Permit No.	Scan Date	DIN
5306-STRUCT-2015	**March 24, 2015**	**24019**

RECEIVED
March 24, 2015
Solid Waste Section
Asheville Regional Office

Permit Application

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, North Carolina

March 2015

Permit Application

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

HDR Engineering, Inc. of the Carolinas
440 South Church St, Suite 1000
Charlotte, NC 28202-2075
704.338.6700

NC License F0116

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Permit Application Overview

Purpose

The purpose of this permit application is to obtain a permit to construct a structural fill project at the Colon Mine Site in Lee County, North Carolina. North Carolina General Statutes (NCGS) §130A-309.215 (a) (2) mandates that no person shall commence or operate a project using coal combustion residuals as structural fill involving the placement of 8,000 or more tons of coal combustion products (CCP) per acre or 80,000 or more tons of CCP in total per project without first receiving an individual permit from the North Carolina Department of Environment and Natural Resources (NCDENR). This permit application is intended to meet that requirement.

General

NCGS §130A-309.215 (b) (2) requires that, for projects involving placement of 8,000 or more tons of CCP per acre or 80,000 or more tons of CCP in total per project, all information required pursuant to subdivision (1) of NCGS §130A-309.215 (b) including construction plans for the project must be provided to NCDENR. In addition, NCGS §130A-309.215 (b) (2) mandates that, if required by NCDENR, a stability analysis must be prepared, signed, and sealed by a professional engineer in accordance with sound engineering practices. The construction plan shall, at a minimum, include a groundwater monitoring system and an encapsulation liner system in compliance with the requirements of NCGS §130A-309.216.

Content

This permit application includes the following sections and is intended to meet the NCGS requirements and mandates.

- Correspondence
- Facility Plan
- Engineering Plan
- Operations Plan
- Closure and Post-Closure Plan
- Calculations
- Design Hydrogeologic Report (includes Water Quality Monitoring Plan)
- Related Documents
- Construction Quality Assurance Plan
- Technical Specifications
- Drawings

This permit application does not include a wetland/stream impact permit. This permit must be obtained prior to construction of the structural fill areas impacting wetlands and streams.

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Correspondence

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

Addendum 3 Transmittal Letter, 3/13/2015
Addendum 2 Transmittal Letter, 3/11/2015
Appendix to Lee County Application, 3/11/2015
NCDENR Completeness Determination, 1/23/1015
HDR Response to Comments, 1/20/2015
NCDENR Technical Review Letter, 1/7/2015
HDR Response to Comments, 12/31 2014
NCDENR Completeness Review Letter, 12/19/2014
Application for Transfer/Amendment Transmittal Letter, 11/21/2014
Structural Fill Permit Application Transmittal Letter, 11/21/2014

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March 13, 2015

Mr. Ed Mussler, III, PE, Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR
1646 Mail Service Center
Raleigh NC 27699

Dear Mr. Mussler,

On behalf of Green Meadow, LLC and Charah, Inc., HDR provides the enclosed Addendum 3 regarding the permit application entitled:

> *Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina*. Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

This addendum revises the financial assurance calculation and Closure Plan to set the largest area available for closure area to 31.9 acres. This area matches the largest Cell area that will be constructed at one time

Financial Assurance Letter
The attached financial assurance letter will replace the letter dated November 11, 2014 currently in the permit application.

Closure-Post Closure Plan
Section 2.5 of the Closure-Post Closure Plan has been revised to identify 31.9 acres as the largest area to require closure at one time.

Revisions in narrative documents are shown with deletions struckthrough (~~struckthrough~~) and additions underlined (underlined) along with a change line indicator in the left margin. As requested, upon completion of the permit application process the revisions will be combined into a final permit application document for the record.

Please contact me should you have any questions. We hope you find these design enhancements acceptable and we look forward to discussing them with you.

Sincerely,
HDR Engineering, Inc. of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosures: Financial Assurance
Closure-Post Closure Plan (revised page only)

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440 S Church Street, Suite 1000, Charlotte, NC 28202-2075
704.338.6700

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March 11, 2015

Mr. Ed Mussler, III, PE, Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR
1646 Mail Service Center
Raleigh NC 27699

Dear Mr. Mussler,

On behalf of Green Meadow, LLC and Charah, Inc., HDR provides the enclosed Addendum 2 regarding the permit application entitled:

> *Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina*. Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

The purpose of this addendum is to relate proposed enhancement to certain design and engineering aspects of the proposed project, specifically regarding the liner system groundwater separation, stormwater and leachate management systems, and the water quality monitoring plan. In addition this addendum clarifies that a minimum five foot groundwater separation buffer is maintained in the design. The following provides a brief summary of the sections and revisions in this addendum.

Facility Plan, Engineering Plan, Operations Plan
The narrative of each of these plans has been edited based on the proposed design enhancements and associated calculations. Changes generally include reference to an increase in the minimum groundwater separation, accommodation of the 25-year 24-hour design storm for leachate management, reduction of the subcell sizes to reduce leachate generation potential of the larger design storm, and an increase in the leachate tank capacity.

Calculations
Revised calculations include HELP model runs using a more stringent lift thickness and design storm in order to model the head on the liner system and determine the required leachate pipe spacing. Additional revised calculations include; leachate generation calculations, pipe capacity and sizing calculations and stormwater calculations to ensure the basins adequately manage the design storm.

Design Hydrogeological Plan
The Plan is revised to reflect the inclusion of 8 background monitoring events, statistical evaluation, and reference to analysis for Appendix III constituents.

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704.338.6700

Technical Specifications
Revisions to the geocomposite, GCL, and geotextiles technical specifications are included that align more specifically to management of coal combustion residuals.

Drawings
Drawing revisions include the reduction of subcell sized, inclusion of additional leachate collection piping, adjustment to associated drawing details, and modification to erosion control drawings and details to accommodate the larger design storm.

Revisions in narrative documents are shown with deletions struckthrough (~~struckthrough~~) and additions underlined (underlined) along with a change line indicator in the left margin. In most cases, only revised pages of narrative documents have been provided. As requested, upon completion of the permit application process the revisions will be combined into a final permit application document for the record.

Please contact me should you have any questions. We hope you find these design enhancements acceptable and we look forward to discussing them with you.

Sincerely,
HDR Engineering, Inc. of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosures: Appendix to Lee County Application
Facility Plan
Engineering Plan
Operations Plan
Calculation D Leachate
- HELP Model Summary Memo
- Design of Leachate Collection System Narrative
- Attachment 1 Summary of Model Input Data and Results
- Attachment 2 HELP Model Output Files (Scenarios 1-7)
- Pipe Sizing
- Pipe Orifice Sizing
- Pipe Perforations
- Pipe Capacity Determination
- Leachate Tank Sizing

Calculation E Stormwater
- Subcell Divider Berms
- Sediment Basins #3, 4, 6, 8, 9

Design Hydrogeological Report
- Figure 6 (revised)

Technical Specifications
- 01060 – Special Conditions
- 02777 – Drainage Composite
- 02778 – Geotextiles
- 02800 – Geosynthetic Clay Liner (GCL)

Drawings
- Site Work
- 00C-02
- 00C-03
- 00C-05
- 00C-06
- 00C-08
- Erosion and Sedimentation Control
- 01C-11
- 01C-12

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APPENDIX TO
LEE COUNTY APPLICATION

This document is attached as an appendix to the application (Application) being submitted by Charah, Inc. for the permitting, construction and operation of a facility in Lee County (Facility) to receive coal combustion products (CCP) from one or more electric generating facilities operated by Duke Energy Progress, Inc. and Duke Energy Carolinas, LLC. For clarity, the applicant will only receive ash from Duke's North Carolina facilities. The purpose of this Appendix is to describe the goals and philosophy reflected in the Application, which is intended to comply with all applicable environmental standards, including both (1) Session Law 2014-122, which enacted the Coal Ash Management Act of 2014 as a part of its terms (collectively, CAMA); and (2) the rules regarding Hazardous and Solid Waste Management system: Disposal of Coal Combustion Residuals from Electric Utilities, promulgated by the United States Environmental Protection Agency (EPA) submitted for publication on December 19, 2014 (CCR Rules).

The Application is being submitted to the Division of Waste Management (DWM) of the North Carolina Department of Environment and Natural Resources to secure an individual permit (Permit) under G.S. § 130A-309.215 that would authorize the use of CCP as structural fill at the Facility to reclaim an open pit mine in accordance with G.S. § 130A-309.201(14). As such, the Application contains the information required under G.S. § 130A-309.215(b), which reflects the following:

- the design, construction and operational requirements in G.S. § 130A-309.216(a);
- the liner, leachate collection system, cap and groundwater monitoring system requirements in G.S. § 130A-309.216(b);
- the siting requirements under G.S. § 130A-309.216(c); and

- the financial assurance requirements of G.S. § 130A-309.217.

The Application also reflects, to the extent necessary or appropriate, efforts that will be required to comply with the remaining terms of Subpart 3 of CAMA and other applicable provisions of Chapter 130 of the North Carolina General Statutes and Title 15A of the North Carolina Administrative Code (NC Requirements).

While the Facility as proposed in the Application would meet the four (4) criteria applicable to unencapsulated beneficial use of the CCP, and the proposed use of the CCP as mine filling as a practical matter constitutes a beneficial use of the material, the Applicant will take the conservative approach of seeking compliance with the requirements of the applicable CCR Rules. While the Application requests a state permit from DWM under the NC Requirements, the Applicant is also voluntarily designing, siting, constructing, and operating the Facility in accordance with the CCR Rules including:

- location restrictions, including placement above the uppermost aquifer (40 CFR § 257.60), wetlands (40 CFR § 257.61), fault areas (40 CFR § 257.62), seismic impact zones (40 CFR § 257.63), and unstable areas (40 CFR § 257.64);
- design criteria (40 CFR § 257.70);
- operating criteria, including air criteria (40 CFR § 257.80), run-on and run-off controls (40 CFR § 257.81), inspection requirements (40 CFR § 257.84), groundwater monitoring and potential groundwater corrective actions (40 CFR §§ 257.90-257.98 and Appendices III and IV), and closure and post-closure care (40 CFR §§ 257.101-275.104); and
- recordkeeping (40 CFR § 257.105), notification (40 CFR § 257.106), and internet posting requirements (40 CFR § 257.107).

It is presumed that any Permit that DWM issues for the Facility based on the Application will be consistent with this approach and design philosophy.

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

January 23, 2015

Mr. Norman Divers, Environmental Manager
Charah, Inc. and Green Meadows, LLC
Post Office Box 287
Belmont, North Carolina 28012

Subject: Permit to Construct Application – Determination of Completeness
Colon Mine Site, Structural Fill
Lee County, DIN 23018

Dear Mr. Divers:

On January 6, 2015 the Division of Waste Management (Division), Solid Waste Section received your response letter and revised application for the Permit to Construct, Colon Mine Site, Structural Fill, located in Lee County. The letter was included in the revised application entitled:

Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina. Prepared for Charah, Inc. Prepared by HDR Inc. November 2014, revised December 2014. DIN 22631.

The Section has performed a review of the revised application for a determination of completeness and determined the application is complete in accordance North Carolina General Statute NCGS 130A-309.203(b). A determination of completeness means that the application includes all required components in accordance with North Carolina General Statute NCGS 130A-309.215, but does not mean that the required components provide all of the information that is required for the Department to make a decision on the application. Accordingly, the Division sent a technical review letter January 7, 2015 (DIN 22502) and your technical review response was received January 21, 2015, entitled:

Response to Technical Review Comments. Prepared for Charah, Inc. Prepared by HDR Inc. January 2015. DIN 22995.

The Division is currently reviewing these responses. This letter in no way restricts the ability of the agency to request additional information or clarification.

Should you have any questions regarding this matter contact Mr. Larry Frost at (828) 296-4704 larry.frost@ncdenr.gov or Mrs. Elizabeth Werner (919) 707-8253 elizabeth.werner@ncdenr.gov.

Sincerely,

Digitally signed by Edward F. Mussler III, P.E.
DN: cn=Edward F. Mussler III, P.E., o=NCDWM, ou=Solid Waste Section, email=ed.mussler@ncdenr.gov, c=US
Date: 2015.01.23 09:20:47 -05'00'

Edward F. Mussler, III, P.E., Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

ec:	Joe Readling	HDR Engineering
	Larry Frost	DWM
	Elizabeth Werner	DWM
	Linda Culpepper	DWM
	Judy Wehner	DEMLR
	Tracy Davis	DEMLR
	Jay Zimmerman	DWR

January 20, 2015

Mr. Ed Mussler, III, PE, Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR
1646 Mail Service Center
Raleigh NC 27699

Dear Mr. Mussler,

On behalf of Green Meadow, LLC and Charah, Inc., HDR provides the following response to NCDENR's January 7, 2015 technical review letter (DIN 22502) regarding the permit application entitled:

> *Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina*. Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

As indicated in your letter, HDR recently submitted a revised permit application dated December 2014 in response to DIN 22536. That document and associated drawings represents the current permit application.

The Division's comments in DIN 22502 have been addressed and responses provided herein. A compact disc (CD) containing the revised or supplemental information in PDF format is included. Revisions in narrative documents are shown with deletions struckthrough (~~struckthrough~~) and additions underlined (underlined) along with a change line indicator in the left margin. As requested, upon completion of the permit application process the revisions will be combined into a final permit application document for the record.

The January 7, 2015 comments from the Division of Waste Management are restated below; HDR's responses on behalf of the applicant follow in *italics*.

Engineering Review

Facility Plan

1. 2.4.2- Leachate generation rates- How does this number compare to experience at the Asheville airport?

   Based on information provided by Charah, the leachate/contact water discharged from the Asheville airport site to the Buncombe County Metropolitan Sewer District (MSD) has averaged 1,418,000 gallons per month for Area 3 (30.8 acres) or 46,039 gallons per acre per month. This average includes varying surface conditions across the Area 3 containment area from open areas where all rainwater becomes contact water to areas that are above grade and covered with soil thereby diverting clean rain water to the sediment basins.

The HELP Model results included in the Calculations section of the Permit Application estimates an average annual flow rate of 43,760 cubic feet (327,325 gallons) per acre assuming a 20 foot thick layer of ash across the acre. However, the worst case condition for leachate handling would be contact water from a storm event immediately upon activating an area. A 2-year storm event was selected as the design storm since the largest subcell (15.3 acres) will take approximately five months to floor in the area with 20 feet of ash at the lower placement rate of 1,560,000 tons per year. The 2-year storm event for the area is 3.6 inches. This equates to 1,495,555 gallons within the largest cell area or 97,749 gallons per acre. The leachate pipes as shown in the Pipe Sizing calculation of the Leachate Calculation section have been designed to convey this storm event in 5.5 days. The subcell divider berms have been designed to store the entire storm event as shown in the Stormwater Calculation section. The leachate/contact water from each subcell will be piped to the sump in solid pipes, out to the leachate tank, and then pumped to the treatment plant.

Section 2.4.2 of the Facility Plan has been amended to include the information above.

2. 2.4.3.3 Final Disposal- The text indicates that leachate will be hauled by truck to the wastewater treatment facility. How many trips a day are anticipated under normal and storm loads?

   Section 2.4.3.3. of the Facility Plan has been revised to state "The primary leachate disposal will be via private sewer line to a wastewater treatment plant. A discharge permit is currently being sought and will be provided prior to operation of the system. "

   The revised Facility Plan is enclosed.

<u>Operations</u>

3. Records 1.1- Documentation of stormwater flap removal and valve adjustments from stormwater to leachate should be considered for recordkeeping

   Section 2.1.3 of the Operations Plan has been revised to describe the process for activating areas for ash placement which consists of opening valves, removal of rain flaps, verifying liner integrity, and documenting the process.

4. 1.9- Training materials used to train operators should be incorporated into the record.

   Section 1.10 of the Operations Plan has been revised to identify that employee training records and materials are kept onsite.

5. 2.1.2 (Facility 2.1.7) Acceptance Requirements- With what frequency will TCLP be run during the course of the movement to verify constancy with the initial results?

   While the Coal Ash Management Act of 2014 does not directly address this comment; Section .1700 of the Solid Waste rules provide a requirement to perform TCLP analysis annually on coal ash being used in a structural fill (15A NCAC 13B .1703 (a) (4)).

Section 2.1.2 of the Operations Plan has been modified to state that TCLP tests will be performed on each new ash source and at least annually for each source.

6. 2.2.2 LCS Maintenance- LCS – All new segments should be camera and cleaned as necessary to detect blockage or glue that could impede future inspections. Propose a schedule for checking and verifying integrity of the system, particularly early on when silting could be an issue.

   Section 2.2.2 of the Operations Plan has been revised to indicate all new segments shall be cleaned and videoed prior to putting into service. The leachate collection system will be video inspected once every two years, then cleaned if the video indicates a concern until the final cap system has been completely installed for the entire structural fill.

7. 2.2.3-There are activities that need to be accomplished including turning valves on or off, and removal of the storm flap. It is recommended that a process be developed to do this and document that the right valve is in the right position and that the flap has been removed with no damage to the liner and the documentation be kept in the facility record.

   [Section 2.2.3 of the Operations Plan (as referenced in the comment) describes the record keeping for leachate sampling. Section 2.1.3, Fill Sequencing, was the apparent reference and is responded to below.]

   Please refer to Response 3 for modification to Section 2.1.3 of the Operations Plan.

   The revised Operations Plan is enclosed.

<u>Closure Plan</u>

8. Introduction- first paragraph- revisions to the plan must be sent to the agency for modification of the permit prior to implementation.

   Section 1 of the Closure-Post Closure Plan has been revised to indicate any revisions to the Closure-Post Closure Plan shall be submitted to the department and approved prior to implementation.

9. 2.9- Certification of Closure should be submitted to the agency for any partial closure within 30-days.

   Section 2.9 of the Closure-Post Closure Plan has been revised to state that a certification signed and sealed by a registered professional engineer will be submitted to NCDENR within 30 days of the completion of the closure cap system or any partial closure of the cap system construction.

10. 3.7 A structural fill qualifies as a beneficial use and mine reclamation is a structural fill. What is the intended post-closure use of the facility beyond a field?

Section 3.7 of the Closure-Post Closure Plan indicates the property will be actively marketed as an industrial use site for development through the local and state economic development commission, as well as other real estate advertisement methods.

