of future impoundments of water, sediment, or slurry:* The 4-percent top grades and 3:1 side slopes promote the drainage of stormwater off of the cap to perimeter drainage channels and preclude future ponding of water on the cap.
- *Measures that provide for major slope stability to prevent sloughing or movement of the final cover system during closure and post-closure care period. Minimize the disruption of the integrity of the final cover system:* The capping components, the cover soil, and the emplaced ash go through rigorous interface friction testing in NRG's engineer's geotechnical laboratory (layer on layer testing) to ensure that the all of the layers exceed the factors of safety for sliding or sloughing required in the design documents. The 40-mil geomembrane and the subsequent layers above it are flexible and will accommodate any potential future subsidence or settlement of the ash below it, thus minimizing the disruption of the integrity of the final cover system. The final ash layer is graded and compacted to meet the construction specifications, thus minimizing the potential for future settlement.
- *Minimize the need for further maintenance of the CCR unit:* The permanent vegetation and permanent slope stability matting on the surface of the cap minimize the need for future maintenance of the cap. Erosion of the cover soil layer is minimized by permanent growth of vegetation and the permanent matting covering the top of the soil layer.
- *Be completed in the shortest amount of time consistent with recognized and generally accepted good engineering practices.* Construction of a multi-layer capping system is the recognized industry standard for capping municipal, industrial, and CCR landfills. The time required to cap the 35-acre Phase 2 CCR landfill by a specialty contractor will be the shortest time that a cap of this design can be completed.

3.3 FUTURE PHASE 2 CLOSURE CAPPING SCHEDULE

Before Phase 2 reaches its capacity to accept any more CCR during the next 3 to 6 years, NRG will begin the process for designing and for future construction of the final capping system. NRG will undertake the following steps:

- **Engineering Design:** The first step would be for NRG to engage its engineering consultant to prepare draft and final design plans and technical specifications for the final capping system of Phase 2. The engineer would undertake a final as-built survey of the surface of Phase 2 which would be used to commence work on the grading plan for the cap. The grading plan would be designed to achieve 4-percent grades on top of Phase 2 and 3:1 side slopes – along with 12-foot wide reverse benches (sloping backward toward the uphill slope) and gabion drainage channel letdowns – that would direct stormwater drainage off of the cap to perimeter drainage channels at the toe of the landfill. The drainage channels would convey flow to stabilized clean water outfalls. The design timeframe will take up to 7 months to complete final.
- **Regulatory Permitting:** The final design plans and specifications must be submitted to MDE and the Prince George’s County SCD (PG SCD) office for review, approval, and permits. It can take up to 9 months to receive approval from both PS SCD and MDE.
- **Contractor Selection:** Once the design plans are approved by MDE and PG SCD and permits are issued, the design plans would be converted to “Issued for Bidding” plans that NRG would use to receive competitive bids from specialty construction contractors. Once awarded, the plans would be converted to “Issued for Construction” plans that NRG, the Contractor, NRG’s Engineer, and the regulatory inspectors would use throughout construction of the closure cap. This process can take up to 5 months for bidding and final award of a contract to the winning contractor.
- **Construction:** NRG’s contractor will follow the design plans and specifications to construct the final capping system on Phase 2.
 - The contractor will grade and compact the final layer of emplaced ash to the lines and grades shown on the plans. Once the grading and compaction requirements have been met for the liner subgrade, and approved by NRG, NRG’s engineer, and the MDE inspectors, the contractor would install the 40-mil geomembrane, welding the seams as required in the specifications and making repairs as necessary.
 - Non-destructive and destructive testing will be undertaken by the contractor on the geomembrane seams. Once approved by NRG, NRG’s engineer, and the MDE inspectors, the contractor will install the 250-mil geocomposite on top of the 40-mil geomembrane. Geocomposite panels will be seamed together using the techniques presented in the project specifications.
 - Once approved by NRG, NRG’s engineer, and the MDE inspectors, the contractor will install the 24-inch cover soil layer on top of the geocomposite. The contractor will install the soil cover in two, 12-inch lifts using LGP equipment.

The soil will be dumped and spread using LGP equipment, tracking the 12-inch lift of soil over the geocomposite to meet the compaction requirements. The LGP equipment will then install the second 12-inch lift, again tracking the soil to achieve the compaction requirements.