11. The Section financial assurance officer will provide guidance to the owner on the submittal of documentation for the instrument chosen, separately. Financial Assurance will be updated annually for construction, closures and inflationary increases.

    Comment noted. Charah/Green Meadow, LLC staff have been in contact with the Section's financial assurance officer. The required financial assurance will be applied as required prior to the operation of the facility as directed by the State.

    Section 2.8 of the Closure-Post Closure Plan has been revised to indicate the cost estimate will be updated annually.

    The revised Closure-Post Closure Plan is attached.

Engineering Plan

12. The liner stability analysis recommends the minimum bottom liner interface friction angle be 25 degrees. Is this reflected in the preconstruction testing requirements of the Technical specifications? Verify that the cross sections of the test are correct to match the analysis.

    Section 7 of the Engineering Plan indicates the minimum interface friction angle for the bottom liner shall be 26 degrees.

    Specification Section 01060 has been added to address the interface friction testing for both the base liner and the cap system. The following specifications have been revised to indicate the requirements for interface friction can be found in Section 01060.

    02240 – Leachate Collection Stone
    02276 – Soil Liner System
    02774 – LLDPE Geomembrane
    02775 – HDPE Geomembrane
    02777 – Drainage Composite
    02800 – Geosynthetic Clay Liner (GCL)

    Specification Sections 01060, 02240, 02276, 02774, 02775, 02777, and 02800 are enclosed.

HELP Modeling

13. With respect to the Help models of the various scenarios- How does the output match with experience by Charah at the Asheville Airport?

As discussed in Response 1 above, the worst case scenario for leachate management is to have a storm event the day a cell is activated for ash placement. HDR has developed several HELP model scenarios varying the thicknesses of ash placed above the liner system to show the impact on leachate generation as the structural fill is completed. In general, as more ash is placed, the leachate generation decreases due to the ability of the ash to absorb and retain the moisture. The leachate generation rates included in the calculations range from an average of 825 gallons per acre per day based on 60 feet of ash in place to an open cell condition where 97,749 gallons per acre are created from one 2-year, 24-hour storm event.

Information provided by Charah indicates the average leachate/contact discharge rate for Area 3 is 46,039 gallons per acre. This average includes varying conditions across the surface of the 30.8 acre containment area from open areas where all rainwater becomes contact water to areas that are above grade and covered with soil, thereby diverting clean rain water to the sediment basins.

The leachate generation calculations presented in the permit application bracket the actual field results seen at the Asheville Airport project.

14. For the open conditions, 100% runoff was allowed. Anything that contacts the ash is leachate. Is this number included in the leachate generation rates? What is the expected effect on the generation rate during operation if there is no runoff? The HELP model is iterative and a layer must be saturated before water moves to or from the next layer. Given the thickness of the ash in the model layers (20 feet) and the fact that the ash will be spread in thinner lifts, consideration might be given to breaking the thick layers into thinner ones. In general, the very bottom layer gives more representative results if layered as 1-2 feet thick. This lends to a more representative movement of the water in and out of the high permeability leachate collection system.

    HDR revised HELP Model Scenario 1 (20 feet of ash above the base liner system) to 0% runoff and the average annual leachate generation results increased from 897 to 1,227 gallons per acre per day. The revised results do not change the worst case for leachate generation (97,749 gallons per acre) which results from an open cell condition as discussed in Response 13 above. Additionally, HDR revised HELP Model Scenario 1 to break the 20 foot layer of ash into ten two-foot thick layers of ash. The leachate generation results were negligible and show a slight reduction in quantity generated per acre. The revised HELP model results have been added to Leachate Calculation section of the permit application as Attachment 6 to the Design of Leachate Collection System.

15. In the determination of leachate storage capacity, a 2-year, 24-hour rain is used for sizing. All of the other determinations used the 10-year, 24-hour storm. Why the difference and how does it affect the results?

    As discussed in Response 1 above, a 2-year storm event was selected as the design storm since the largest subcell (15.3 acres) will take approximately five months to floor in the area

with 20 feet of ash at the lower placement rate of 1,560,000 tons per year. The 10-year, 24-hour storm event was used for stormwater management on the closed cap and all other areas outside of the lined structural fill area.

16. While not specifically addressed by the statutes, please discuss the threatened and endangered species of the area and any potential cultural resources or lack thereof. Is it correct to assume this work was done prior to the issuance of a mining permit at some time in the past?

    A Threatened and Endangered Species Review and Habitat Assessment was conducted by ClearWater Environmental Consultants, Inc. for the site. An Archaeological Survey was conducted by TRC Environmental Corporation for the site. Both studies were included in the revised permit application dated December 31, 2014 submitted with HDR's response to completeness letter DIN 22536.

CQA Plan

17. Camera/Inspection of leachate lines after construction and before use is not specified, but highly recommended. In the experience of the section there is almost always an issue discovered in this process that can be fixed before the line is totally submerged under waste. For example, bends in the pipe or leftovers from the joining process can prohibit the movement of cameras or cleaning equipment, blockage due to dirt, rocks, and/or bottles is often found.

    Comment noted. Please refer to Response 6 above.

18. 6.2.4 -Are any of the materials sensitive to environmental exposure and are they properly speced to be covered, or have adequate UV protection? What is the UV standard for the geotextile of the drainage net?

    Geotextiles are sensitive to UV exposure. HDPE geomembrane's are not generally considered sensitive to UV exposure as they are predicted to last longer than 36 years in an exposed condition (GRI White Paper #6, February 2011).

    Section 02778 – Geotextiles is the specification for the geotextile component of the geocomposite. Page 02778-4 indicates geotextiles left uncovered for more than 90 days shall be replaced unless otherwise allowed by the Engineer. Additionally, Item C. under Part 2.2 of the specification has been added requiring manufacturer's certification that the material can withstand a minimum of 90 days of ultraviolet exposure.

    Page 02777-4 of Section 02777 – Drainage Composite has been revised to refer to Section 02778 for exposure limits.

    Revised Sections 02777 and 02778 are enclosed.

19. 10.2 Do you use traditional film or digital camera for photographic evidence?

Section 10.2 of the CQA Plan has been revised to indicate digital photographs or videos will be used to document the project.

A Revised CQA Plan is enclosed.

Technical Specs

20. There are no specifications or engineering for leachate storage tanks and secondary containment, or leachate lagoons. Please provide.

    Please refer to the Storage Tank technical specification and Tank Sizing calculation provided in the revised permit application dated December 31, 2014 submitted with HDR's response to completeness letter DIN 22536.

21. Are survey specifications needed? How many points and on what grid is the survey required? Make sure to remind the surveyor to survey at the same points for thickness, and that depth on side slopes is measured perpendicular to the slope.

    Specification Section 01060 has been added to indicate survey requirements. Survey requirements are also indicated in the CQA Plan.

22. 02220-What is the frequency of density testing on a berm? Is a test per unit foot and/or lift required as opposed to the 1 test per 10,000 ft2 mass area fill requirement?

    The testing frequency on a berm is the same as in the floor. Section 02220 3.2.D.3 has been revised to refer to the minimum test frequency indicated in Part 3.6.E.2 of the Section.

23. 02774- What are the specifications and conditions for the Interface Friction testing? (Section 2.3), such as layers and arrangements and confining pressure, friction etc. Are these tests required before placement of materials?

    Refer to Response 12 above on interface friction testing.

24. 02774 and 02275 – What are the specs for the nondestructive air pressure testing? (Section 3.Bb5b) Such as duration, pressure loss, accounting for temperature change and isolating the leak. Please ensure that it is recognized that repair of a leak by extrusion welding the flap is not an acceptable method. It should be cut out and wedge welded or have a cap strip placed over the area.

    Sections 02774 and 02775 indicate nondestructive air pressure testing to be performed in accordance with industry standard GRI GM6. The repair method for a failing non-destructive test is indicated in 3.1B4g and h respectively.

25. Specification 3.1A2e, what are the approved methods of determining thickness?

Part 3.1 A2e of Specification 02775 has been revised to indicate reference to Specification 01060 and the CQA Plan for approved methods of determining thickness.

Part 3.1 A of Specification 02774 has been revised to reflect the surface preparation of the CCP instead of surface preparation for soil liner.

26. 2777-2.3 Transmissivity Testing- Is the cross section correct? It uses soil against the upper fabric, but isn't ash the contact substance? Why is a confining pressure of 10,000 psi and gradient of 0.3 used? The transmissivity needed was determined with a 5k psi confining pressure and 0.02 gradient.

    The cross section and confining pressure for the transmissivity testing has been revised.

27. 02800 What is the reinforcement method for the GCL that is required?

    The reinforcement in a GCL is created during the manufacturing process by the fibers of a non-woven geotextile being needle-punched through the bentonite layer and into another non-woven geotextile. The needle-punched fibers give reinforced GCL higher internal shear strength.

28. Interface friction - Specify the specifications and layers.

    Section 01060 – Special Conditions has been added to indicate the interface friction testing requirements and layers.

Drawings

29. 01-08 Document flap removal and valve switch, and also verify that valves don't inhibit camera or cleaning equipment used in the cleaning of the leachate lines.

    Section 2.1.3 of the Operations Plan has been revised to describe the process for putting subcells into operation which consists of opening valves, removal of rain flaps, verifying liner integrity, and documenting the process. Full flow ball valves will be used to allow camera inspection and pipe cleaning.

The following items are provided for information and planning purposes.

General

30. Upon issuance of the Permit, any further modification or amendment to approved plans will require Section approval prior to implementation.

    Comment noted.

Prior to Construction – the following must be provided to the Section prior to commencement of construction;

31. Submit well abandonment records (Form GW-30) for each abandoned piezometer as needed during the progression of construction of each Subcell in electronic format (pdf).

    For each piezometer that is abandoned during construction, a well abandonment record (Form GW-30) will be submitted to NCDENR in electronic pdf format.

32. The permit will include conditions to submit the Construction Quality Assurance documentation for the constructed liner to the Section for review upon the completion of each permitted subcell or increment of construction. Should any discrepancies be indicated, the Section will contact the engineer for follow up. Placement of coal in the area prior to sign off by the section will be at the owner's risk.

    Section 2 of the Operations Plan has been revised to incorporate this comment.

33. Provide the approved Erosion and Sedimentation Control permit from the Division of Energy, Mining and Land Resources, in electronic format (pdf), for the Section's database record.

    The Erosion and Sedimentation Control permit is currently being reviewed. Upon approval, the permit will be submitted in electronic pdf format.

Prior to Initial Operation – the following must be provided to the Section prior to commencement of operations;

1. Once the monitoring wells have been installed, submit boring logs and well construction records (Form GW-1b) for each of the nine (9) compliance groundwater monitoring wells in electronic format (pdf).

    Comment noted.

2. Recent publication of the proposed CCR rules by the USEPA include provisions for groundwater sampling. Propose a ground water monitoring sampling schedule for the first six (6) months which addresses the initial baseline sampling of eight (8) independent background sampling events for the nine (9) compliance groundwater monitoring wells and one (1) background sampling event for the two (2) surface water monitoring locations. At least one sampling event must be completed before waste is put in the lined fill area. Plan to submit all results in electronic format (pdf).

    Charah/Green Meadow will implement a groundwater sampling procedure that adheres to the current rules and law.

In addition to the above edits, Clear Water Environmental Consultants, Inc. has provided an updated Stream and Wetland Delineation Map to HDR based upon their confirmation with the Army Corp of Engineers. This map has been added to the Related Documents section of the Permit Application. A copy is enclosed.

As a result, the following drawings have been revised to include the update: 00G-02, 00C-01, 00C-02, O1C-0101, 01C-02, and 01C-03. These revised drawings are enclosed.

If you have any questions, comments, or require additional information, please contact me at 704. 338.6843.

Sincerely,
HDR Engineering, Inc. of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosures:
- Facility Plan (revised)
- Operations Plan (revised)
- Closure-Post Closure Plan (revised)
- Calculation D
  - Design of Leachate Collection System Attachment 6 (new)
- CQA Plan (revised)
- Technical Specifications
  - 01060 – Special Conditions (new)
  - 02240 – Leachate Collection Stone (revised)
  - 02220 – Earthwork (revised)
  - 02276 – Soil Liner System (revised)
  - 02774 – LLDPE Geomembrane (revised)
  - 02775 – HDPE Geomembrane (revised)
  - 02777 – Drainage Composite (revised)
  - 02778 – Geotextiles (revised)
  - 02800 – Geosynthetic Clay Liner (GCL) (replaced)
- Related Documents
  - Stream and Wetland Delineation Map
- Drawings
  - 00G-02
  - 00C-01
  - 01C-01
  - 01C-02
  - 01C-03

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

Donald R. van der Vaart
Secretary

January 7, 2015

Mr. Norman Divers, Environmental Manager
Charah, Inc. and Green Meadow, LLC
Post Office Box 287
Belmont, North Carolina 28012

Subject: Permit Application – Technical Review
Colon Mine Site, Structural Fill
Lee County, DIN 22502

Dear Mr. Divers:

On November 21, 2014 the Division of Waste Management, Solid Waste Section (Section) received Charah Inc.'s Permit Application, entitled:

Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina. Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

The Section has reviewed the application and has questions. Please address the following items:

Engineering Review

Facility Plan

1. 2.4.2- Leachate generation rates- How does this number compare to experience at the Asheville airport?
2. 2.4.3.3 Final Disposal- The text indicates that leachate will be hauled by truck to the wastewater treatment facility. How many trips a day are anticipated under normal and storm loads?

Operations

3. Records 1.1- Documentation of stormwater flap removal and valve adjustments from stormwater to leachate should be considered for recordkeeping
4. 1.9- Training materials used to train operators should be incorporated into the record.
5. 2.1.2 (Facility 2.1.7) Acceptance Requirements- With what frequency will TCLP be run during the course of the movement to verify constancy with the initial results?
6. 2.2.2 LCS Maintenance- LCS – All new segments should be camera and cleaned as necessary to detect blockage or glue that could impede future inspections. Propose a schedule for checking and verifying integrity of the system, particularly early on when silting could be an issue.
7. 2.2.3-There are activities that need to be accomplished including turning valves on or off, and removal of the storm flap. It is recommended that a process be developed to do this and document that the right valve is in the right position and that the flap has been removed with no damage to the liner and the documentation be kept in the facility record.

Closure Plan

8. Introduction- first paragraph- revisions to the plan must be sent to the agency for modification of the permit prior to implementation

9. 2.9- Certification of Closure should be submitted to the agency for any partial closure within 30-days.
10. 3.7 A structural fill qualifies as a beneficial use and mine reclamation is a structural fill. What is the intended post-closure use of the facility beyond a field?
11. The Section financial assurance officer will provide guidance to the owner on the submittal of documentation for the instrument chosen, separately. Financial Assurance will be updated annually for construction, closures and inflationary increases.

Engineering Plan

12. The liner stability analysis recommends the minimum bottom liner interface friction angle be 25 degrees. Is this reflected in the preconstruction testing requirements of the Technical specifications? Verify that the cross sections of the test are correct to match the analysis.

HELP Modeling

13. With respect to the Help models of the various scenarios- How does the output match with experience by Charah at the Asheville Airport?
14. For the open conditions, 100% runoff was allowed. Anything that contacts the ash is leachate. Is this number included in the leachate generation rates? What is the expected effect on the generation rate during operation if there is no runoff? The HELP model is iterative and a layer must be saturated before water moves to or from the next layer. Given the thickness of the ash in the model layers (20 feet) and the fact that the ash will be spread in thinner lifts, consideration might be given to breaking the thick layers into thinner ones. In general, the very bottom layer gives more representative results if layered as 1-2 feet thick. This lends to a more representative movement of the water in and out of the high permeability leachate collection system.
15. In the determination of leachate storage capacity, a 2-year, 24-hour rain is used for sizing. All of the other determinations used the 10-year, 24-hour storm. Why the difference and how does it affect the results?
16. While not specifically addressed by the statutes, please discuss the threatened and endangered species of the area and any potential cultural resources or lack thereof. Is it correct to assume this work was done prior to the issuance of a mining permit at some time in the past?

CQA Plan

17. Camera/Inspection of leachate lines after construction and before use is not specified, but highly recommended. In the experience of the section there is almost always an issue discovered in this process that can be fixed before the line is totally submerged under waste. For example, bends in the pipe or leftovers from the joining process can prohibit the movement of cameras or cleaning equipment, blockage due to dirt, rocks, and/or bottles is often found.
18. 6.2.4 -Are any of the materials sensitive to environmental exposure and are they properly speced to be covered, or have adequate UV protection? What is the UV standard for the geotextile of the drainage net?
19. 10.2 Do you use traditional film or digital camera for photographic evidence?

Technical Specs

20. There are no specifications or engineering for leachate storage tanks and secondary containment, or leachate lagoons. Please provide.

21. Are survey specifications needed? How many points and on what grid is the survey required? Make sure to remind the surveyor to survey at the same points for thickness, and that depth on side slopes is measured perpendicular to the slope.
22. 02220-What is the frequency of density testing on a berm? Is a test per unit foot and/or lift required as opposed to the 1 test per 10,000 ft2 mass area fill requirement?
23. 02774- What are the specifications and conditions for the Interface Friction testing? (Section 2.3), such as layers and arrangements and confining pressure, friction etc. Are these tests required before placement of materials?
24. 02774 and 02275 – What are the specs for the nondestructive air pressure testing? (Section 3.Bb5b) Such as duration, pressure loss, accounting for temperature change and isolating the leak. Please ensure that it is recognized that repair of a leak by extrusion welding the flap is not an acceptable method. It should be cut out and wedge welded or have a cap strip placed over the area.
25. Specification 3.1A2e, what are the approved methods of determining thickness?
26. 2777-2.3 Transmissivity Testing- Is the cross section correct? It uses soil against the upper fabric, but isn't ash the contact substance? Why is a confining pressure of 10,000 psi and gradient of 0.3 used? The transmissivity needed was determined with a 5k psi confining pressure and 0.02 gradient.
27. 02800 What is the reinforcement method for the GCL that is required?
28. Interface friction - Specify the specifications and layers.

Drawings

29. 01-08 Document flap removal and valve switch, and also verify that valves don't inhibit camera or cleaning equipment used in the cleaning of the leachate lines.

The following items are provided for information and planning purposes.

General

30. Upon issuance of the Permit, any further modification or amendment to approved plans will require Section approval prior to implementation.

Prior to Construction – the following must be provided to the Section prior to commencement of construction;

31. Submit well abandonment records (Form GW-30) for each abandoned piezometer as needed during the progression of construction of each Subcell in electronic format (pdf).
32. The permit will include conditions to submit the Construction Quality Assurance documentation for the constructed liner to the Section for review upon the completion of each permitted subcell or increment of construction. Should any discrepancies be indicated, the Section will contact the engineer for follow up. Placement of coal in the area prior to sign off by the section will be at the owner's risk.
33. Provide the approved Erosion and Sedimentation Control permit from the Division of Energy, Mining and Land Resources, in electronic format (pdf), for the Section's database record.

Prior to Initial Operation – the following must be provided to the Section prior to commencement of operations;

1. Once the monitoring wells have been installed, submit boring logs and well construction records (Form GW-1b) for each of the nine (9) compliance groundwater monitoring wells in electronic format (pdf).
2. Recent publication of the proposed CCR rules by the USEPA include provisions for groundwater sampling. Propose a ground water monitoring sampling schedule for the first six (6) months which addresses the initial baseline sampling of eight (8) independent background sampling events for the nine (9) compliance groundwater monitoring wells and one (1) background sampling event for the two (2) surface water monitoring locations. At least one sampling event must be completed before waste is put in the lined fill area. Plan to submit all results in electronic format (pdf).

The section acknowledges that there is already a previous request for information, see DIN 22536 issued December 19, 2014. That information submitted in response to the request will also be reviewed. This letter in no way restricts the ability of the agency to request additional information or clarification.

Please address the above questions from your original application and provide any responses or addendums to the Section. It is not necessary to provide a complete application. Upon completion of the permit application process all the addendums can be combined into a final document for the record. Two (2) hard copies and an electronic (pdf) copy of the amended application must be provided to the Section, at that time. Should you have any questions contact Mr. Larry Frost at (828) 296-4704 larry.frost@ncdenr.gov or Mrs. Elizabeth Werner (919) 707-8253 elizabeth.werner@ncdenr.gov.

Sincerely,

Digitally signed by Edward F. Mussler III, P.E.
DN: cn=Edward F. Mussler III, P.E., o=NCDWM, ou=Solid Waste Section, email=ed.mussler@ncdenr.gov, c=US
Date: 2015.01.07 13:49:28 -05'00'

Edward F. Mussler, III, P.E., Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

cc:	Joe Readling	HDR Engineering
ec:	Larry Frost	DWM
	Elizabeth Werner	DWM
	Linda Culpepper	DWM
	Judy Wehner	DEMLR
	Tracy Davis	DEMLR
	Tom Reeder	DWR

December 31, 2014

Mr. Ed Mussler, III, PE, Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR
1646 Mail Service Center
Raleigh NC 27699

Dear Mr. Mussler,

On behalf of Green Meadow, LLC and Charah, Inc., HDR provides the following response to NCDENR's December 19, 2014 completeness review letter (DIN 22354) regarding the permit application entitled:

> *Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina.* Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

As requested, the Division's comments have been addressed, the previously submitted Addendum No. 1 (issued December 9, 2014 via e-mail to Mr. Ed Mussler) has been incorporated into the application, and two hard copies of the application binder and associated drawings are attached herewith. A compact disc (CD) containing the entire revised application and drawings in PDF format is included in the inside pocket of each application.

As a reminder, the application includes a Correspondence section which is intended to be used to track communication received from DENR or provided to DENR on behalf of the applicant while the application is under review. To that end, HDR had included copies of the Division's December 19, 2014 completeness review letter as well as this response letter in that section of the application. Future correspondence will be handled similarly.

The December 19, 2014 comments from the Division of Waste Management are restated below; HDR's responses on behalf of the applicant follow in *italics.*

Hydrogeological Review Comments

1. Submit a site map showing the proposed base grades along with the potentiometric surface in order to determine the required 4-foot vertical separation between bottom of waste and long-term seasonal high groundwater in hard copy and electronic format (pdf).

   A new Figure 6 has been included showing the requested surfaces. [The Water Quality Monitoring Plan, which was Figure 6 in the previous submittal, has now been renumbered as Figure 7.]

hdrinc.com 440 S Church Street, Suite 1000, Charlotte, NC 28202-2075
704.338.6700

2. Submit boring logs and well construction records (Form GW-1b) for each of the nine (9) compliance groundwater monitoring wells in electronic format (pdf).

   Some of the original piezometers are intended to function as future compliance wells, while some compliance wells are yet to be installed. In Section 13.1 of the Design Hydrogeologic Report piezometers PZ-1 (MW-1) and PZ-7 (MW-2), which were installed during the Design Hydrogeologic investigation, are identified to be utilized as compliance wells. For the existing wells, the construction records are included. Construction records for any compliance wells installed in the future will be submitted at that time.

3. Submit revised *Figure 6-Water Quality Monitoring Plan* with the groundwater monitoring wells and surface water monitoring locations properly labeled in hard copy and electronic format (pdf).

   The Water Quality Monitoring Plan, now Figure 7, has been revised as requested.

Engineering Review Comments

FACILITY PLAN

4. 2.4.1 -The method of leachate storage is not chosen. Please submit the method chosen for permit review.

   The Facility Plan and Drawings have been revised to clarify the intent to use a tank for leachate storage.

5. Financial assurance- Appendix G- Financial assurance numbers could be subject to change depending on the final design plans. General Statute 130A-309.217 specifies that coverage be posted to cover any sudden and nonsudden accidental occurrences. Please submit information to document coverage for sudden and nonsudden accidental occurrences. This coverage is for the corporation's operation in North Carolina rather than specific to an individual facility.

   Any sudden and nonsudden accidental occurrences will be covered by an insurance policy that will provide four million dollars ($4,000,000) for each individual occurrence and eight million dollars ($8,000,000) for the aggregate of occurrences as directed by the State. The certificate of insurance has been added to Appendix G of the Calculations section.

6. 4.4.5 CQA Plan- Refers to backfilling of the anchor trench. The plan must address the handling and protection of the runout of the liner, construction and filling of the anchor trench as well as welding/joining to the next cell for continued construction. Items such as welding a cap strip over the joining seam, verifying integrity of GCL, joining of the low permeability soil component and the like must be addressed.

Section 4.4.5 of the CQA Plan has been revised to address handling and protection of the anchor trench and runout of the low permeability soil component, GCL, and liner during construction and backfilling as well as welding/joining to the next cell for continued construction.

TECHNICAL SPECS

7. Specifications and engineering designs for leachate storage tanks and secondary containment, or leachate lagoons must be provided for the permitting of the leachate handling infrastructure.

   The Leachate Storage Capacity calculation has been revised to address sizing the leachate storage tank and is included in Part D of the Calculations section. A specification for the leachate storage tank is provided in the Specifications section.

DRAWINGS

8. 01-07 the plan must address protection of liner runout and liner tie in and joining of subcells etc.

   Drawing 00C-07 has been revised to include a construction detail to illustrate a subcell tie-in.

Information and Planning Purposes Comments

GENERAL

- Transfer/offloading sites that will feed coal ash to this site must have environmental controls and operation plans in place that are protective of public health and the environment. Please describe those plans.

  Transfer/offloading infrastructure is being developed in conjunction with the railroad providers identifying site access and traffic patterns. The offloading of rail cars will be performed by using a straddle-excavator that will work along the rail car spur line. Material shall be removed from the car and loaded into an off-road dump truck and then transported to the structural fill for placement inside the lined placement area. The off-loading spur line(s) will be constructed with a containment liner that will consist of an HDPE flexible membrane liner. All leachate from the offloading area will be collected and conveyed onsite to the storage tank and on to the wastewater treatment plant.

PRIOR TO CONSTRUCTION – the following must be provided to the Section prior to commencement of construction:

- Submit well abandonment records (Form GW-30) for each abandoned piezometer as needed during the progression of construction of each Subcell in electronic format (pdf).

  Requirement acknowledged.

- Provide the approved Erosion and Sedimentation Control permit from the Division of Energy, Mining and Land Resources, in electronic format (pdf), for the Section's database record.

  Requirement acknowledged.

- In areas with streams and/or wetlands, provide the approved 404/401 from U.S. Army Corps of Engineers and/or the N.C. Division of Water Resources, in electronic format (pdf), for the Section's database record.

  Requirement acknowledged.

PRIOR TO INITIAL OPERATION – the following must be provided to the Section prior to commencement of operations:

- A leachate disposal permit must be provided, in electronic format (pdf), for the Section's database record.

  Requirement acknowledged.

- Submit a monitoring report of the four (4) independent background monitoring events for the nine (9) compliance groundwater monitoring wells and one (1) background monitoring event for the two (2) surface water monitoring locations in electronic format (pdf).

  Requirement acknowledged.

- The CCP generator location forms must be provided for each generator site, in electronic format (pdf), for the Section's database record.

  Requirement acknowledged. Information is provided for Duke Energy's Riverbend and Sutton plants in this application.

- Submit TCLP analysis reports for each new CCP generator site identified, in electronic format (pdf), for the Section's database record.

  Requirement acknowledged. Information is provided for Duke Energy's Riverbend and Sutton plants in this application.

- An approved Financial Assurance mechanism must be established.

  Requirement acknowledged.

If you have any questions, comments, or require additional information, please contact me at 704. 338.6843.

Sincerely,
HDR Engineering, Inc. of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosures: Permit Application Binder (2)
Drawings 22x34 (2 sets)

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

December 19, 2014

Mr. Norman Divers, Environmental Manager
Charah, Inc. and Green Meadow, LLC
Post Office Box 287
Belmont, North Carolina 28012

Subject: Permit Application – Completeness Review
Colon Mine Site, Structural Fill
Lee County, DIN 22536

Dear Mr. Divers:

On November 21, 2014 the Division of Waste Management, Solid Waste Section (Section) received Charah Inc.'s Permit Application, entitled:

> *Permit Application, Colon Mine Site, Structural Fill, Charah, Inc., Sanford, North Carolina.* Prepared for Charah, Inc. Prepared by HDR Inc. November 2014. DIN 22354.

The Section has determined that additional information is needed to allow the division to make a completeness determination. Please provide the following:

Hydrogeological Review

1. Submit a site map showing the proposed base grades along with the potentiometric surface in order to determine the required 4-foot vertical separation between bottom of waste and long-term seasonal high groundwater in hard copy and electronic format (pdf).
2. Submit boring logs and well construction records (Form GW-1b) for each of the nine (9) compliance groundwater monitoring wells in electronic format (pdf).
3. Submit revised *Figure 6-Water Quality Monitoring Plan* with the groundwater monitoring wells and surface water monitoring locations properly labeled in hard copy and electronic format (pdf).

Engineering Review

Facility Plan

4. 2.4.1 -The method of leachate storage is not chosen. Please submit the method chosen for permit review.
5. Financial assurance- Appendix G- Financial assurance numbers could be subject to change depending on the final design plans. General statute 130A-309.217 specifies that coverage be posted to cover any sudden and nonsudden accidental occurrences. Please submit information to support coverage for sudden and nonsudden accidental occurencence. This

coverage is for the corporation's operation in North Carolina rather than specific to an individual facility.

6. 4.4.5 CQA Plan- Refers to backfilling of the anchor trench. The plan must address the handling and protection of the runout of the liner, construction and filling of the anchor trench as well as welding/joining to the next cell for continued construction. Items such as welding a cap strip over the joining seam, verifying integrity of GCL, joining of the low permeability soil component and the like must be addressed.

Technical Specs

7. Specifications and engineering designs for leachate storage tanks and secondary containment, or leachate lagoons must be provided for permitting the leachate handling infrastructure.

Drawings

8. 01-07- The written plan must address protection of liner runout and liner tie-in and joining of subcells etc.

The following items are requested to provide clarification or additional information.

General

Transfer/offloading sites that will feed coal ash to this site must have environmental controls and operation plans in place that are protective of public health and the environment. Please describe those plans.

Prior to Construction – the following must be provided to the Section prior to commencement of construction:

Submit well abandonment records (Form GW-30) for each abandoned piezometer as needed during the progression of construction of each Subcell, in electronic format (pdf).

Provide the approved Erosion and Sedimentation Control permit from the Division of Energy, Mining and Land Resources, in electronic format (pdf), for the Section's database record.

In areas with streams and/or wetlands, provide the approved 404/401 from U.S. Army Corps of Engineers and/or the N.C. Division of Water Resources, in electronic format (pdf), for the Section's database record.

Prior to Initial Operation – the following must be provided to the Section prior to commencement of operations:

A leachate disposal permit must be provided, in electronic format (pdf), for the Section's database record.

Submit a monitoring report of the four (4) independent background monitoring events for the nine (9) compliance groundwater monitoring wells and one (1) background monitoring event for the two (2) surface water monitoring locations in electronic format (pdf).

The CCP generator location forms must be provided for each generator site, in electronic format (pdf), for the Section's database record.

Submit TCLP analysis reports for each new CCP generator site identified in electronic format (pdf), for the Section's database record.

An approved Financial Assurance mechanism must be established.

Additional technical information to supplement the permit application will be requested upon further permit review.

Please address the above issues from the original application and combine any addendums provided to the Section in an amended permit application. Two (2) hard copies and an electronic (pdf) copy of the amended application must be provided to the Section. Should you have any questions, contact Mr. Larry Frost at (828) 296-4704 larry.frost@ncdenr.gov or Mrs. Elizabeth Werner (919) 707-8253 elizabeth.werner@ncdenr.gov.

Sincerely,

Digitally signed by Edward F. Mussler III, P.E.
DN: cn=Edward F. Mussler III, P.E., o=NCDWM, ou=Solid Waste Section, email=ed.mussler@ncdenr.gov, c=US
Date: 2014.12.19 15:44:08 -05'00'

Edward F. Mussler, III, P.E., Supervisor
Permitting Branch, Solid Waste Section
Division of Waste Management, NCDENR

Cc:		
	Joe Readling	HDR Engineering
	Larry Frost	DWM
	Elizabeth Werner	DWM
	Linda Culpepper	DWM
	Judy Wehner	DEMLR
	Tracy Davis	DEMLR
	Tom Reeder	DWR

November 21, 2014

Tracy Davis
Director
Division of Energy, Mineral and Land Resources
North Carolina Department of Environment and Natural Resources
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Application for Transfer and Amendment
Mine Permit No. 53-05
Colon Mine Site – Lee County, NC
HDR Project No. 235691

Dear Director Davis,

On behalf of Green Meadow, LLC and Charah, Inc., HDR is submitting this application for a transfer and amendment/modification of the referenced permit to allow for structural fill to be located at the Colon Mine Site (the "Site") in Lee County, North Carolina. Two copies of the application document are enclosed; each contains an electronic copy of the application on CD and is accompanied by a full size set of drawings (bound separately). The applicants understand that the provisions of Subpart 3 of the North Carolina Coal Ash Management Act of 2014 (codified at North Carolina General Statutes Chapter 130A Article 9 Part 2I) will apply to the placement of structural fill at the Site, and that the requirements of Subpart 3 will be expressly included as specific requirements in the transferred, amended/modified permit. If you have any questions about this permit application, please feel free to contact me at (704) 338-6843.

Sincerely,
HDR Engineering Inc., of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosure

hdrinc.com

440 S Church Street, Suite 1000, Charlotte, NC 28202-2075
704.338.6700

November 21, 2014

Ms. Linda Culpepper
NCDENR Division of Waste Management Director
1646 Mail Service Center
Raleigh, NC 27699-1646

RE: Structural Fill Permit Application
Colon Mine Site – Lee County, NC
HDR Project No. 235961

Dear Ms. Culpepper,

On behalf of Green Meadow, LLC and Charah, Inc., this letter is to confirm today's hand delivery of a permit application for a structural fill to be located at the Colon Mine Site in Lee County, North Carolina (North Carolina Department of Environment and Natural Resources (NCDENR) Mine Permit No. 53-05). This permit application has been completed in accordance with the North Carolina Coal Ash Management Act of 2014 Subpart 3 - Use of Coal Combustion Products in Structural Fill (codified at North Carolina General Statutes Chapter 130A Article 9 Part 2I). A separate mining permit transfer/modification application covering this site has been sent to Tracy Davis, Director of the Division of Energy, Mineral, and Land Resources of NCDENR.

If you have any questions about this permit application, please feel free to contact me at (704) 338-6843.

Sincerely,
HDR Engineering Inc., of the Carolinas

Michael D. Plummer, PE
Project Manager

Enclosure

cc: Tracy Davis

hdrinc.com

440 S Church Street, Suite 1000, Charlotte, NC 28202-2075
704.338.6700

Facility Plan

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

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Table of Contents

List of Figures and Tables

Appendices

1 Introduction

This is a facility plan to reclaim the Colon Mine Site located in Lee County, North Carolina with coal combustion products (CCP) structural fill. The mine, once complete, will be reclaimed by encapsulating CCPs in a lined containment in order to re-establish the mine contours to a useful design.

Construction of the structural fill will begin once the North Carolina Department of Environment and Natural Resources (NCDENR) approves this permit application. Construction of the composite base liner system is anticipated to be completed in two phases. The Owner anticipates placing approximately 1,600,000 tons of CCPs a year in the 7.25 million cubic yard (cy) structural fill; therefore, placement will last approximately 5 to 5.5 years. The final closure cap is designed to minimize infiltration and erosion. In accordance with the North Carolina General Statutes, post-closure care will be performed for 30 years unless a revised schedule is approved by NCDENR.

1.1 Background

Green Meadow, LLC owns and Charah, Inc. will operate the Colon Mine Site located in Lee County, off Brickyard Road in Sanford, North Carolina under NCDENR Permit No. 53-05. The mine property, consisting of approximately 411 acres, is shown in the permit drawings. The property was previously owned and operated by General Shale. The mine was originally permitted in October 1972 according to information on the NCDENR website.

The structural fill, including associated perimeter berms, channels, and haul roads, will encompass approximately 137 acres, of which approximately 118 acres will be covered with a composite liner system for subsequent CCP placement. The proposed structural fill area is bounded on the east by the CSX railroad; on the north by a tributary to Roberts Creek; and on the south by Norfolk Southern railroad.