- Once the 24-inch cover soil layer has been surveyed (As-Built Survey of the final cover surface) and has been approved by NRG, NRG's engineer, and the MDE inspectors, the contractor will install the permanent seed mix, mulch, and permanent soil stabilization matting.
- The construction timeframe cannot be estimated until bids and schedules are received from the competitive bidding process.

The four steps discussed above – design, permitting, bidding and contract award, and construction will complete the closure process for the Brandywine Phase 2 CCR landfill.

4.0 PHASE 2 POST-CLOSURE CARE PLAN

This portion of the *Post-Closure Care Plan* presents post-closure care requirements for Phase 2 of the Brandywine Ash Site in accordance with 40 CFR 257.104(d) and COMAR §26.04.07.22 – Post-Closure Monitoring and Maintenance.

This *Post-Closure Care Plan* is designed to maintain the integrity and effectiveness of the final capping system, including making repairs to the final cover as necessary to correct the effects of settlement, subsidence, erosion, and preventing run-on or runoff from eroding or damaging the final cover. Additionally, this Plan follows the requirements specified in COMAR §26.04.07.22 for closed Industrial Waste landfills (including CCR landfills) which generally requires the permittee to conduct post-closure monitoring and maintenance for a period of time not less than 5 years after the installation of the landfill cap is complete.

4.1 SITE RESPONSIBILITY DURING POST-CLOSURE PERIOD

The Brandywine Ash Site is owned by NRG which plans to maintain ownership of the site over the duration of the post-closure care period. There are no current plans to transfer any portion of the site from NRG ownership. Responsibility for maintenance of the site after completion of the construction of the final capping system will remain with NRG. Any questions regarding Phase 2 during the post-closure period shall be directed to:

Walter Johnson
NRG MD Ash Management LLC
25100 Chalk Point Road
Aquasco, MD 20608
Cell (301) 751-6756

4.2 POST CLOSURE CARE PERIOD

Under COMAR §26.04.07.22, the owner/operator of a CCR landfill is required to conduct post-closure monitoring and maintenance for a period of time not less than 5 years after the installation of the landfill cap is complete. This time period may be extended by MDE if significant maintenance situations occur at the landfill during the 5-year period after closure. Under 40 CFR §257.104(c), the owner or operator of a CCR landfill must conduct post-closure care for 30 years. If at the end of the post-closure period, the site is operating under assessment monitoring (§257.95), the owner or operator must continue the post-closure period until the site returns to detection monitoring (§257.95).

4.3 POST-CLOSURE USE OF PHASE 2

NRG intends to maintain Phase 2 as open space. Because of geometry and shape of Phase 2, it is not feasible for the site to be converted to any other land use. Any activities consistent with open space that could potentially be allowed to occur on Phase 2 would be conducted in a manner that would be designed not to disturb the final cover that has been installed over the capped areas. Upon closeout under COMAR, NRG would not undertake any construction or excavation within the cells without first obtaining written authorization from MDE.

Although NRG currently plans to maintain the ownership of the property for the post-closure care period, and no additional construction activity is planned at the site, long-term plans may be subject to change. Following completion of the post-closure care period for Phase 2, NRG will notify MDE that a certification, signed by an independent registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan, has been placed in the operating record. Additionally, MDE will also be required to certify that the post-closure care has been completed to its satisfaction.

4.4 SITE INSPECTION FREQUENCY

Site inspections of Phase 2 will be conducted by NRG a minimum of two (2) times per year in accordance with COMAR §26.04.07.22(B). These inspections will include:

1. Observation of the closure cap cover.
2. Notation of any drainage irregularities or signs of erosion of the cover soil.
3. Notation of any voids created by settlement of the cap.
4. Notation of any surface expressions of leachate (seeps) at the closure cap.
5. Checking the status of the monitoring wells.
6. Observation of stormwater control devices.
7. Checking status of security fencing, locks, and gates.

Maintenance, irregularities or problems noted during the inspections will be corrected within 30 days of their observance.

4.5 RESULTS REPORTING

In accordance with COMAR 26.04.07.22(D), the results of the semiannual site inspection will be recorded and reported to MDE within 60 days of the inspection. The results of inspections will be maintained for a period of 5 years following closure.

NRG will also provide MDE with a copy of the results of any site specific inspections and monitoring activities, such as:

- Operation of the site leachate management system;
- Monitoring of the groundwater wells.

4.6 MAINTENANCE OF THE FINAL COVER FOR PHASE 2

The upper portion of the closure cap system is the final cover soil, which consists of 24-inches of earthen material, with the top of this layer being amended with fertilizers and nutrients to promote the growth of permanent vegetation. The vegetative stabilization is intended to prevent erosion of the protective cover soil cap. The cap cover soil is intended to protect the underlying geosynthetic closure cap materials. The low permeability membrane layer is designed to reduce or eliminate infiltration of percolate into the underlying buried ash materials. The final cover soil layer needs to be protected and maintained to prevent its erosion, which would expose the underlying layers of the closure cap, potentially leading to damage of the geosynthetics and infiltration of percolate into the ash materials.

After completion of the closure cap construction, the area will be vegetatively stabilized to protect the final cover soil that has been placed over the geosynthetic membrane and geocomposite drainage layer. Permanent erosion control matting (soil stabilization matting) with a minimum useful life of 36 months will be installed on the final vegetative cover to add significant additional stabilization protection for the vegetation. All permanent seeding will conform to the requirements of the 2011 Maryland Standards and Specifications for Soil Erosion and Sediment Control and the PG SCD. These standards and specifications include a permanent seed mix as well as soil amendment specifications. During the construction of the closure cap, the Contractor will maintain the site, correcting any washouts and reseeding as necessary until the vegetative cover is established over the entire site. Once the closure cap is installed and the Contractor has been released, NRG will then assume responsibility for maintaining the entire site, including the vegetative cover over the capped cell.

During the post-closure period, NRG will perform the necessary repairs or maintenance as specified above. In addition, NRG may propose to mow the vegetative cover on a semi-annual basis, depending upon rainfall patterns and vegetative growth that develops on the site. Trees or other deep-rooted vegetative cover that has the potential to penetrate the geosynthetic membrane over the waste cells will not be permitted to establish or grow on the geosynthetic capped areas of the site.

4.7 OPERATION AND MAINTENANCE OF SITE RUNOFF AND RUN-ON CONTROLS

Surface water drainage off of the final capping system has been designed to minimize the amount of percolation through the closure cap cover soil. Surface water drainage at the site during construction of the closure cap will be managed through implementation of standard erosion and sediment control practices around the site and through a series of earth dikes, reverse benches, geomembrane lined riprap let-downs, and geomembrane and riprap-lined perimeter drainage channels around the toe of the landfill.

During the post-closure period, the stormwater management system will be inspected 4 times per year (quarterly). During these quarterly inspections, the drainage channels, earth dikes, let-downs, culverts, and other drainage structures will be inspected to assess their condition. Vegetation in the surrounding areas of the stormwater management systems will be mowed and/or controlled using a lawn mower or weed eater equipment. Riprap and velocity control devices will be inspected to ensure their operability. Any necessary repairs or maintenance needs will be addressed by NRG.

4.8 OPERATION OF THE LEACHATE MANAGEMENT SYSTEM

The leachate management system for Phase 2 consists of a gravity drain system that collects leachate at the base of the internal cells and transports the leachate to Pond 006 (Phase 2's designated leachate storage pond). Discharge from Pond 006 is regulated under a National Pollutant Discharge Elimination System (NPDES) permit issued by MDE. The existing leachate management system for Phase 2 will be operated throughout the post-closure period.

Leachate generated in Phase 2 collects near the bottom of the Phase 2 cell on top of the geomembrane and within the leachate collection drainage layer. The leachate then travels in the leachate piping network to the high density polyethylene (HDPE) transfer pipeline to the forebay of Pond 006. At a specific elevation in the forebay, the leachate flows over a broad-crested weir into the main portion of Pond 006. An HDPE riser structure prohibits liquids in Pond 006 from discharging until the liquids reach the crest of the HDPE riser structure which is set at an elevation considerably higher than the elevation of the weir from the forebay to the main pond. The Phase 2 engineered leachate collection system was installed over the geomembrane liner during the initial construction of Phase 2.

Pond 006 will be inspected on a weekly basis as part of the weekly operations and maintenance inspections of the Brandywine site as a whole. During the weekly inspections of the stormwater management system, Pond 006 will be inspected for the following items:

- The outfall structures will be inspected to ensure that all components are working properly.
- The pond bottom will be inspected to ensure that any erosion of the bottom soils has been addressed and that the liner materials are not exposed.
- The rip-raped influent aprons will be inspected to ensure that the rocks are properly chinked and that there is no erosion taking place.