The structural fill is scheduled for construction in early 2015 with ash placement scheduled to begin in March 2015 to be in a position to comply with the schedule defined in the Coal Ash Management Act of 2014.

Figure 1 shows various site features including the proposed structural fill cells and the current property boundaries superimposed on an aerial photo. Figure 2 contains a survey of the structural fill property.

1.2 Responsible Party

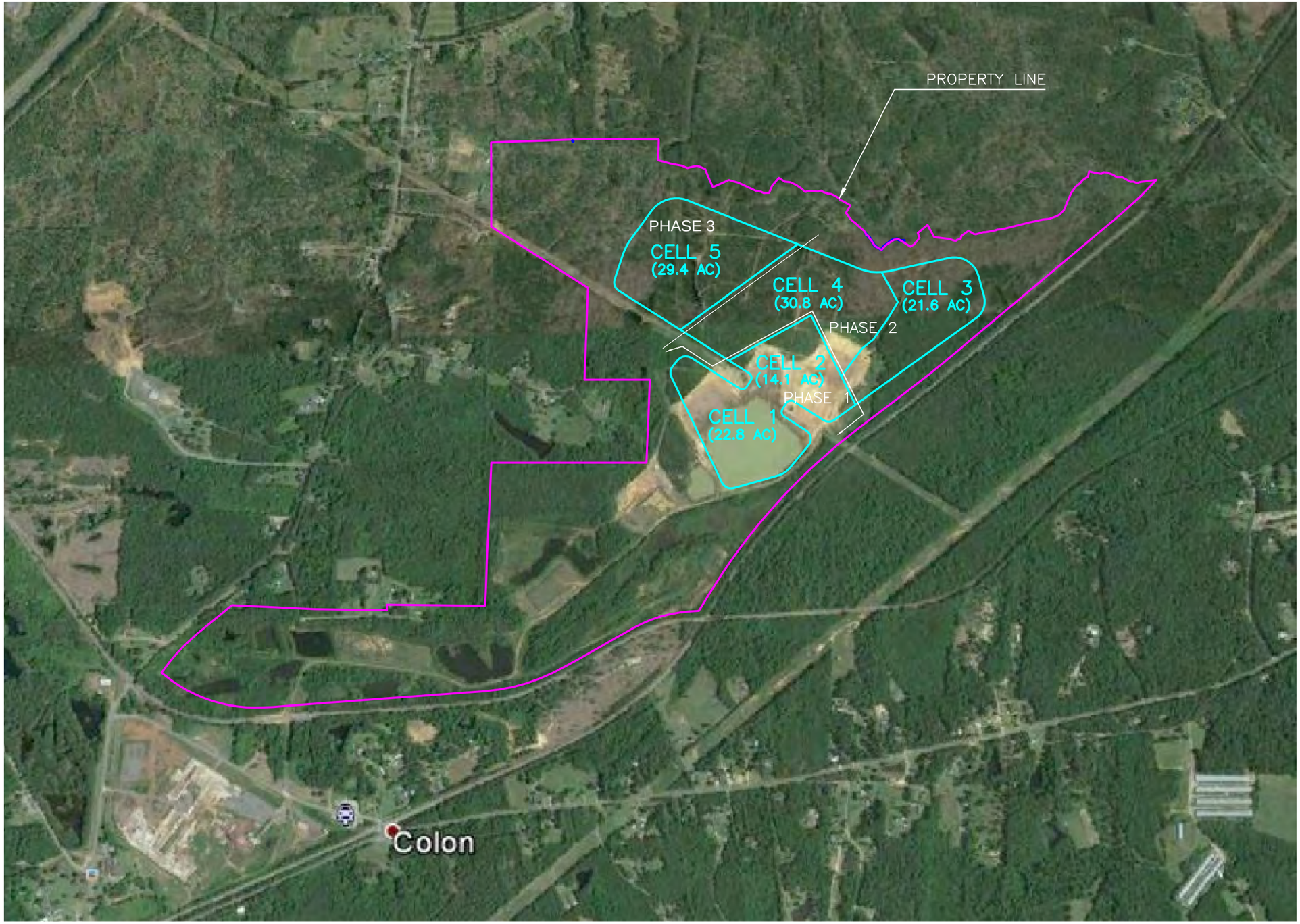
The owner of the Colon Mine Site is as follows.

Owner: Green Meadow, LLC
12601 Plantside Drive Louisville, KY 40299
(877) 314-7724, (502) 245-1353
Facility Contact: Mr. Charles E. Price

The Owner is also the Permittee and is responsible for this permit application

The company responsible for the operation and maintenance of the Colon Mine Site is as follows.

Operator: Charah, Inc.
12601 Plantside Drive Louisville, KY 40299
(877) 314-7724, (502) 245-1353
Facility Contact: Mr. Charles E. Price



HDR Engineering Inc.
of the Carolinas

440 S. Church St. Suite 1000
Charlotte, NC 28202-2075
704.338.6700
N.C.B.E.L.S. F-0116

COLON MINE SITE OVERVIEW

Charah®

COLON MINE SITE

DATE
11/2014

FIGURE
1

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Legend

Power Line	ohe
Power pole	PP
Light pole	LP
Fire hydrant	FH
Water meter	WM
Water valve	WV

WNC

PROFESSIONAL ENGINEERS & SURVEYORS
WNC-PE&S, PLLC
1095 HENDERSONVILLE RD, SUITE G
ASHEVILLE, NC 28803
828-277-5074

ALTA SURVEY OF

GENERAL SHALE BRICK, INC. & THE CHEROKEE SANFORD GROUP, LLC PROPERTY

FOR:

CHARAH, INC.

SCALE 1" = 250'

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2 Facility Plan

2.1 Facility Plan

2.1.1 Facility Services

The Colon Mine Site facilities and activities may consist of the following.

- Administrative offices
- Equipment maintenance facility
- Mining/stockpiling operations and equipment
- CCP placement
- Railway off-loading area
- Structural fill operations
- Stormwater management devices

2.1.2 Facility Description

Sheet 00G-02, Facility Plan and Buffers, shows the Colon Mine Site property line. The plan includes all property, structures, and appurtenances designated as Colon Mine Site property, inclusive of the mining operations and the structural fill area; a total of approximately 411 acres.

The Colon Mine Site is located approximately five miles northeast of Sanford, North Carolina. The area surrounding the site consists of rural residential, wooded, and agricultural property. The site is bounded on the north by an unnamed tributary to Roberts Creek, on the east by the CSX railroad, and on the south by the Norfolk Southern railroad. The site is bisected by a Duke Energy power line right-of-way and consists of previously mined and wooded, unmined areas. There are several ponds on the southern half from previous mining activities. Onsite elevations range from approximately 226 to 336 mean sea level.

As described in Section 1 above, the structural fill, including stormwater management, leachate management, and haul roads, etc. will encompass approximately 137 acres, of which approximately 118 acres will be covered with a composite liner system for subsequent CCP placement.

2.1.3 Separation Requirements

Horizontal and vertical separation requirements are mandated in NCGS §130A-309.216 (c) and are discussed below.

2.1.3.1 HORIZONTAL SEPARATION REQUIREMENTS - LOCATION RESTRICTION DEMONSTRATION

Table 2 below summarizes the horizontal separation requirements.

Table 1 Structural Fill Horizontal Separation Requirements Summary

Feature	Restriction: A structural fill cannot be within
Property boundary	50 feet
Private dwelling or well	300 feet
Perennial stream or other surface water body[a]	50 feet
Floodplain	A 100-year floodplain[b]
Wetland	50 feet[c]

[a] The structural fill cannot be within 50 feet of the top of the bank of a perennial stream or other surface water body.

[b] In accordance with NCGS §130A-309.216 (c) (5), the structural fill cannot be placed "within a 100-year floodplain except as authorized under [NC]G.S. 143-215.54A(b). A site located in a floodplain shall not restrict the flow of the 100-year flood, reduce the temporary water storage capacity of the floodplain or result in washout of solid waste so as to pose a hazard to human life, wildlife, or land or water resources."

[c] In accordance with NCGS §130A-309.216 (c) (6), the structural fill cannot be placed "within 50 horizontal feet of a wetland, unless, after consideration of the chemical and physical impact on the wetland, the United States Army Corps of Engineers issues a permit or waiver for the fill."

The property boundary, private dwellings, groundwater wells, and floodplain buffers have been maintained as shown on Sheet G-02, Facility Plan and Buffers . Streams and wetlands were delineated and located onsite by Clearwater Environmental on August 8, 2014. The structural fill design impacts approximately 2,040 linear feet of streams and 0.62 acres of wetlands. Impacts to these will be permitted by the US Army Corp of Engineers and the NCDENR Division of Water Quality before construction occurs in these areas.

2.1.3.2 VERTICAL SEPARATION REQUIREMENT

NCGS §130A-309.216 (c) also mandates a vertical separation requirement for CCPs used as structural fill. The structural fill can not be placed within four feet of the seasonal high groundwater table per NCGS §130A-309.216 (c) (4). For this application the bottom of the GCL liner has been designed to be a minimum five feet above the estimated seasonal high groundwater table. The proposed design satisfies the vertical separation requirements as shown on drawings provided with the Design Hydrogeological Report included in this Permit Application.

2.1.4 Types of CCP

The types of CCP specified for placement in the structural fill area are anticipated to be consistent with the CCP definition found in NCGS §130A-309.201 (4). This includes fly ash, bottom ash, boiler slag, or flue gas desulfurization materials.

2.1.5 Estimated Placement Rates

The anticipated filling rates of 6,000 to 8,000 tons per day which equates to 130,000 to 140,000 tons per month or 1,560,000 to 1,680,000 tons per year. This material will be brought to the site by truck, rail, or a combination thereof. Placement methods are detailed in the Operations Plan included in this Permit Application. Based on these filling rates, an assumed CCP density of 1.25 tons per cy, and an overall CCP capacity of approximately 7.25 million cy, this structural fill should take approximately 5.4 TO 5.8 years to complete.

2.1.6 Service Area

CCPs may come from power generation facilities located in North Carolina and South Carolina. Initial operations will receive ash from Duke Energy's Riverbend and Sutton facilities.

2.1.7 Procedures for CCP Acceptance

The structural fill will only accept CCPs that it is permitted to receive. The appropriate toxicity characteristic leaching procedure (TCLP) analyses are included in the Related Documents section of this application. The process will be repeated if the source changes. Any load that contains materials or CCPs that the structural fill is not allowed to accept will not be placed in the structural fill.

2.1.8 Equipment Requirements

Equipment requirements may vary in accordance with the method or scope of structural fill operations at any given time. Additional or different types of equipment may be provided as necessary to enhance operational efficiency; however, in order to ensure adequate operation of the proposed facility, arrangements shall be made to ensure that equipment is available for the following activities.

- Excavation of onsite soil
- Preparing the cells for CCP reception
- Spreading and compacting the CCP
- Moisture conditioning the CCP or structural fill
- Excavating and transporting cover soil
- Spreading and compacting cover soil
- Site maintenance, dust control, and clean-up work

The equipment onsite is currently used to manage mining operations. When the proposed structural fill is ready to accept CCPs, the equipment will use the procedures and techniques for spreading, compacting, and covering CCPs outlined in the Operations Plan included in this Permit Application. In the event the amount of CCP placement increases significantly, the need for additional equipment will be evaluated. Additional equipment may be rented to accommodate short term needs or purchased to accommodate increased CCP placement rates.

2.2 Containment and Environmental Control Systems

The base liner and final cap system will be constructed in accordance with NCGS §130A-309.216.

2.2.1 Base Liner System

The purpose of the base liner system is to contain CCPs within the structural fill and prevent groundwater contamination by the CCPs. The base liner area for the structural fill is approximately 118 acres and is shown on Sheet No. 00C-03, Top of Liner. The post-settlement bottom elevation of the GCL liner will meet the minimum requirement of five feet above the seasonal high groundwater table. North Carolina law allows two different types of baseliner systems. The following describes the components of the regulatory base liner system options from top down and as shown on the drawings.

2.2.1.1 COMPOSITE BASE LINER SYSTEM OPTION 1

- 60 mil HDPE geosynthetic liner
- 24 inches of compacted soil liner with a permeability of 1×10^{-7} cm/sec

2.2.1.2 COMPOSITE BASE LINER SYSTEM OPTION 2

- 60 mil HDPE geosynthetic liner
- geosynthetic clay liner
- 18 inches of compacted soil liner with a permeability of 1 x 10^{-5} cm/sec

Option 2 was used as the basis of design for this permit application.

2.2.2 Final Cap System

The purpose of the final cap system is to contain CCP within the structural fill, prevent exposure of CCP, prevent infiltration into the structural fill, minimize erosion, and prevent stormwater from contacting CCP. The total area for the final cap system for the structural fill is approximately 118 acres (see Sheet 00C-04, Reclamation Plan). There are two proposed final cap system designs: a soil and geomembrane cap system option and a soil, geocomposite drainage layer and geomembrane cap system option. Each cap system has a top design and a side slope design. The components of the two proposed final cap systems are shown in Tables 2 and 3 below. The soil permeabilities are shown on the drawings.

Table 2 Final Cap System Design: Soil and Geomembrane Option

2% Top Design	4:1 Sideslope Design
• 6 inches topsoil	• 6 inches topsoil
• 12 inches low permeable soil layer	• 12 inches low permeable soil layer
• 24 inches unclassified soil layer	• 12 inches unclassified soil layer
• 30 inches drainage soil layer	• 18 inches drainage soil layer
• 40 mil polyethylene geomembrane	• 40 mil polyethylene geomembrane

Table 3 Final Cap System: Soil, Geocomposite Drainage Layer and Geomembrane Option

2% Top Design	4:1 Sideslope Design
• 6 inches topsoil	• 6 inches topsoil
• 66 inches soil layer	• 42 inches soil layer
• 250 mil geocomposite drainage layer	• 250 mil geocomposite drainage layer
• 40 mil polyethylene geomembrane	• 40 mil polyethylene geomembrane

2.2.3 Drainage, Erosion and Sediment Control

The erosion and sediment control structures are designed and maintained to manage the run-off generated by the 25-year storm event, convey it to the sediment basins, and conform to the requirements of the Sedimentation Pollution Control Law. Sediment basins were designed to contain the 25-year 24-hour design storm without employing use of the emergency spillways. Additional routing was performed to confirm that the emergency spillways can successfully pass the 100-year storm events.

As part of the final cap system, diversion berms, side slope swales, and slope drains will be constructed to intercept run-off and prevent erosion. The side slope swales and diversion berms will be longitudinally sloped will carry run-off to slope drains that discharge into a perimeter channel. Channels will direct stormwater flow to sediment basins within the property.

Vegetation shall be established to protect the final cover system from erosion and to enhance the aesthetics of the closed structural fill. Plant species shall be selected based on the following criteria.

- Vegetation depth of rooting shall not extend to the geosynthetics per final cover design
- Final cover vegetation to be generally tolerant to local cover soil conditions
- Site climate adaptability (temperature, rainfall or drought tolerance, wind effects, exposure, and sunshine)
- Plant species shall be persistent and self-propagating
- Plant species shall exhibit a high percentage of surface coverage
- Plant species shall exhibit low long-term maintenance needs
- Additional procedures will be developed to implement and protect the integrity and quality of the final cover, and prevent soil erosion in disturbed areas

Calculations demonstrating the adequacy of the drainage and erosion and sediment control structures are provided in the Calculations portion of this Permit Application.

2.3 Total Structural Fill Capacity

The estimated volume of CCPs in the structural fill once it is complete is approximately 7.25 million cubic yards.

2.3.1 Available Soil Resources and Required Soil Quantities

The available soil resources for the construction of the proposed structural fill may come from a combination of onsite excavated soil from the structural fill footprint, onsite borrow soils, and offsite resources. Based on laboratory test data obtained from the Design Hydrogeologic Report, the hydraulic conductivity (k) of the onsite soils ranges from 6.23×10^{-5} cm/sec to 1.35×10^{-7} cm/sec. Generally the soils exhibiting the lower hydraulic conductivities were within the first few feet of the surface and tended to be more clayey. Construction of a base liner system using either onsite $k \leq 1 \times 10^{-7}$ cm/sec soils, or an alternate liner system design utilizing 18 inches of $k \leq 1 \times 10^{-5}$ cm/sec soil and a geosynthetic clay liner (GCL) is proposed. Soil borings indicate suitable onsite soils are available; however, a detailed borrow area study to determine the amount of suitable soils has not been completed.

The following table presents the estimates of the soil requirements for the structural fill construction based on the latest topographic survey available which is dated August 2014.

Table 4 Structural Fill Soil Requirements

Purpose	Material	Cap System Option 1 Quantity (cy)[a]	Cap System Option 2 Quantity (cy)[a]
Base Liner System[b]	18" of 1×10^{-5} cm/sec	305,000	305,000
Final Cap System	Topsoil	114,000	114,000
Final Cap System	Low Permeable Soil Layer	209,000	NA
Final Cap System	Unclassified Soil Layer	335,000	937,000
Final Cap System	Soil Drainage Layer	430,000	NA
	Total	**~1.4 million**	**~1.4 million**

[a] Each layer of the base liner and cap system assumes a 0.1 foot overbuild.
[b] 1×10^{-7} cm/sec base liner system was not used for this soil estimate.

Based on the topography shown on Sheet 00C-01, Existing Conditions, approximately 1.83 million cy of cut and 250,000 cy of fill are anticipated to construct the structural fill basegrades, perimeter berms, and perimeter roads. This represents an excess of approximately 1.58 million cy of soil that can be used for liner system or final cover construction if the soil meets the applicable specifications. Soils unsuitable for these uses can be stockpiled for operations or sold under the existing mining permit. Since Table 4 indicates that approximately 1.4 million cy will be required for the base system and closure, a net soil surplus of approximately 180,000 cy is anticipated, assuming all the soils onsite are suitable for use in the construction. Should there be a deficit in soils, the soil necessary to compensate for this deficit will be obtained from onsite borrow areas unidentified at this time or offsite sources. Two areas on Sheet 00C-02, Base Grade Plan, identified locations for potential future stockpiling of onsite soils. Erosion and sedimentation controls will be designed and permitted and any other necessary permits will be obtained prior to construction.

2.4 Leachate Management

The leachate management system includes features for collection, storage and disposal of leachate.

2.4.1 Leachate Collection System

NCGS §130A-309.216 (b) (2) mandates that, “[a] leachate collection system, which is constructed directly above the base liner and shall be designed to effectively collect and remove leachate from the project.” The base liner system will be constructed to maintain positive drainage post settlement to encourage leachate to drain to the sump.

The general leachate management system includes the collection, storage, treatment, and disposal of the leachate generated. The collection of leachate will be facilitated within the structural fill by the geocomposite drainage layer located directly on top of the base liner system and the use of perforated HDPE pipe laterals and header designed to hydraulically convey leachate to sump areas, which will contain submersible pumps. From there, leachate will be pumped through a solid wall HDPE forcemain to a leachate storage tank that will be located at the site. Clean-out riser pipes will be provided as shown on the drawings to allow for cleaning as necessary.

Leachate storage is provided in a 1,000,000 gallon storage tank with secondary containment. Leachate storage may be managed in the structural fill as needed for periods not exceeding 72 hours.

The Operator will dispose of the leachate properly at a wastewater treatment plant and will obtain a discharge permit and/or a pump and haul permit for the leachate.

2.4.2 Leachate Generation Rates

Leachate is generated from a couple of sources: the liquids present in the ash at the time of placement and stormwater that infiltrates the CCP. Disposal of large quantities of liquid is currently prohibited in structural fills and unless it has rained during collection, most CCP is relatively dry; therefore, the majority of all leachate is derived from precipitation. Operations can

greatly influence the diversion of precipitation from the placed CCP and hence impact the amount entering the system to be collected as leachate at some future date.

Construction of structural fill will result in a total lined area of approximately 118 acres. For the largest cell 31.9 acres in size and using an estimated leachate generation rate of 78,144 cubic feet per acre per year as determined through HELP Model runs (see Calculations section of this Permit Application), a typical daily generation rate of 51,085 gallons per day is anticipated. A 1,000,000 gallon leachate storage tank represents approximately 23.5 days of storage capacity for the entire structural fill in operation.

Based on information provided by Charah, the leachate/contact water discharged from the Asheville airport site to the Buncombe County Metropolitan Sewer District (MSD) has averaged 1,418,000 gallons per month for Area 3 (30.8 acres) or 46,039 gallons per acre per month. This average includes varying surface conditions across the Area 3 containment area from open areas where all rainwater becomes contact water to areas that are above grade and covered with soil thereby diverting clean rain water to the sediment basins.

The HELP Model results included in the Calculations section of the Permit Application estimates an average annual flow rate of 59,786 cubic feet (447,200 gallons) per acre assuming a 20 foot thick layer of ash across the acre. However, the worst case condition for leachate handling would be contact water from a storm event immediately upon activating an area. A 25-year 24-hour storm event was selected as the design storm which for the area is 6.28 inches. This equates to approximately 1,023,000 gallons over a 6 acre subcell area. The leachate pipes as shown in the Pipe Sizing calculation of the Leachate Calculation section have been designed to reduce the head on the liner system to below 30 cm for this storm event within 72 hours. The subcell divider berms have been designed to store the entire storm event as shown in the Stormwater Calculation section. The leachate/contact water from each subcell will be piped to the sump in solid pipes, out to the leachate tank, and then pumped to the treatment plant.

2.4.3 Leachate Management Systems

2.4.3.1 LEACHATE PIPELINE OPERATING CAPACITY

The 8-inch diameter design for the leachate collection laterals and headers is sufficient to drain leachate and allow for pipe cleaning and video recording. The maximum drainage length is 950 feet. The required maximum drainage length will vary as the slope of the base liner varies. Leachate pipe spacing should be verified prior to leachate pipe placement. HDPE pipe will be used due to its chemical resistance to corrosion from leachate. The thickness and other physical properties of the pipe were selected to provide adequate structural strength to support the maximum static and dynamic loads and stresses imposed by the overlying materials and any equipment used in construction and operation of the structural fill.

The material surrounding the leachate collection pipes will consist of a coarse aggregate installed to provide a direct conduit between the pipe and CCP. The aggregate will be chemically compatible with the leachate generated and will be placed to provide adequate support to the pipes.

Calculations for various materials and conditions are included in the Calculations portion this Permit Application.

2.4.3.2 CAPACITY OF STORAGE AND TREATMENT FACILITIES

The primary leachate disposal will via private sewer line to a wastewater treatment plant. A discharge permit is currently being sought and will be provided prior to operation of the system

2.4.3.3 FINAL DISPOSAL PLANS AND DISCHARGE LIMITS

Leachate will be hauled by tanker trucks for disposal at a wastewater treatment plant. A discharge permit has not yet been obtained from a wastewater treatment plant. A copy of the discharge permit for the leachate will be included in the Operations Plan. The industrial discharge permit will be provided prior to the placement of ash within the structural fill. A pump and haul permit may also be obtained.

2.5 Landowner Statement

NCGS §130A-309.215 (b) (1) e. requires that this permit application include a signed and dated statement by the owner of the land on which the structural fill is to be placed, acknowledging and consenting to the use of CCP as structural fill on the property and agreeing to record the fill in accordance with the requirements of G.S. 130A-[309].219. The Landowner Statement can be found in Appendix A of this Facility Plan.

2.6 Generator Contact Information

In accordance with NCGS §130A-309.215 (b) (1) f., the name, address, and contact information for the generator of the CCP is provided in Appendix B. Initial generators listed are Duke Energy's Riverbend and Sutton facilities. This information will be updated if new generators or new sources of CCP will be used as structural fill at the site.

2.7 Coal Combustion Product Generation Location

In accordance with NCGS §130A-309.215 (b) (1) g. the physical location of the project at which the CCP were generated is provided in Appendix B. This information will be updated if new generators or new sources of CCP will be used as structural fill at the site.

A

Landowner Statement

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Landowner Statement

In accordance with North Carolina General Statute §130A-309.215 (b) (1) e., I certify that Green Meadows, LLC own(s) the Colon Mine Site and I acknowledge and consent to the use of coal combustion products as structural fill on the property. I agree to record the fill in accordance with the requirements of North Carolina General Statute §130A-309.219.

Charles E. Price	Green Meadows, LLC
Printed Name	Company
Charles Price	President / CEO
Signature	Title
11-6-14	
Date	

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B

Coal Combustion Product Generator and Location Information

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Coal Combustion Product Generator and Location Information

Coal Combustion Product Generator Information

Company Name: Duke Energy

Company Address: 550 South Tryon Street

Charlotte, NC 28202

Contact Person: Chris Varner

Contact Person Email: chris.varner@duke-energy.com

Contact Person Telephone: (980) 373-2510

Coal Combustion Product Generation Location

Generation Location Address: Duke Energy – Riverbend Steam Station

175 Steam Plant Road

Mt. Holly, NC 28120

Generation Location Coordinates:

Latitude: 35.36022

Longitude: -80.97432

Generation Location Address: Duke Energy – Sutton Plant

801 Sutton Plant Road

Wilmington, NC 28401

Generation Location Coordinates:

Latitude: 34.28324

Longitude: -77.98595

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Engineering Plan

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

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Table of Contents

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1 Facility Design

The facility has been designed and will be constructed, operated, closed, and maintained in general accordance with NCGS §130A-309.216 to minimize the potential for harmful release of constituents of coal combustion residuals to the environment or create a nuisance to the public. The design includes an encapsulation liner system constructed below and above the structural fill designed to efficiently contain, collect, and remove leachate generated by the coal combustion products (CCP), as well as separate the CCP from any exposure to surrounding environs. Site development will include excavation of mine/borrow areas, construction of the lined containment, perimeter roadway, stormwater conveyance system, environmental control systems, and leachate collection systems.

The facility is currently surrounded on all sides by natural barriers, fencing, or an equivalent means of controlling vehicular access and preventing illegal disposal. All access is limited by gates, and such gates are securable and equipped with locks.

Internal roads will be maintained to be passable in all weather by vehicles. All operations areas and units will be accessible. Roads will be finished with either gravel or asphalt. Internal roads will be a minimum of 20 feet wide and will not have slopes steeper than 8 percent.

Preparation and development of the facility will require a number of activities including some site clearing, subgrade preparation, soil liner placement, high density polyethylene flexible membrane liner (HDPE FML) installation, and placement of the leachate collection system.

Site clearing will be staged to limit the area required for development and structural filling operations. Portions are currently cleared and are within the boundary of the structural fill footprint. Trees, stumps, and other wood debris will be disposed of offsite or burned in accordance with state requirements for disposal of land-clearing debris.

Topsoil will be removed and stockpiled for later use in closure operations. During any site clearing activity, appropriate erosion and sediment control procedures will be followed to control erosion from disturbed areas.

2 Subgrade Settlement Analysis

The foundation of the structural fill is anticipated to consist primarily of the undisturbed naturally occurring soils with structural fill comprised of onsite or imported natural soils being required to construct the perimeter containment berms and to fill the existing drainage features on site. In addition, the pond in the Cell 1 area will be drained and backfilled to construct a stable base for the liner system.

Based on the geologic exploration of the subsurface (see Design Hydrogeological Report) no areas of gross instabilities are expected. After excavation and/or filling of the site to the design subgrade, the area will be tested for stability confirmation and any areas noted to exhibit signs of instability will be excavated and backfilled with suitable soil fill material.

Boring logs from the Design Hydrogeological Report were used to determine the soil types, depths and SPT values for each well and piezometer location within the structural fill footprint. Proposed base grades, final grades, and water table elevations were determined at each well and piezometer location. The existing vertical stress was calculated in each soil layer based on laboratory test data obtained for the foundation soils and published information for similar materials. The structural fill loading due to CCP and final cover was also determined using laboratory test data provided for compacted CCP obtained from the Riverbend Steam Station in Mount Holly, North Carolina. The total settlement was calculated using standard equations for elastic settlement and primary and secondary consolidation settlement as appropriate for the types of soils encountered at each location. The controlling surface (bedrock or water) was determined and the post settlement separation of the base grade from the controlling surface was verified. Also determined was the post settlement slope of the base grade. The pre- and post-settlement average slopes at several locations were analyzed for local settlement based on the anticipated loading and the boring log information. The calculations indicated positive drainage toward the leachate sumps would be maintained after settlement.

3 Base Liner System Design

In accordance with NCGS §130A-309.216 a base liner consisting of one of two liner systems are allowed for CCP structural fills.

3.1 Base Liner System 1

- A composite liner that consists of two components: a geomembrane liner installed above and in direct and uniform contact with a compacted clay liner with a minimum thickness of 24 inches (0.61 m) and a permeability of no more than 1.0×10^{-7} centimeters per second.

3.2 Base Liner System 2

- A composite liner that consists of three components: a geomembrane liner installed above and in uniform contact with a geosynthetic clay liner overlying a compacted clay liner with a minimum thickness of 18 inches (0.46 m) and a permeability of no more than 1.0×10^{-5} centimeters per second.

For the purposes of this Permit Application, Base Liner System 2 has been shown in the calculations; however, either liner system is allowed.

4 Leachate Management System Details

The general leachate management system includes the collection, storage, treatment, and disposal of the leachate generated. The collection of leachate will be facilitated within the structural fill by use of a series of interconnected perforated and solid HDPE pipe laterals and headers designed to hydraulically convey leachate to a sump area along with a geocomposite that covers the geomembrane barrier layer. The leachate collection pipes are surrounded by stone and geotextile. The solid and perforated pipes contain valves to allow the pipes to segregate stormwater and leachate depending on whether the subcell has received CCP. In

addition to the valves each subcell divider berm will have a rain flap welded to the bottom geomembrane. When the Operator is ready to activate a subcell for CCP placement the valves will be opened and the rain flap removed to allow leachate to flow downstream to a sump area that will contain two submersible pumps. There are three sump locations with pumps installed in HDPE riser pipes that will pump the leachate into a forcemain which discharges to a leachate storage tank to be located south of Cell 1. The leachate will then be pumped from the tank to the receiving treatment plant or into trucks for hauling to and disposal at the local treatment plant. Depending on availability, the leachate may be discharged directly to the sanitary sewer system.

Clean-out riser pipes will be provided for each lateral and header as shown on the drawings to allow for periodic cleaning and maintenance. The leachate collection system has been designed to manage a 25-year, 24 hour storm event during an open subcell condition and has been modeled through the HELP model for prediction of long term leachate generated at varying stages of fill.

5 Stormwater Segregation Features

In order to minimize leachate generation during initial filling, stormwater will be segregated by using subcell divider berms, pipes, and a rain flap over the divider berms. The subcell divider berms have been sized to manage a 25-year 24-hour storm. The stormwater that is collected in the subcells will be pumped out to the perimeter channel. Stormwater that is in contact with the CCP structural fill will be collected and handled as leachate. As filling progresses, the areas where CCP has reached final grade will be covered with intermediate cover soil to minimize leachate generation.

Site development is intended to comply with the North Carolina Sedimentation Pollution Control Act of 1973, as amended.

The plans provide for a pre- and post-development erosion control plan that splits the onsite drainage areas into nine separate basins during the initial grading operations. As the fill project comes out of the ground and begins to take shape with permanent drainage, four of these initial basins will be removed and drainage redirected to one of the five remaining basins to serve as the final erosion control primary measures. The drainage areas for these basins range in size from 3 to 86 acres. The ponds are designed to discharge the 25-year storm (Type II, 24 hour) through the principal spillways (Risers and Barrels) and are capable of passing the 100-year storm in a controlled manner through an emergency spillway.

Initial development will include the installation of all perimeter erosion control measures (construction entrance, silt fence, tree protection), and temporary diversion swales as necessary to direct sediment laden run-off to the primary treatment basins. Along all sensitive boundaries (streams and wetlands not to be disturbed), double silt fence will be installed. The ponds that are to exist in both pre and post conditions are to be installed for the most conservative condition and outlet protection is designed for the maximum flow that a particular basin and its drainage area may produce.

Post development erosion controls include maintaining the pre-development erosion controls establishing permanent slope stabilization and channel stabilization on the permanent fill slopes. This would include erosion control fabric and permanent vegetation immediately upon reaching final grade. The contractor shall minimize disturbance opened at any given time to the greatest extent possible.

6 Cap System

There are two proposed final cap system designs: a soil and geomembrane cap system and a soil, geocomposite drainage layer and geomembrane cap system.

6.1 Cap System Option 1

To meet the requirements of NCGS §130A-309.216(b), the proposed components of the final soil and geomembrane cap system will be as follows from the top down.

- On the 2% Top Slope: a 6-inch thick topsoil layer, a 12-inch thick low permeable soil layer, a 24-inch thick unclassified soil layer, a 30-inch thick drainage soil layer, and an 40 mil polyethylene geomembrane.
- On the side slopes: a 6-inch thick topsoil layer, a 12-inch thick low permeable soil layer, a 12-inch thick unclassified soil layer, an 18-inch thick drainage soil layer, and an 40 mil polyethylene geomembrane.

6.2 Cap System Option 2

To meet the requirements of NCGS §130A-309.216(b), the proposed components of the final soil, geocomposite drainage layer and geomembrane cap system will be as follows from the top down.

- On the 2% top slope: a 6-inch thick topsoil layer, a 66-inch thick low permeable soil layer, a 250 mil geocomposite drainage layer, and an 40 mil polyethylene geomembrane.
- On the side slopes: a 6-inch thick topsoil layer, a 42-inch thick low permeable soil layer, 250 mil geocomposite drainage layer, and an 40 mil polyethylene geomembrane.

A veneer slope stability analysis was conducted to demonstrate that the proposed final cover design would be capable of maintaining a minimum factor of safety of 1.5. The analysis indicated that the proposed materials for cap construction should be capable of maintaining adequate stability (see the final cover stability analysis in the calculations section of this Permit Application).

The maximum design sideslope is 4H:1V and benches will be constructed every 30 vertical feet. The final surface of the structural fill will be graded to a 2% slope and provided with drainage systems that minimizes erosion of cover materials, promotes drainage, and prevents ponding of surface water.

7 Slope Stability Analyses

In accordance with the EPA Guidance Document EPA/600/R-95/051 and ASTM E2277 Design and Construction of Coal Ash Structural Fills, slope stability analyses were conducted for the proposed final grades for the proposed Colon Mine Structural Fill. ASTM E2277 requires minimum factors of safety against slope failures of 1.5 statically and 1.2 dynamically for completed structural fills. Structural fills located within seismic impact zones should be designed to resist the maximum horizontal acceleration in lithified earth material at the site. Seismic impact zones are defined as an area with a ten percent or greater probability that the maximum horizontal acceleration in lithified earth material, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 250 years. A review of the USGS 2008 National Seismic Hazard Maps, Peak Horizontal Acceleration with 2% Probability of Exceedance in 50 years, which is equivalent to 10% probability of exceedance in 250 years, indicates that the structural fill is located in an area with a maximum horizontal acceleration of 0.09g and is therefore not located within a seismic impact zone. Dynamic slope stability analyses were still performed, however, to verify stability under seismic conditions.

The computer program PCSTABL5M was used to evaluate the slope stability of the structural fill. Two types of analyses were conducted on a cross-section through the structural fill. These included sliding block failures along the bottom liner surface and circular arc failures through the CCP and foundation soils. The cross-section represents a critical location based on maximum fill height and minimum buttressing effect at the base of the structural fill slope.

The cross-section analyzed extends from north to south along the north slope of the structural fill and represents a final CCP fill condition with a maximum elevation of 320 feet at the top of the 4H:1V slope. After this slope break, the top of the structural CCP fill extends at a 2% slope to a maximum elevation of approximately 330 feet at the center of the CCP fill.

The bottom liner design proposed for the structural fill was evaluated to determine the interface that represented the potential sliding surface with the least shear strength. Direct shear test results for materials similar to those that may be used for the structural fill were evaluated to select the critical interface, which was determined to be between the geonet composite and the textured 60-mil HDPE geomembrane. The strength parameters selected for this interface were a peak friction angle (φ) of 26° and cohesion (c) of 0. Peak values were selected since sufficient movement along the interface to mobilize residual strength is not anticipated. A minimum peak shear strength of φ =26° and c = 0 will therefore be required for all liner system interfaces in the project technical specifications.