- For flow of leachate into Pond 006 will be observed at the leachate pipe discharge into the pond. (Note: the absence of flow does not necessarily indicate an obstructed drain, but should be verified by flushing)

The Phase 2 leachate collection system consists of a network of drain pipes which have flush connections at the upstream end to allow the pipes to be flushed and cleaned as needed. Flow through the main transfer pipe is verified at the downstream end that discharges into Pond 006. Flushing is accomplished by connecting the site water truck discharge hose to the drain pipe flush connection and pumping water through the drain pipe. Flow at the discharge end of the pipe should match the input from the water truck. If flow is obstructed, flushing should continue until proper flow is observed. If the obstruction does not flush out in a reasonable time, it may be necessary to bring in a jet blasting service to clear the pipe.

4.9 MONITORING OF SURFACE AND GROUNDWATER

The Brandywine Ash Site currently collects groundwater samples and monitors groundwater in accordance with the requirements of the NPDES Permit for the Brandywine Ash Site. Detailed surface water and groundwater monitoring and sampling plans have been developed as part of the Consent Decree condition requiring Nature and Extent of Contamination studies (paragraph 59, Civil Action 8:11-CV-01209-PJM, 8:10-CV-00826-PJM, 8:12-CV,03755-PJM). The Surface and Groundwater Monitoring Plan for the Brandywine Facility has been reviewed and approved by MDE. This Monitoring Plan, which is an independent activity at the Brandywine site and is presented under a separate cover, addresses the requirements of COMAR §26.21.04.07 and contains detailed procedures for groundwater and surface water sampling, analysis, and reporting.

5.0 RECORDS, NOTIFICATIONS, AND INTERNET ACCESS

5.1 RECORDKEEPING REQUIREMENTS

In accordance with 40 CFR §257.105, a written operating record will be maintained for the Brandywine Ash Site CCR facility. This operating record will include the most recent version of this *Closure & Post-Closure Care Plan* and any subsequent revisions or amendments. The following information associated with the closure of Phase 2 will be placed in the facility's operating record:

- The notification of intent to initiate closure of the CCR landfill.
- The notification of completion of closure of the CCR landfill.
- The written demonstration for a time extension for initiating closure.
- The written demonstration for a time extension for completing closure.
- The notification of the recording of a notation on the property deed.
- The notification of the completion of the post-closure care period.

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.

5.2 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. In accordance with §257.106(i), NRG will make the following notifications to MDE:

- The availability of the written Closure Plan and the Post-Closure Care Plan.
- The intent to initiate closure of the CCR landfill.
- The completion of closure of the CCR landfill.
- The availability of a demonstration for a time extension for initiating closure.
- The availability of a demonstration for a time extension for completing closure.
- The recording of a notation on the property deed.
- The completion of the post-closure care period.

5.3 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 *Closure & Post-Closure Care Plan*, along with any revisions or amendments will be maintained on this website. In accordance with §257.107(i), NRG will place the following information in the Brandywine Web site:

- The written Closure Plan, the written Post-Closure Care Plan, and any amendments.
- The notification of the intent to initiate closure of the CCR landfill.
- The notification of completion of closure of the CCR landfill.
- The demonstration for a time extension for initiating closure.
- The demonstration for a time extension for completing closure.
- The recording of a notation on the property deed.
- The notification of completion of the post-closure care period.

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.