The strength of the compacted CCP material was selected as φ = 8° and c = 4,300 psf under total stress (i.e. short-term undrained conditions) and φ = 22° and c =2,600 psf under effective stress (i.e. long-term drained conditions based on testing data on compacted CCP samples obtained from the Riverbend Steam Station located in Mount Holly, NC. Similarly, a unit weight of 83.8 pounds per cubic foot (pcf) was selected to represent the compacted CCP based on the Riverbend testing data. The strengths of the foundation soils were determined based on correlations with standard penetration test (SPT) blowcounts, or N values, recorded during the Hydrogeologic study and unit weights were selected based on typical weights of similar

materials. A detailed description of the parameter selection process is provided in the slope stability Calculations section of this permit application.

A search routine within PCSTABL5M was used to determine the critical sliding block surface based on the modified Janbu method and critical circular arc surface using the modified Bishop method. Analyses were performed under both total stress and effective stress conditions. The estimated high groundwater potentiometric surface was also used in the analyses. Two types of circular arc analyses were performed by adjusting the limits of the search routine. These included global circular arc failure surfaces extending through the foundation soils and into or beyond the perimeter berm as well as failure surfaces originating and terminating within the CCP fill. A summary of the minimum factors of safety associated with each analysis under both static and seismic conditions is provided in the slope stability calculations included in this permit application. The critical analysis was determined to be the sliding block analysis along the bottom liner system under effective stress conditions with static and seismic factors of safety of 4.33 and 3.03, respectively. All factors of safety are satisfactory and meet EPA guidelines.

Final cover veneer stability analyses were performed for both final cover options to determine the minimum interface friction angle required for the final cover system. The analysis for Option 1, which included an 18-inch thick soil drainage layer placed directly over the final cover geomembrane, assumed that this layer would be fully saturated due to lateral seepage. The analysis for Option 2, which included a geocomposite placed directly over the final cover geomembrane in lieu of the soil drainage layer used for Option 1, assumed the geocomposite would be designed to contain the lateral seepage and therefore the overlying soil would not become saturated. The analyses that were performed for the proposed final slope of 25% (4H:1V) under both static and seismic conditions resulted in a minimum required interface friction angle of 25.0 degrees for Option 1 and 20.5 degrees for Option 2. These minimum required interface friction angles should be readily achieved using geosynthetic products readily available in the market. Project specific interface testing, however, should be performed to confirm that the minimum required interface friction angle can be achieved using the actual materials that will be used during construction.

8 Leachate/Stormwater Storage and Treatment Facilities

Determination of leachate storage capacity was based on average annual leachate collection rate from the HELP model. The maximum average annual leachate collection calculated was 78,144 cf/acre. Based on the largest cell at 31.9 acres the leachate generation volume is 2,492,794 cf/year (51,085 gal/day). Considering the 1,000,000 gal capacity available onsite, the storage capability is approximately 23.5 days. Note that the above estimate is based on average leachate generation rate and the storage capacity needed could be significantly more if peak day leachate generation rates are used. Therefore, the owner may need increased leachate pumping and/or trucking capabilities during peak demands.

Determination of storage capacity is based on the 25-year, 24-hr rain event which is 6.28 inches. Each subcell has been analyzed for its storage capacity based on grading and the height of the subcell divider berms. All subcells are capable of holding the design storm event.

9 Site Access

Security for the site consists of fencing, gates, berms, and wooded buffers. Unauthorized vehicle access to the site is prevented around the property by woodlands, fencing, gates, and stormwater conveyance features.

The access road to the site is of all-weather construction and will be maintained in good condition. Potholes, ruts, and debris on the road(s) will receive immediate attention in order to avoid damage to vehicles.

10 Construction Practices

A test pad will be constructed of the soils proposed for use as the soil liner to determine the construction methods necessary to achieve the design criteria.

Placement will begin by “ramping in” with material from a corner of the cell. Low ground pressure dozers will be used to spread the material. A minimum thickness of 24 inches will be maintained between the liner and the tracks of the spreading equipment and 24 inches above the HDPE pipes. The CCP material will be end-dumped onto previously placed material and then spread out by the dozer. A spotter assisting the operator will observe placement of protective cover material to ensure that spreading is not causing excessive wrinkling or other damage to the synthetic liner, pipes, or geocomposite drainage media. The spotter will measure the forward edge of material placement to ensure that the proper thickness is being applied. The contractor will confirm adequate thickness by surveying before and after placement. The operator shall observe the top of the completed protective cover layer for a smooth, uniform surface free of depressions or high-spots. Refer to the Technical Specifications and Construction Quality Assurance (CQA) Plan included in this Permit Application

11 Design Hydrogeologic Report

The subsurface geology and hydrogeology beneath the proposed structural fill is detailed in the Design Hydrogeologic Report included in this Permit Application.

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Operations Plan

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

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Table of Contents

1 Introduction

1.1 Plan History

The following table provides a brief description of the revisions to the Operations Plan.

Revision	***Date of Document***	***Description of Revisions***
Initial Issue	October 15, 2014	Initial issuance of document.
Rev 1	December 31, 2014	Revised per NCDENR Comments DIN 22536
Rev 2	January 14, 2015	Revised per NCDENR Comments DIN 22502

1.2 Purpose

The purpose of this Operations Plan is to provide for the safe and efficient operation of the Colon Mine Site Structural Fill. This Operations Plan presents the operational requirements for 1) general facility operations, 2) operations management, 3) erosion and sedimentation control, and 4) vegetation management along with guidance for structural fill closure and required regulatory submittals. The Operations Plan also includes a structural fill life estimate.

The Colon Mine Site is located in Lee County, North Carolina at 1600 Colon Road, Sanford, NC 27330.

1.3 Contact Information

Correspondence and questions concerning the operation of the Colon Mine Site should be directed as follows.

Owner
Green Meadow, LLC
12601 Plantside Drive Louisville, KY 40299
(877) 314-7724
Facility Contact: Mr. Charles E. Price

Operator
Charah, Inc.
12601 Plantside Drive, Louisville, KY 40299
(502) 245-1353
Operations Contact: Mr. Scott Sewell

1.4 Safety

Operations at the Colon Mine Site were developed considering the health and safety of the facility's operating staff. The operating staff is provided with site-specific safety training prior to operations, and onsite activities are to be conducted according to the applicable sections of the Operator's Health and Safety Plan which shall be written to comply with all applicable OSHA standards. The Operator will prepare an Emergency Action Plan to address potential emergency situations at the site.

1.5 Access and Security Requirements

Security for the site consists of fencing, gates, berms, and wooded buffers. Unauthorized vehicle access to the site is prevented around the property by woodlands, fencing, gates, and stormwater conveyance features.

The access road to the site is of all-weather construction and will be maintained in good condition. Potholes, ruts, and debris on the road(s) will receive immediate attention in order to avoid damage to vehicles.

1.6 Equipment

In accordance with NCGS §130A-309.216 (a) (4) equipment will be provided that is capable of placing and compacting the coal combustion products (CCP) and handling the earthwork required during the periods that CCPs are received at the fill project. The structural fill site will have sufficient equipment to provide structural fill placement and compaction operations. Where possible, spare or substitute equipment will be provided as needed. If spare or substitute equipment is not available, other equipment may be obtained from other onsite operations. If other equipment is not available after 14 days, arrangements will be made for replacement equipment until the original equipment can be placed back in service.

1.7 Operating Hours

The Colon Mine Site is open for operation between the hours of 7:00 AM and 7:00 PM, Monday through Saturday. It is anticipated that this schedule will continue; however, operational hours may change as the need arises.

1.8 Signs

A sign providing facility name and operating hours will be posted at the site entrance and shall be maintained in good condition. Additional signs may be posted to facilitate facility operations as needed.

1.9 Training

Due to the diversity and nature of job tasks required at the site, personnel shall be adequately trained to handle facility operations and maintenance.

The site superintendent shall have a general understanding of all the tasks required for site operations. Individuals performing the various tasks shall have adequate training for the site-specific tasks they are assigned.

Noteworthy operations and maintenance tasks to be addressed in training include the following.

- Maintaining accurate records of fill loading (quantitative and qualitative)
- Operating requirements for stormwater segregation from exposed CCP material
- Operating and maintaining the leachate collection system (LCS)

1.10 Recordkeeping

An operating record is to be maintained onsite and include the following records.

- Leachate Collection System – Maintenance Documentation & Disposal Records
- Erosion and Sedimentation Control Inspection Logs
- Groundwater Monitoring (and Sampling) Report
- Precipitation Totals

- Daily Operation Record
- Employee Training Records and Materials
- or anything else as indicated in the Operations Plan

The above records are to be kept in the operating record for the active life of the Colon Mine Site and the 30-year post-closure period. Information contained in the operating record must be furnished upon request to the North Carolina Department of Environment and Natural Resources (NCDENR). Additional records kept onsite should include the following.

- Facility permit application
- Facility permits
- Record of the amount of structural fill placed on a monthly basis
- Regulatory agency inspection reports
- Construction documents
- Employee training records
- As-built drawings and specifications
- Health & Safety Plan
- Emergency Action Plan

1.11 Permit Drawings

Permit drawings are included in the structural fill permit application.

2 Operations Management

The primary objective of operations management at the Colon Mine Site is to place structural fill in the form of CCPs in compliance with permit conditions while operating in a safe manner. Prior to placement of CCP in a new cell, new subcell, or portion of a new subcell, the Owner will submit to NCDENR the Construction Quality Assurance documentation for the constructed base liner for review. Should any discrepancies be indicated, NCDENR will contact the Owner for follow up. Placement of CCP in new cell, new subcell, or portion of a new subcell prior to approval by NCDENR will be at the owner's risk.

The structural fill site has been designed to provide separation of contact water from non-contact water. Contact water is defined as water that contacts CCP material within the geomembrane lined limits of structural fill. Contact water will be managed as leachate while non-contact water will be managed as stormwater. Contact water and non-contact water separation are further described in subsequent sections of this plan.

Filling operations will generally proceed from low to high. The working face will be limited to as small an area as practical, at the owner's discretion. Contact water from the active face will be directed to the leachate collection system.

Intermediate cover will be placed as CCP fill reaches final grades to prevent contact water from entering the stormwater control features.

2.1 Structural Fill Placement and Sequencing

2.1.1 Structural Fill Capacity

The total anticipated airspace capacity for the Colon Mine Site is approximately 7.25million cubic yards and is based on a proposed 118-acre fill area.

2.1.2 Structural Fill Acceptance Requirements

In accordance with NCGS §130A-309.216 (a) (2) CCPs shall be collected and transported in a manner that will prevent nuisances and hazards to public health and safety. CCPs shall be moisture conditioned, as necessary, and transported in covered trucks or rail cars to prevent dusting. As such, the Colon Mine Site can accept CCPs defined as fly ash, bottom ash, boiler slag, or flue gas desulfurization materials in NCGS §130A-309.216 (4).

In accordance with NCGS §130A-309.215 (b) (1) d, a Toxicity Characteristic Leaching Procedure (TCLP) analysis has been performed on a representative sample from Duke Energy's Sutton Plant and Riverbend Steam Station CCP sources to be used in the structural fill project. Each was analyzed for, at a minimum, the following constituents: arsenic, barium, cadmium, lead, chromium, mercury, selenium, and silver. The TCLP results are included in the Related Documents section of this application. TCLP tests will be performed on each new ash source and at least annually for each source.

Asbestos containing material will not be placed in the structural fill site. In addition, the removal of CCP structural fill material from the site is prohibited without owner approval. Structural fill will be hauled and placed by dedicated and consistent operators.

2.1.3 Fill Sequencing

The Colon Mine Site will be developed in sequence from Cell 1 through Cell 5. CCP product will be placed in three to five foot operational lifts, low to high. A conceptual schematic of fill sequencing from low to high is included in the permit drawings; however, actual fill sequencing and lift heights may be modified at the Owner's discretion. More than one cell may be operational at a time. The cells are also subdivided into subcells.

The following procedure shall be followed to activate an area for leachate collection prior to placing CCP.

- Remove all stormwater (i.e., water that has not contacted ash) ponded within the area. Stormwater may be pumped directly into the perimeter channel.
- Open the leachate valve. Ensure the valve is opened fully.
- Remove the rain flap by cutting above the weld to the sacrificial liner above the primary geomembrane (refer detail 8 on Drawing 00C-08). Visually inspect the area to confirm the integrity of the base liner. If the base liner appears damaged, repair it in accordance with the technical specifications.

Document on a site plan the location of the subcell where the stormwater valve was closed, the leachate valve was opened, the rain flap was removed, condition of the base liner, and the specifics of any repairs that were made. Place the documentation in the operating record.

2.1.4 Fill Placement

Structural fill placed at the Colon Mine Site will be transported to the facility via railcar or highway-rated vehicles. Upon reaching the site, off-road equipment may be utilized, within the facility boundary, to transport material to the active working area. After initial placement, additional operational equipment generally consisting of vibratory smooth drum rollers, sheepsfoot compactors, bulldozers, water trucks, spray trailers, track hoes, and service trucks may be utilized in fill placement.

Fill progression will be maintained to provide controlled drainage of contact water to the leachate collection system and stormwater runoff to the stormwater benches and perimeter ditches. No fill shall be placed in standing water.

2.1.5 Compaction Requirements and Testing

After the bottom liner is placed and approved, CCP placement may begin. The initial CCP lift placed should be two to three feet thick to protect the liner system. The initial lift shall be placed in a manner that minimizes development of folds in the geosynthetics. The surface should be lightly compacted to help avoid potential damage to the liner system.

Subsequent lifts of CCP should be placed in 12-inch thick loose lifts and compacted to at least 95 percent of its Standard Proctor (ASTM D698) maximum dry density. It may be necessary to adjust the moisture content of the CCP fill to achieve the specified compaction.

2.1.5.1 IN-PLACE DENSITY AND MOISTURE CONTENT TESTING

In-place density and moisture content testing shall be performed at a minimum frequency of one test per 10,000 tons placed. CCP shall be compacted to a minimum 95 percent of its Standard Proctor (ASTM D698) maximum dry density. Compacted moisture content shall be within five percent of the material's optimum moisture content as determined by ASTM D698. If field density tests indicate that the relative compaction or moisture content requirements are not met, the material shall be moisture conditioned and/or re-worked and re-tested until the compaction density and moisture requirements are met. The field density testing report should document any failing tests and re-work required to meet testing requirements.

In-place density tests shall be performed using the Sand Cone Method (ASTM D1556), Drive-Cylinder Method (ASTM D2937), or Nuclear Method (ASTM D6938). If the nuclear method is selected, a minimum of one comparison density test using the Sand Cone or Drive Cylinder method shall be performed for every three nuclear density tests, and correlations between the test methods shall be developed and reviewed by the Engineer. A sample of CCP material shall be collected from each density test location and placed in a sealed container for subsequent field and laboratory moisture testing.

A family of Proctor curves shall be developed for the onsite CCP material as standard Proctor moisture-density tests are performed as a reference for the field density testing. Laboratory proctors shall be conducted at one test per 50,000 tons of CCP placed. A minimum of one (1) one-point field Proctor test shall be performed for each week of field density testing or if there is a noticeable change in material. Additional Standard Proctor samples shall be obtained and tested if one-point Proctor testing indicates that the estimated maximum dry density of the

material varies by more than five pounds per cubic foot (pcf) from the nearest representative standard Proctor moisture-density relationship as determined by the one-point Proctor method.

Field moisture content testing shall be performed for each density test using the Direct Heating Method (ASTM D4959). The Nuclear Method (ASTM D6938) shall not be used for moisture content testing on the CCP material. Comparison laboratory moisture content testing shall be performed using the Oven Method (ASTM D2216), at an oven temperature of 60 degrees Celsius. The laboratory moisture content shall control in the event of a discrepancy between laboratory moisture content and in-place moisture content.

2.1.5.2 LABORATORY TESTING

Laboratory moisture content testing shall be performed in conjunction with the field density testing as described above. The laboratory moisture content testing shall be performed using the Oven Method (ASTM D2216), at an oven temperature of 60 degrees Celsius.

2.1.6 Cover Requirements

2.1.6.1 INTERIM COVER SOIL

Interim cover soil should be applied, as needed, for dust control and stormwater management. The interim cover may be applied at a thickness suited to its purpose. For example, the interim cover soil may be applied in thinner layers to provide dust control and it may be applied in thicker layers where protection from surface erosion is desired.

Interim cover layer may be placed on exterior slopes and in areas where final structural fill grades have been reached. Interim cover will be seeded within seven days in accordance with erosion and sediment control requirements. Vegetation shall be removed and the interim cover soil shall be scarified or removed prior to placing any overlying CCP material or final cover system. Interim cover soil is not required, but may be used to protect the CCP materials and segregate contact water from stormwater.

2.1.6.2 FINAL COVER

The final cover consists of a six foot thick system of layers for the top slopes and a four foot thick system of layers for the sideslopes. Each area has two options. Option 1 has a one foot thick drainage soil placed directly above the HDPE geomembrane. Option 2 replaces the drainage layer soils with unclassified soils and has a geocomposite placed immediately above the HDPE geomembrane. See the table below and the details on the drawings for additional information.

Layer	Sideslope Option 1	Top slope Option 1	Sideslope Option 2	Top slope Option 2
Topsoil	6 inches	6 inches	6 inches	6 inches
Low Perm Soil	12 inches	12 inches	NA	Not used
Unclassified Soil	12 Inches	24 inches	42 inches	66 inches
Drainage Soil	18 inches	30 inches	NA	NA
Geocomposite	Not used	Not used	used	used
HDPE Geomembrane	40 mil	40 mil	40 mil	40 mil

The final cover system construction for the structural fill site will begin 30 working days or 60 calendar days, whichever is less, after CCP placement completion unless otherwise approved by NCDENR.

Please refer to the Closure/Post-Closure Plan included in this Permit Application for final cover specifications and maintenance requirements.

2.1.7 Dust, Litter, Odor, and Vector Control

Litter, odors, and vectors are not anticipated to be concerns. The material placed in the structural fill does not attract vectors, and windblown material is not anticipated to be a problem. Additionally, CCP materials are not typically associated with odors.

2.1.7.1 DUST CONTROL

In accordance with NCGS §130A-309.216 (a) (9) the structural fill project will be operated with sufficient dust control measures to minimize airborne emissions and to prevent dust from creating a nuisance or safety hazard and shall not violate applicable air quality regulations.