Appendix A

Figures

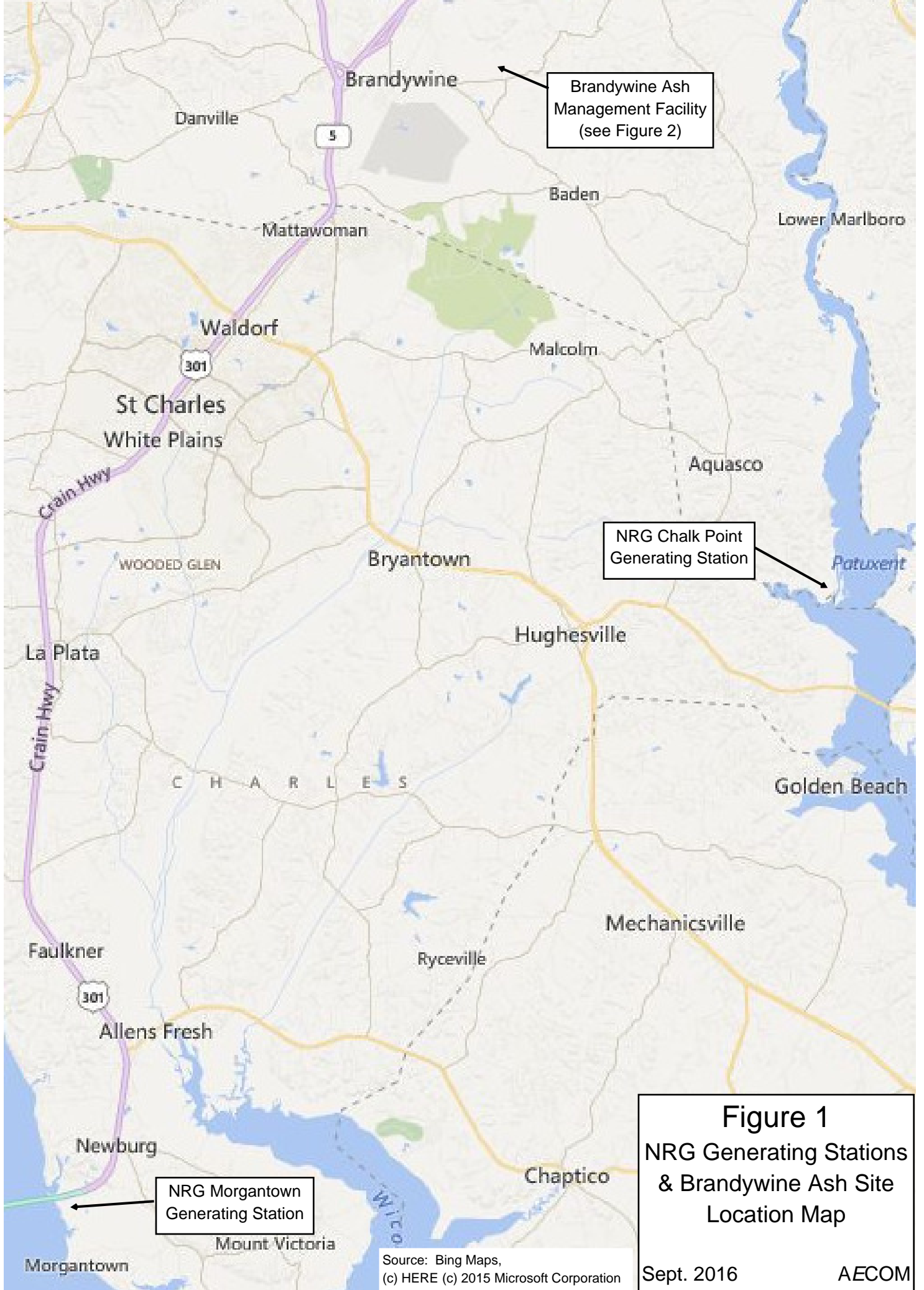