The primary potential source of dust emissions on site is the top deck area and active area of structural fill placement. These areas are at a higher risk for producing dust due to vehicular and equipment traffic and earthwork-like construction. Exterior slopes are less of a dust control concern, as they have interim cover soil which is vegetated.

Dust emissions can be controlled through a variety of methods identified herein. Dust control methods may be characterized as products and/or applications, structural wind breaks and/or covers, and operational methods.

Dust control methods for the facility include the following.

- Watering
- Establishing vegetative cover
- Mulching
- Structural controls consisting of:
    - Wind breaks (i.e. fencing and/or berms), and
    - Temporary coverings (i.e. tarps)
- Spray applied dust suppressants consisting of, and not limited to:
    - Anionic asphalt emulsion
    - Latex emulsion
    - Resin in water
    - Polymer based emulsion
    - Mineral mortar coatings (i.e. posi-shell)
- Calcium chloride
- Soil stabilizers (i.e. soil cements)
- Operational soil cover
- Modifying the active working area
- Modifying operations during dry and windy conditions

The operator may use, and is not limited to, combinations of these dust control methods or any method that is technically sound to control dust for specific site conditions. If the operator intends to use a dust control method not presented above, the proposed dust control method will be evaluated on a case by case basis to assess the effectiveness with specific site conditions. For the purposes of this Operations Plan, interim cover soil will be defined as soil material applied at a suitable thickness to provide dust control.

The effectiveness of the dust control methods implemented should be evaluated through visual observations of dust prone areas. Equipment operators shall continuously observe the active face and other areas within the facility for dust emissions.

If fugitive dust emissions are observed and observations indicate dust control measures are not achieving their intended purpose, then appropriate corrective actions will be taken. Dust control measures should be reapplied, repaired, or added, as necessary, to control dust emissions. The operator will construct, install, apply, and/or repair dust control measures prior to the end of the work day to control dust emissions during non-operating hours. The operator shall also implement dust control measures as preventative controls rather than in response to fugitive dust emissions.

A wheel wash system may be necessary to minimize dust and tracking of CCPs outside the facility.

2.2 Leachate and Contact Water Management

In accordance with NCGS §130A-309.216 (a) (5) the CCP structural fill project will be effectively maintained and operated as a nondischarge system to prevent discharge to surface water resulting from the project.

As previously described, the structural fill site has been designed to provide separation of contact water from non-contact water (stormwater). Contact water will be treated as leachate and conveyed to the LCS. Contact water which contacts exposed CCP material within the lined footprint will be conveyed through the LCS. Stormwater will be routed to onsite sediment basins prior to discharge from the site.

2.2.1 Leachate Collection System

The LCS includes a synthetic composite drainage layer and leachate collection pipes with clean-outs. Leachate generated in each cell drains by gravity via perforated header pipes to a series of sumps and then pumped to a central lift station where it is then pumped into a 1,000,000 gallon storage tank with a secondary containment. Leachate will either be transported to a wastewater treatment plant or discharged directly into a sanitary sewer system.

All loading of leachate tankers will take place on the loading pad next to the storage tank. Prior to loading the operator will insure that the leachate diverter valve is open on the drain pad so any leachate that may be spilled during loading operations will drain back into the lift station.

It will be the responsibility of the tanker operator to ensure that the load is within legal transportable limits. If the load exceeds permissible limits then the tanker operator will:

- Go back to the loading drain pad
- Verify that the leachate diverter valve is open
- Discharge a quantity of leachate sufficient to meet the maximum transport weight capacity

The owner is responsible for the operation of the leachate collection and removal system and for maintaining the system as designed for the life of the structural fill and the post-closure period. The department may allow the constructor or operator to stop managing leachate upon a satisfactory demonstration that leachate from the project no longer poses a threat to human health and the environment. Leachate shall be collected and treated as necessary so that water quality standards and criteria are not violated. A recording rain gauge will be maintained onsite to record precipitation at the structural fill site. Precipitation records are included with the operating record and are maintained and used by the Operator to compare with leachate generation rates.

2.2.2 LCS Maintenance

The maintenance of the leachate collection system's physical facilities (consisting of high-density polyethylene (HDPE) piping and storage unit(s)) and records will be performed by or under the direct supervision of the Owner or Owner's representative. Visual observations of proper LCS performance will be made periodically to verify that the LCS is performing properly.

New leachate collection systems will be water pressure washed and inspected by video recording prior to putting the system into service. Until the structural fill unit is closed, the system will be re-inspected by video once every two years, then cleaned if video indicates a concern. If it becomes apparent that the system is not functioning properly, it may be inspected by video. Records of the collection system cleanings and inspections shall be kept onsite. A report shall document each video and/or cleaning activity and shall include the following details at a minimum.

- General details (a signed letter/report with company name that performed the cleaning/video inspection, dates & time for jet-cleaning/video inspection, any historical issues associated with jet-cleaning/video inspection, etc.)
- Pipe IDs that were jet-cleaned/video inspected; for example: Cleanout 1 was jet cleaned/video inspected
- Length of each pipe jet-cleaned/video inspected; for example: Cleanout 1 was jet cleaned/video inspected for 400 feet
- Any obstruction or unusual situation that occurs during jet-cleaning/video inspection. For example: Cleanout 2 was jet cleaned 20 feet only as pressure hose did not go beyond
- The maintenance frequency of the LCS may be modified based on consecutive inspection results and observed operating conditions

2.2.3 LCS Record Keeping and Sampling

. Untreated leachate shall be sampled and analyzed at least semi-annually concurrently with the groundwater sampling. Leachate will be sampled as a composite grab sample from the effluent line of the leachate collection system. The leachate must be analyzed for the same constituents

as the groundwater monitoring wells in the Water Quality Monitoring Plan included with the Design Hydrogeological Report contained in this Permit Application. The results must be submitted to NCDENR with groundwater results.

2.3 Stormwater Management System

The stormwater management system includes slope drains, culverts, perimeter channels, etc., that convey stormwater to the sediment basins. Stormwater that does not come in contact with structural fill will be treated as non-contact water. To improve operations, stormwater should be diverted from the active area. Excessive surface water at the working face creates difficulties for maneuvering equipment and prevents the operator from achieving maximum compaction of structural fill. To divert stormwater runoff away from the working face, temporary diversion berms may be installed as dictated by the direction of grade. In addition, interim soil cover may be placed over structural fill that has reached final grade. This cover will be uniformly graded and compacted to prevent the formation of erosion channels. In the event that channels do form, the cover should be promptly repaired.

Typically, all stormwater runoff that has not contacted structural fill will be drained from the active fill areas and routed to the peripheral drainage channels that surround each working area. The stormwater channels, culverts, and sedimentation ponds are designed to convey and discharge all stormwater runoff from a 25-year, 24-hour-duration storm event. Within the active portion of the site, all working areas are to be maintained and graded to allow stormwater to flow away from the active face and toward the peripheral drainage channels. Interceptor berms to control the flow of runoff from the surface are to be constructed so that runoff will not be allowed to cascade down the side slopes.

The stormwater management system within the structural fill boundary will be constructed during each phase of partial closure. A series of permanent swales and structures to control the flow of runoff from the finished and capped structural fill will be used. These swales and structures will assist in the prevention of erosion damage to the structural fill's final cover. The stormwater management structures will be in accordance with the closure plan for the full buildout. Minor modifications to the locations of terraces, inlet structures and slope drains may be required depending on the prevailing grades of the structural fill cover at the time of closure due to settlement. If such modifications are needed, an investigation will be performed to confirm that worst case input parameters will not be exceeded. If any of the worst case input parameters exceed, original calculations will be revised prior to closure to confirm that original design intent is met.

The stormwater management system outside the structural fill footprint will be constructed along with each cell construction. The stormwater channels are constructed around the perimeter of the site as shown on the closure plan so that stormwater from the closed fill areas will flow into these ditches and then into the stormwater detention ponds. The stormwater detention areas are designed to control all runoff from this nearly impervious final cover cap.

Stormwater collection and conveyance measures will be inspected and maintained in accordance with the current Erosion and Sedimentation Control (E&SC) Plan.

The following shall be performed on all permitted systems.

- Removal of debris, if any
- Inspection of inlets, outlets and culverts
- Removal of sediments when the storage volume or conveyance capacity of the system is below design level or when the system is rendered ineffective on account of clogging/sedimentation of the pond bottom
- Any breach of the system's integrity shall be immediately repaired. Whenever erosion is detected, measures shall be taken to stabilize and protect the affected area
- Mowing and removal of grass clippings

2.3.1 Stormwater Discharge

The stormwater system at the site was designed to assist in preventing the discharge of pollutants. Structural fill operation shall not cause a discharge of pollutants into waters of the United States, including wetlands, that violates any requirement of the Clean Water Act, including but not limited to NPDES requirements, pursuant of Section 402. In addition, under the requirements of Section 404 of the Clean Water Act, the discharge of dredge or fill material into waters of the state that would be a violation of the requirements shall not be allowed.

Operations of the site shall not cause the discharge of a non-point source of pollution to waters of the United States, including wetlands, that violates any requirements of an area-wide or statewide water quality management plan that has been approved under Section 208 or 319 of the Clean Water Act, as amended.

2.3.2 Contact and Stormwater Maintenance Requirements

All drainage features (i.e., diversion ditches, berms, risers, discharge pipes, etc.) will be inspected and maintained in accordance with the current E&SC Plan and documented for signs of damage, settlement, clogging, silt buildup, or washouts. If necessary, repairs to drainage control features will be made as early as practical. The stormwater controls and/or erosion control measures shall be employed to correct any erosion which exposes CCP or causes malfunction of the stormwater management system. Such measures shall be implemented within three days of occurrence. If the erosion cannot be corrected within seven days of occurrence the structural fill site operator shall notify the Department and propose a correction schedule.

2.4 Water Quality Monitoring Requirements and Management

In accordance with NCGS §130A-309.216 (a) (6) the structural fill project will be effectively maintained and operated to ensure no violations of groundwater standards adopted by the Commission pursuant to Article 21 of Chapter 143 of the General Statutes due to the project. Groundwater and surface water will be monitored in accordance with the Water Quality Monitoring Plan included with the Design Hydrogeological Report contained in this Permit Application.

Groundwater monitoring wells are located around the facility's perimeter. A readily accessible, unobstructed path shall be maintained so that monitoring wells may be accessed using four-wheel drive vehicles. Care must be taken to prevent any damage to the wells.

3 Erosion and Sedimentation Control

Erosion and sedimentation control during filling operations will consist of monitoring and repairing E&SC stormwater conveyance features and surface erosion as defined in this Operations Plan and the current E&SC plan. Monitoring and maintenance of the E&SC system will be in accordance with the current E&SC Plan.

4 Vegetation Management

Vegetation will be established to minimize erosion and to ensure no visible CCP migration to adjacent properties. Temporary and permanent seeding will be applied as required. Temporary and permanent seeding will be applied in accordance with Technical Specification 02485, Seeding included in this Permit Application.

5 Site Closure

The Colon Mine Site will be closed in accordance with the design drawings and Closure/Post-Closure Plan. The Closure/Post-Closure Plan outlines the sequence for closing the site and the post-closure maintenance activities. Closure is designed to minimize the need for long-term maintenance and to control the post-closure release of contaminants. Closure activities may be revised as appropriate for materials, specifications, technology advancements, or changes in regulations at the time the site is closed or in post-closure. In general, the site development is designed so that final cover can be established as soon as practical.

6 Required Regulatory Submittals

Water Quality Monitoring Reports will be submitted to NCDENR in accordance with the Water Quality Monitoring Plan included with the Design Hydrogeological Report contained in this Permit Application.

Closure and Post-Closure Plan

Colon Mine Site Structural Fill

Charah, Inc.

Sanford, NC

March 2015

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List of Tables

Appendix

1 Introduction

The purpose of the Closure/Post-Closure Plan is to outline the steps for the Operator to follow during closing of the structural fill and the post-closure maintenance activities for the structural fill. Closure is designed to minimize the need for long term maintenance and to control the post-closure release of contaminants. The proposed Closure Plan should be re-evaluated by a registered professional engineer prior to closure activities. Closure activities may be revised as appropriate for materials, specifications, technological advances or changes in regulations at that time. Any revisions shall be submitted to the department and approved prior to implementation. The proposed top of coal combustion products (CCP) contours for the structural fill are shown on Sheet 00C-04, Reclamation Plan, contained in the facility permit application.

Phasing of the structural fill development is designed so that final cover can be established as soon as possible. The final cover will be constructed in stages as cells of the structural fill reach final grade. The final structural fill contours will have erosion control benches and side slopes at a maximum 4H:1V. The top of the structural fill is designed for a minimum two percent slope.

Final closure of each structural fill cell will commence when the Operator declares that no more CCP will be placed or as directed by the North Carolina Department of Environment and Natural Resources (NCDENR).

Prior to beginning closure of each structural fill cell, the Operator shall notify NCDENR that a notice of intent to close the structural fill cell has been placed in the operating record. Closure activities for the structural fill cell shall begin no later than 30 working days or 60 calendar days, whichever is less, after CCP placement has ceased (in accordance with North Carolina General Statute (NCGS) §130A-309.218(a)(1)) unless otherwise approved by NCDENR.

The final cover system for the closed phase will be certified by a professional engineer as being completed in accordance with the Closure/Post-Closure Plan.

Following closure operations, the facility may be developed.

If the structural fill must be closed prior to reaching the final contours, the surface of the structural fill will be sloped to a minimum grade of two percent and maximum grade of 4H:1V. A final cover will be established over the structural fill cell being closed.

2 Closure Plan

A Closure Plan is required by North Carolina General Statute (NCGS) §130A-309.218 (b) (1) to be submitted to the North Carolina Department of Environment and Natural Resources (NCDENR) for large structural fill projects. Large structural fill projects are defined in NCGS §130A-309.218 (b) as involving placement of 8,000 or more tons of CCP per acre or 80,000 or more tons of CCP in total per project. NCGS §130A-309.218 (b) (1) requires a closure plan to describe the cap system and the methods and procedures used to install the cap system; provide an estimate of the largest area of the structural fill that will require a cap system; provide

an estimate of the maximum inventory of CCPs onsite; and provide a schedule for completing closure. In addition, NCGS §130A-309.219 requires specific recordation once closure is complete.

2.1 Cap System Description

NCGS §130A-309.218 (b) (1) a. requires the Closure Plan describe the cap liner system and the methods and procedures that will be used to install the cap in conformance with NCGS § 130A-309.216 (b). The cap will be built in accordance with NCGS §130A-309.216 (b) (3), minimizing infiltration and erosion. There are two proposed cap systems for the structural fill. A decision on which cap system to use will be made before closure begins and will be based on cost, soil availability and other factors. One proposed cap system consists of (from top down to CCP): topsoil, a low permeable soil layer, an unclassified soil layer, a drainage soil layer and a geomembrane. The other proposed cap system consists of (from top down to CCP): topsoil, a low permeable soil layer, a geocomposite drainage layer and a geomembrane. The thickness of some of the layers will vary depending on the location of the cap on the structural fill. The top of the structural fill will have a six foot cap and the side slopes of the structural fill will have a four foot cap as shown in Table 1 below.

Table 1 Cap System Thickness

	Soil/Geomembrane Cap		**Soil/Geocomposite Drainage Layer/Geomembrane Cap**	
Layer	**Top**	**Side Slope**	**Top**	**Side Slope**
Topsoil thickness	6 inches	6 inches	6 inches	6 inches
Low permeable soil layer thickness	12 inches	12 inches	66 inches	42 inches
Unclassified soil layer thickness	24 inches	12 inches	NA	NA
Drainage soil layer thickness	30 inches	18 inches	NA	NA
Geocomposite drainage layer	NA	NA	250 mil	250 mil
PE geomembrane	40 mil	40 mil	40 mil	40 mil
Total Cap Thickness[a]	**6 feet**	**4 feet**	**6 feet**	**4 feet**

[a] Ignores the nominal thickness of the geocomposite drainage layer and the PE geomembrane.

The Operator will prepare the supporting CCP surface or interim cover for the closure cap. Vegetation shall be removed and the interim cover soil shall be scarified or removed prior to placing any overlying material. The surface to be covered with geomembrane will be rolled and compacted so as to be free of irregularities, protrusions, loose materials, and abrupt changes in grade. Prior to geomembrane placement, perimeter anchor trenches will be excavated. The geomembrane panels will be placed one at a time and field seamed.

Soil materials will be placed directly on top of a geomembrane or geocomposite in such a manner as to ensure there is no damage to the geomembrane or geocomposite. Typically, a minimum thickness of one foot of soil is specified between a low ground-pressure dozer and the geomembrane or geocomposite. The soils must be free of objects that could cause damage to the geomembrane or geocomposite.

Soil materials will be placed in six-inch compacted lifts with equipment only operating over previously placed soil material. The lifts will be placed with sufficient number of passes to achieve 90% compaction (Standard Proctor) and compacted by tracking using low-ground

pressure construction equipment meeting the requirements of the project specifications. The topsoil will be a six-inch thick layer of soil capable of promoting the growth of vegetation. The total thickness of the final cover shall be at least six feet on the top of the structural fill and at least four feet on the side slopes of the structural fill.

2.2 Surface Water Runoff and Run-on

Surface water running off the structural fill during and after a rainfall event will be collected and routed off the cover by erosion control benches and slope drains. Surface water that flows toward the structural fill from uphill areas (run-on) will be intercepted and channeled away from the structural fill and final cover surface by diversion channels and perimeter berms.

2.3 Erosion Control

Erosion will be controlled by vegetation, erosion control benches and diversion of run-off. Vegetation will aid in reducing soil erosion. Benches break the velocity of sheet flow over the closed structural fill, control development of erosion features before they damage the final cover, and divert runoff into manageable flow volumes. Sediment laden runoff will be collected in the sediment basins.

2.4 Dust Control

Dust control during closure construction will be managed as outlined in the Operations Plan and appropriate for closure construction.

2.5 Estimate of Largest Area to Require Closure

NCGS §130A-309.218 (b) (1) b. requires the Closure Plan to provide an estimate of the largest area of the structural fill project that will require a cap at any time during the overall construction period. The largest area requiring closure at any time will be 31.9 acres.

2.6 Estimate of Maximum Inventory of Coal Combustion Products

NCGS §130A-309.218 (b) (1) c. requires the Closure Plan to provide an estimate of the maximum inventory of CCPs ever onsite over the construction duration of the structural fill. The structural fill is sized to hold an estimated total of approximately 7.25 million cubic yards of CCPs in five cells.