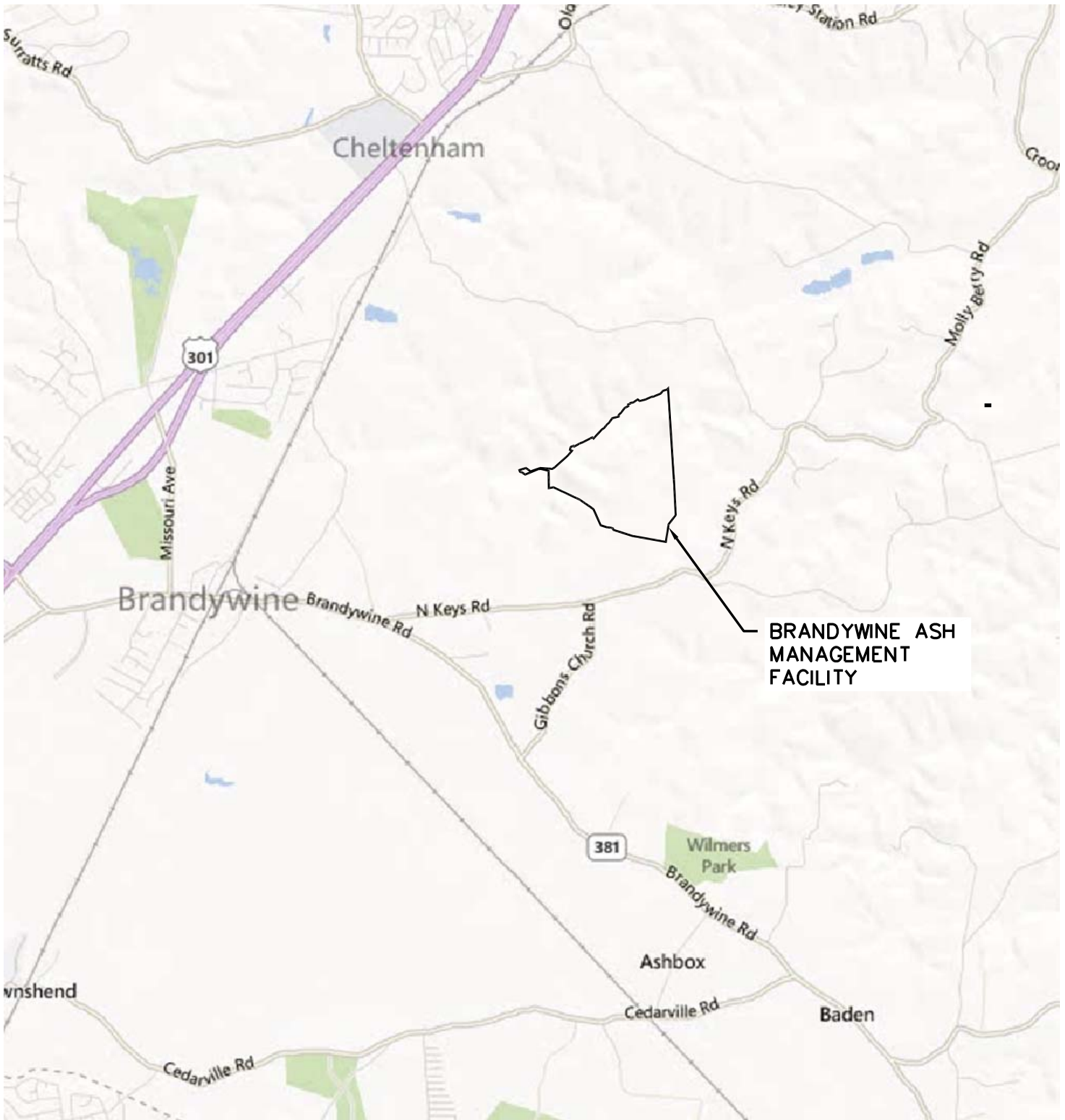
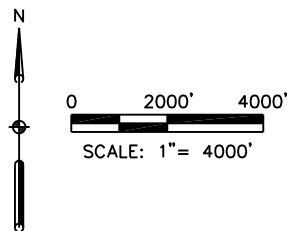


Figure 1
 NRG Generating Stations
 & Brandywine Ash Site
 Location Map

Source: Bing Maps,
 (c) HERE (c) 2015 Microsoft Corporation



**BRANDYWINE ASH
MANAGEMENT
FACILITY**



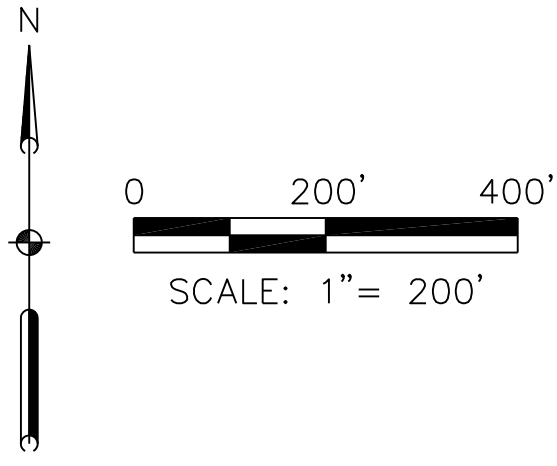
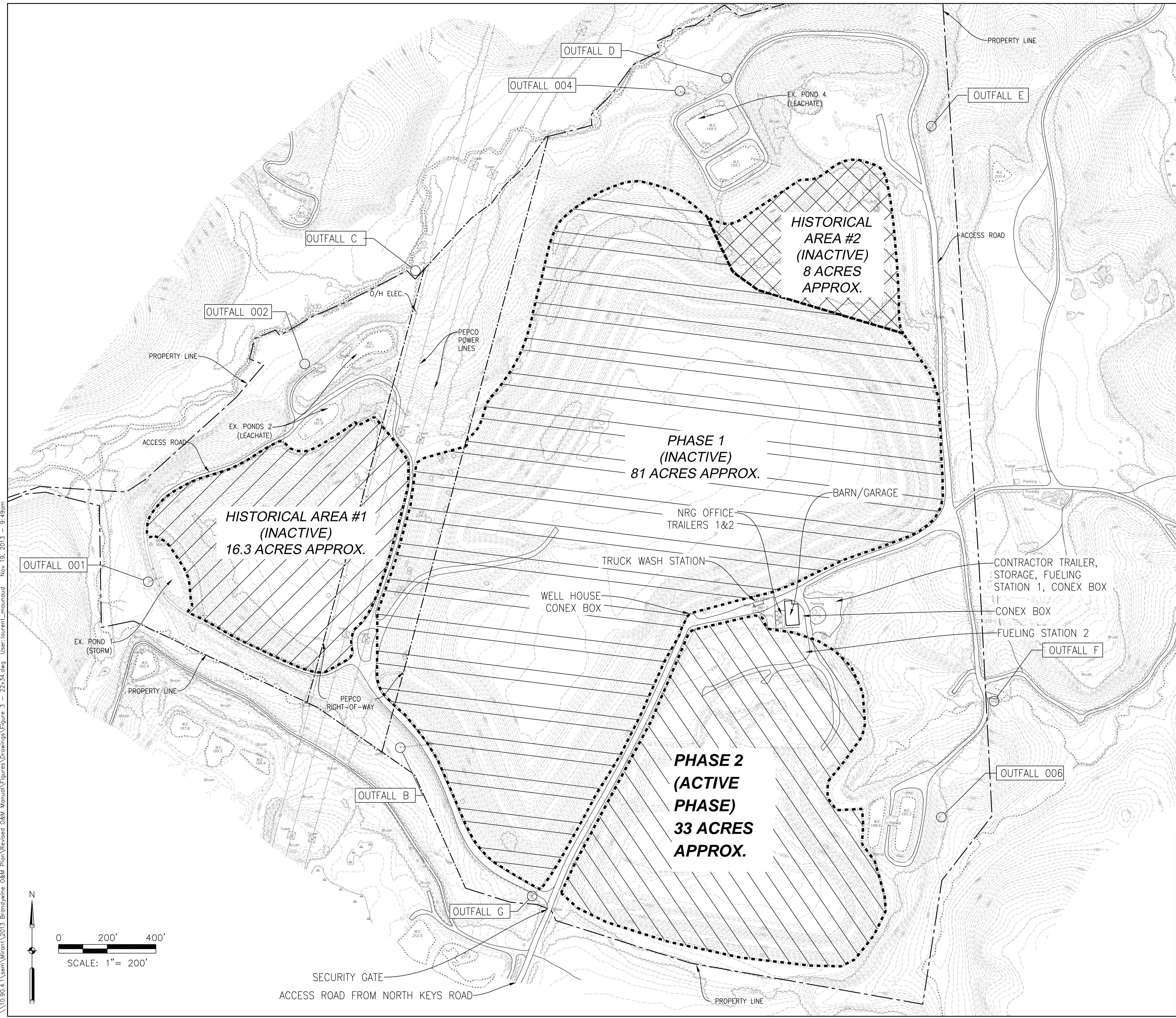
OWNER:  **BRANDYWINE ASH MANAGEMENT FACILITY**

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	2

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OWNER:		 BRANDYWINE ASH MANAGEMENT FACILITY		
BRANDYWINE FACILITY OPERATIONS PLAN				
PREPARED BY:		AECOM 12420 MILESTONE CENTER DRIVE, SUITE 150 GERMANTOWN, MD 20876 TEL: 301.820.3000 FAX: 301.820.3009		
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JRH	60429240	09/2016	3	

Appendix B – Plan Revisions and Amendments