2.7 Closure Schedule

NCGS §130A-309.218 (b) (1) d. requires the Closure Plan to provide a schedule for completing all activities necessary to satisfy the closure criteria. In accordance with NCGS §130A-309.218 (a) (1), cap application will start no later than 30 working days or 60 calendar days, whichever is less, after CCP placement has ceased. Closure construction is anticipated to take up to a year to complete. Refer to the Reclamation Timeline in the Earthwork Calculations section for the anticipated closure schedule.

2.8 Closure Cost Estimate

The cost to complete closure is calculated on a per acre basis. The final cap thickness varies between the top (i.e., flatter slope) and the side slopes (i.e., 4H:1V slope). In addition, both of the cap cross-sections have the option to be constructed with or without a geocomposite. The calculations included in Appendix A of this section cover each of the possible options. The cost estimates include, as warranted, the items listed below.

- Mobilization, Administration & Bonds
- Surveying & Control
- Topsoil Layer
- Low Permeable Soil Layer
- Unclassified Soil Layer
- Lateral Drainage Soil Layer (depending on option)
- Geocomposite Drainage Layer (depending on option)
- Geomembrane (40 mil double sided textured polyethylene)
- Seeding/Fertilizing/Mulching
- Contingency
- Engineering - Plans & Specs
- CQA & Certification
- Construction Management

Selection of the closure cap option will depend on the availability and pricing of materials at the time of closure. The cost estimate will be updated annually.

2.9 Certification

A certification signed and sealed by a registered professional engineer will be submitted to NCDENR within 30 days of the completion of the closure cap system or any partial closure of the cap system construction. The certification will verify that the closure has been completed in accordance with the Closure Plan and the law.

2.10 Recordation

NCGS §130A-309.219 requires recordation of the structural fill project (with more than 1,000 cubic yards of CCP) with the Register of Deeds. The recordation will include a statement with the volume and location of the coal combustion residuals and will identify the parcel of land where the structural fill is located. The statement will be signed and acknowledged by the landowners in the form prescribed by NCGS 47-38 through NCGS 47-43. NCGS §130A-309.219 will be consulted for all the information required in the statement and the format of the statement prior to the creation of the statement. In accordance with NCGS §130A-309.219 (b) the statement will be submitted to the Register of Deeds within 90 days after completion of the structural fill project using coal combustion residuals. NCDENR will be notified by the Operator of the closure completion, certification by a professional engineer that closure was completed in accordance with the Closure/Post-Closure Plan, deed notation, and placement of these records into the structural fill's operating record.

3 Post-Closure Plan

A Post-Closure Plan is required by NCGS §130A-309.218 (b) (2) to be submitted for large structural fill projects. NCGS §130A-309.218 (b) (2) requires a post-closure plan to describe the monitoring and maintenance activities required for the structural fill project; provide contact information for a person or office responsible for the structural fill project during the post-closure period; describe the planned uses of the property during the post-closure period; and provide a cost estimate for the post-closure period activities.

Large structural fill projects are required by NCGS §130A-309.218 (b) to perform post-closure care. In accordance with NCGS §130A-309.218 (b), the post-closure care will be conducted for 30 years, unless NCDENR permits a decrease in the post-closure care period or requires an increase in the post-closure care period.

Post-closure care of the facility after closure will consist of the following elements:

- Inspection and maintenance of final cap systems, including
    - Repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events
    - Preventing run-on and run-off from eroding and damaging the cap system (see Sections 2.2 and 2.3 of this Closure/Post-Closure Plan)
- Operation, inspection and maintenance of the leachate collection system.
- Control of access with fences and/or signs.

The final cover system will be inspected quarterly for signs of settlement, erosion, and bare spots. Additional inspections will be performed after large storm events. Depressions in the cover that pond water or otherwise impair the function of the final cover will be filled and/or regraded. Areas subject to regrading will be revegetated. Erosion damage will be repaired, and the source of the damage will be corrected, if possible. The grass will be mowed at least twice annually. Bare spots will be revegetated with grass seed. Any deep-rooted or woody vegetation that may have established itself on the cover soil will be removed so that deep root growth will not compromise the integrity of the geosynthetics of the final cover.

The leachate collection system shall be inspected on a quarterly basis. The pipeline, manholes, pumps, and the leachate storage system will be inspected and maintained as needed.

Following completion of the post-closure care period of the structural fill, the Operator will submit NCDENR a certification, signed by a registered professional engineer, verifying that post-closure care has been completed in accordance with the post-closure plan and will place the certification in the operating record.

3.1 Post-Closure Monitoring and Maintenance Requirements

In accordance with NCGS §130A-309.218 (b) (2) a., a description of the monitoring and maintenance activities required is listed in Table 2.

Table 2 Post-Closure Monitoring & Maintenance Activities and Their Frequencies

Activity	Frequency
General Site Inspection Cap System Stormwater Management System Utilities Leachate Collection System Other Miscellaneous Inspections	Quarterly[a]
Mowing	at least twice per year or as needed
Water Quality Monitoring	per Water Quality Monitoring Plan
Groundwater Monitoring System Inspection	Semiannually

[a] The cap system and stormwater management system will be inspected within seven days of a major storm event.

A description of the monitoring and maintenance activities follows.

3.2 General Site Inspection & Maintenance

A general site inspection will occur quarterly. This inspection will include a cap system inspection, a stormwater management system inspection, utilities inspection, a leachate collection system inspection, and other miscellaneous inspections. In addition to inspections, general maintenance will be performed. This general maintenance includes maintaining the vegetation onsite, removing woody waste, and mowing at least twice per year or as needed. The quarterly site inspection has been allocated $5,000 per inspection; actual costs may vary. A checklist for quarterly inspection tasks is provided in Appendix B. These and other inspection records must be maintained in a central location and made available for any NCDENR inspections.

3.2.1 Cap System Inspection & Maintenance

In accordance with NCGS §130A-309.218 (b) (3) the integrity and effectiveness of the cap system will be maintained. This will include repairing the system as necessary to correct the defects of settlement, subsidence, erosion, or other events and preventing run-on and runoff from eroding or otherwise damaging the cap system (NCGS §130A-309.218 (b) (3)). The cap system will be inspected quarterly or within seven days of a major storm event, whichever is more frequent. The cap system will be inspected for evidence of settlement, subsidence, erosion, and other damage or potential damage.

Cap maintenance will be performed as necessary to maintain the integrity and effectiveness of the cap system. To account for erosion control and cover maintenance in the post-closure period, some reconstruction of the cap (including grassing and soil fill material) has been considered. An annual average cap maintenance of one acre per year of regrassing, and 400 CY of top soil replacement and 400 CY of protective cover replacement per year have been estimated.

3.2.2 Stormwater Management System Inspection & Maintenance

The stormwater management system (sediment basins, perimeter channels, etc.) will be inspected at least quarterly or within seven days of a major storm event, whichever is more frequent, to ensure the system is functioning properly. The current Erosion & Sediment Control

Plan may require more frequent inspections and should be followed. Maintenance will be performed as necessary. A lump sum amount of $2,000 has been allocated for annual stormwater management system maintenance and a lump sum amount of $1,200 has been allocated for each stormwater monitoring event. Two stormwater monitoring events have been allocated each year for an annual total of $2,400 for stormwater monitoring; actual costs may vary.

3.2.3 Utilities

Some utilities at the site will be maintained in operational condition during the post-closure period and will be inspected quarterly. The estimated power requirement is $500 a month which is equal to $6,000 a year; actual costs may vary.

3.2.4 Leachate Collection System Operation, Inspection & Maintenance

In accordance with NCGS §130A-309.218 (b) (4) the leachate collection system will continue to operate and be maintained during the post-closure care period. The parts of the leachate collection system that are above ground or easily accessible will be inspected quarterly. This will include inspections of the pipelines, manholes, pumps, and the leachate storage system. Maintenance will be performed as necessary in order to ensure the leachate collection system is functioning properly.

Leachate disposal has been measured using the HELP Model to estimate the average quantity of leachate requiring offsite treatment and disposal. The 30-year average during the post-closure period is approximately 9,200 gallons per acre per year. For the 118 acre footprint (based on the construction baseline), the average annual volume of leachate is 1,094,800 gallons. The annual post-closure leachate treatment cost is estimated to be $0.0235 per gallon for an annual leachate treatment amount of $25,500; actual costs may vary. In addition, a lump sum leachate system maintenance cost has been assumed to be $2,500 per year.

The owner may request from the Department to stop managing leachate from the project if the owner can demonstrate that leachate from the project through a post-closure care leachate monitoring program no longer poses a threat to human health and the environment (NCGS §130A-309.218 (b) (4)). If the owner is allowed to stop managing leachate from the project, the owner will stop operating the leachate collection system and may dismantle portions of the leachate collection system that are not under the structural fill project. The leachate collection system inspection and maintenance frequency will be revised if the structural fill is no longer required to operate the leachate collection system.

3.2.5 Other Miscellaneous Inspection & General Maintenance

Any security control devices such as fences and gates located at the site will be inspected quarterly. Repairs will be made as necessary to ensure the security of the structural fill project. A lump sum amount of $500 is assumed as cost associated with fence repairs and other security management; actual costs may vary.

3.3 Mowing

Vegetation on the cap system will be maintained. Mowing will occur at least twice per year or as needed. The unit cost of mowing is assumed to be $24.00 per acre; actual cost may vary. Therefore two events at $24.00/acre x 118 acres = $5,700 per year (or $2,850 per event).

3.4 Water Quality Monitoring, System Inspection & Maintenance

In accordance with NCGS §130A-309.218 (b) (5), the groundwater monitoring system will be monitored and maintained in accordance with NCGS §130A-309.216. The groundwater monitoring system will be inspected at least semiannually, or at least during a groundwater monitoring event, whichever is sooner. A checklist for semiannual inspection tasks is provided in Appendix B. Groundwater monitoring system inspections will include inspecting the groundwater monitoring wells, covers, pads, etc. for damage. Maintenance will be performed as necessary. Groundwater and surface water will continue to be monitored according to the Water Quality Monitoring Plan for the structural fill throughout post-closure.

There are nine groundwater monitoring wells and two surface water sampling locations that require semi-annual sampling and reporting per the Water Quality Monitoring Plan. The unit cost per semiannual monitoring event is estimated to be $6,000. Groundwater monitoring well maintenance is assumed to have a lump sum amount of $1,000 per year for well maintenance and replacement; actual cost may vary.

3.5 Administrative Costs

Professional engineering services expected during the post-closure period include investigations of documented problems from the inspection reports. An annual cost of $2,000 per year has been estimated to cover miscellaneous administrative costs; actual costs may vary.

3.6 Contact Person Information

In accordance with NCGS §130A-309.218 (b) (2) b., the name, address, and telephone number of the person or office responsible for the project during the post-closure period is listed below.

Charles E. Price
12601 Plantside Drive
Louisville, KY 40299
(877) 314.7724

3.7 Proposed Post-Closure Use of the Property

NCGS §130A-309.218 (b) (2) c. requires that a description of the planned uses of the property during the post-closure period be included in the post-closure plan. The property will be actively marketed as an industrial use site for development through the local and state economic development commission as well as other real estate advertisement methods. In accordance with NCGS §130A-309.218 (b) (2) c., any post-closure use of the property will not disturb the integrity of the cap system, base liner system, or any other components of the containment system or the function of the monitoring systems, unless necessary to comply with the

requirements of this subsection. NCDENR will be consulted prior to any disturbance of the structural fill project and/or its containment system. Prior to any disturbance, the Operator will demonstrate that disturbance of the cap system, base liner system, or other component of the containment system will not increase the potential threat to public health, safety, and welfare; the environment; and natural resources as required by NCGS §130A-309.218 (b) (2) c.

3.8 Post-Closure Cost Estimate

Reference Appendix A in this section for an annual cost estimate for the post-closure activities in accordance with NCGS §130A-309.218 (b) (2) d.

3.9 Post-Closure Care Completion Certification

In accordance with NCGS §130A-309.218 (c), “following completion of the post-closure care period, [the Operator will] submit a certification, signed by a registered professional engineer, to [NCDENR], verifying that post-closure care has been completed in accordance with the post-closure plan, and include the certification in the operating record.”

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A

Closure/Post-Closure Cost Estimates

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Closure Cost Estimate – Soil/Geomembrane Cap

The following is an estimate of closure costs; actual costs may vary.

				Soil/Geomembrane Cap					
				Top			Side Slope		
Item	Description	Unit Price	Unit	Thickness (in)	Quantity	Total	Thickness (in)	Quantity	Total
1	Mobilization, Administration & Bonds	4%	of Items 2-9		4%	$ 4,000		4%	$ 3,200
2	Surveying & Control	$ 1,600	Acres		1	$ 1,600		1	$ 1,600
3	Topsoil Layer	$ 11.60	CY	6	900	$ 10,400	6	900	$ 10,400
4	Low Permeable Soil Layer*	$ 6.70	CY	12	1,700	$ 11,400	12	1,700	$ 11,400
5	Unclassified Soil Layer*	$ 6.70	CY	24	3,300	$ 22,100	12	1,700	$ 11,400
6	Drainage Soil Layer*	$ 6.70	CY	30	4,100	$ 27,500	18	2,500	$ 16,800
7	Geocomposite Drainage Layer	$ 0.70	SF		0	$ -		0	$ -
8	Geomembrane (40 mil double sided textured polyethylene)	$ 0.60	SF		43,560	$ 26,100		43,560	$ 26,100
9	Seeding/Fertilizing/Mulching	$ 1,500	Acre		1	$ 1,500		1	$ 1,500
10	Contingency	10%	of Items 1-9		10%	$ 10,500		10%	$ 8,200
11	Engineering - Plans & Specs	6%	of Items 1-9		6%	$ 6,300		6%	$ 4,900
12	CQA & Certification	6%	of Items 1-9		6%	$ 6,300		6%	$ 4,900
13	Construction Management	5%	of Items 1-9		5%	$ 5,200		5%	$ 4,100
					Cost Per Acre	$ 132,900		Cost Per Acre	$ 104,500

*The permeabilities for the soil layers may be different; however, the costs have been assumed to be the same with the exception of the topsoil.

Closure Cost Estimate – Soil/Geocomposite Drainage Layer/Geomembrane Cap

The following is an estimate of closure costs; actual costs may vary.

				Soil/Geocomposite Drainage Layer/Geomembrane Cap					
				Top			Side Slope		
Item	Description	Unit Price	Unit	Thickness (in)	Quantity	Total	Thickness (in)	Quantity	Total
1	Mobilization, Administration & Bonds	4%	of Items 2-9		4%	$ 5,200		4%	$ 4,300
2	Surveying & Control	$ 1,600	Acres		1	$ 1,600		1	$ 1,600
3	Topsoil Layer	$ 11.60	CY	6	900	$ 10,400	6	900	$ 10,400
4	Low Permeable Soil Layer*	$ 6.70	CY	66	8,900	$ 59,600	42	5,700	$ 38,200
5	Unclassified Soil Layer*	$ 6.70	CY		0	$ -		0	$ -
6	Drainage Soil Layer*	$ 6.70	CY		0	$ -		0	$ -
7	Geocomposite Drainage Layer	$ 0.70	SF		43,560	$ 30,500		43,560	$ 30,500
8	Geomembrane (40 mil double sided textured polyethylene)	$ 0.60	SF		43,560	$ 26,100		43,560	$ 26,100
9	Seeding/Fertilizing/Mulching	$ 1,500	Acre		1	$ 1,500		1	$ 1,500
10	Contingency	10%	of Items 1-9		10%	$ 13,500		10%	$ 11,300
11	Engineering - Plans & Specs	6%	of Items 1-9		6%	$ 8,100		6%	$ 6,800
12	CQA & Certification	6%	of Items 1-9		6%	$ 8,100		6%	$ 6,800
13	Construction Management	5%	of Items 1-9		5%	$ 6,700		5%	$ 5,600
					Cost Per Acre	$ 171,300		Cost Per Acre	$ 143,100

*The permeabilities for the soil layers may be different; however, the costs have been assumed to be the same with the exception of the topsoil.

Annual Post-Closure Care Cost Estimate

The following is an estimate of post-closure costs; actual costs may vary.

1	Quarterly Site Inspections	4	Events	$5,000	$20,000
2	Cap System Maintenance				
	a. Seeding/Fertilizing/Mulching	1	acres	$1,500	$1,500
	b. Topsoil Replacement	400	CY	$11.60	$4,600
	c. Protective Cover Replacement	400	CY	$6.70	$2,700
3	Stormwater Management	1	LS	$2,000	$2,000
4	Stormwater Monitoring	2	Events	$1,200	$2,400
5	Utilities	12	Events	$500	$6,000
6	Mowing	2	Events	$2,850	$5,700
7	Fence Repairs and Security	1	LS	$500	$500
8	Administration	1	Events	$2,000	$2,000
9	Leachate System Maintenance	1	Events	$2,500	$2,500
10	Leachate Collection and Treatment	1,085,600	gallons	$0.0235	$25,500
11	Water Quality Monitoring & Report	2	Events	$6,000	$12,000
12	Groundwater Monitoring System Maintenance	1	Events	$1,000	$1,000
13	Contingency	10%		$88,400	$8,800
	Annual Total				$97,200
	30-YR Total				$2,916,000

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B

Post-Closure Inspection Checklists

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Quarterly Tasks

Date: _____

Name: _____

Action	Action Completed	Comments/Follow up
Inspection of leachate pipelines, manholes, pumps		
Inspection of leachate storage system		
Inspection of power to leachate sump pumps (if applicable)		
Inspection of grass condition & removal of woody waste		
Inspection of security control devices		
Inspection of utilities		
Inspection of cap system for evidence of settlement, subsidence, erosion or other damage*		
Inspection of stormwater management system (sediment basins, perimeter channels, etc.)*		
Other:		
Other:		
Other:		
Other:		

*Complete these tasks quarterly or within seven days of a major storm event, whichever is more frequent.

Notes:

Semiannual Tasks

Date: _____

Name: _____

Action	Action Completed	Comments/Follow up
Inspection of groundwater monitoring wells, covers, pads, etc		
Other:		
Other:		
Other:		

Notes:

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