2022 Landfill CCR Inspection Report

Entergy Arkansas, LLC White Bluff Plant
Class 3N Landfill

Permit No. 0199-S3N-R3
AFIN: 35-00110

January 2023
Promus Project No. 220197

Prepared for:
Entergy Arkansas, LLC
P.O. Box 551
Little Rock, Arkansas 72203

Prepared by:

PROMUS ENGINEERING

PROFESSIONAL ENGINEER'S CERTIFICATION

This report on the annual engineering inspection of the Entergy Arkansas, LLC White Bluff Plant Class 3N Landfill and supporting documentation was prepared under the direction and supervision of a qualified, State of Arkansas-registered Professional Engineer. Mr. Brad Fureigh, PE, of Promus Engineering, LLC. (Promus), was responsible for the overall preparation of this report. The report has been prepared to fulfill the requirements of §257.84(b). Based on the inspection of the landfill facility and review of available landfill documents, the design, construction, operation, and maintenance of the landfill is consistent with recognized and generally accepted good engineering standards.

Brad N. Fureigh, PE
AR Registered Professional Engineer No.: 14977

January 13, 2023
Date

TABLE OF CONTENTS

TABLES

APPENDICES

2022 Landfill CCR Inspection Report

Entergy Arkansas, LLC White Bluff Plant Class 3N Landfill
Redfield, Arkansas

1.0 INTRODUCTION

1.1. Purpose of Report

The purpose of this report is to document the annual inspection of the Entergy Arkansas, LLC White Bluff Plant Landfill facility in accordance with 40 CFR §257, *Subpart D - Disposal of Coal Combustion Residuals from Electric Utilities* (the CCR Rule). In particular, the report has been prepared to comply with §257.84(b), which requires an inspection to be conducted by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the landfill is consistent with recognized and generally accepted good engineering standards.

The report includes:

- Information on the current layout of the landfill,
- Waste volume estimates for the amount of waste contained in the landfill and remaining disposal capacity, and
- An assessment of the landfill including structural integrity and overall operations with respect to the CCR Rule and the facility permit requirements.

1.2. White Bluff Power Plant Information

Entergy Arkansas, LLC (Entergy) operates the White Bluff Steam Electric Station, located on the west bank of the Arkansas River, near Redfield in Jefferson County, Arkansas, as shown on Figure 1 (all figures are located in Appendix A). The approximate 3,400-acre site is situated on a bluff overlooking the relatively flat alluvial plain east of the Arkansas River.

The plant generates electricity through the combustion of coal and has been in operation since 1981. Coal combustion by-products (residues) (CCRs) that are generated during the electrical generation process are disposed in the on-site landfill. The ash is generally segregated into two categories, “fly” and “bottom.”

Approximately 80% of the ash produced is classified as fly ash, which is derived from the boiler exhaust gas and is collected in electrostatic precipitators. The fly ash is composed of very fine particles similar to glass and has the consistency of a powder. Collected fly ash is pneumatically transferred to silos for short-term storage. A subcategory of the fly ash is known as economizer ash. This material is the coarsest fraction of the fly ash, which drops out before the electrostatic precipitators, and represents approximately 2% of the fly ash production. The plant collects this material in a separate silo system.

The bottom ash is composed of angular, glassy particles with a porous surface texture and has the consistency of coarse sand. The bottom ash is sluiced to a remote submerged flight conveyor for removal of bottom ash from the bottom ash transport water, which is recycled. The bottom ash is deposited into the bottom ash bunker from which it is removed and bottom ash is transported from the bottom ash bunker for disposal in the landfill.

Historically, approximately 60 to 70 % of the two types of ash have been marketed regionally to construction-related industries. The remaining amount of ash is placed in the on-site landfill for disposal.

1.3. Permit History

The Landfill was initially issued a permit in 1982 by the Arkansas Department of Pollution Control and Ecology, now the Arkansas Department of Energy & Environment - Division of Environmental Quality (DEQ) and has received three permit modifications to date. The facility permit history is as follows:

1. In October 1982, Chem-Ash, Inc. (Chem-Ash), the on-site landfill contractor which managed coal ash sales and landfill disposal operations for Arkansas Power & Light (AP&L), was granted a permit (No. 199-S) from the DEQ to construct and operate a solid waste disposal facility at the White Bluff Plant (Entergy Arkansas, Inc., now known as Entergy Arkansas, LLC, became AP&L's successor in interest as of April 1996).
2. In March 1983, DEQ granted among other provisions a permit modification request to transfer the landfill permit from Chem-Ash to AP&L and revised the permit number to 199-SR-1.
3. In June 1984, AP&L submitted an application for permit modification requesting operational changes and other provisions to include an increase of the permitted landfill area from 110 acres to 177 acres, with 153 acres for waste disposal. DEQ granted the permit modification request in September 1985. The permit number was revised to 199-SR-2.
4. Entergy Arkansas submitted a permit modification application to the DEQ-SWMD to upgrade the Landfill to Arkansas Regulation No. 22 (Regulation No. 22) standards in December 1997. The DEQ issued the permit November 2000.
5. Entergy Arkansas submitted a minor permit modification in April 2011 and the DEQ approved the request in May 2011 to reconfigure the waste disposal areas into five disposal cells, which is the current landfill configuration. However, the DEQ permitted Landfill footprint remains at 153 acres.

2.0 LANDFILL LAYOUT

2.1. Existing Conditions of Landfill

The permitted landfill area consists of approximately 177 acres (153 acres for solid waste disposal) and is located in the southwestern portion of the plant site as shown on Figure 1.

The current layout of the Landfill, as shown on Figure 2, includes a total of 5 disposal cells and has a permitted waste capacity of approximately 4,688,200 cubic yards (cy). Waste Cells 1 through 4 have been constructed and comprise the active disposal area of the Landfill having received CCR materials after October 19, 2015.

Construction of the disposal cells has followed the numerical sequence of the cell numbers with design, construction, operation and maintenance in compliance with the requirements of Arkansas Pollution Control and Ecology Commission (APC&EC) Rule 22. Waste Cells 1 through 4 are existing landfill CCR units and are operated in accordance with requirements of the CCR Rule.

No final cover system has been installed on Waste Cells 1 through 4. Older portions of the landfill that received CCR and were closed prior to the effective date of the Rule (October 2015) have been closed per the permit requirements in effect at the time of closure.

Table 2.1 presents a summary of the existing CCR Unit disposal cells that have been constructed at the White Bluff Landfill.

Table 2.1: Construction Summary of White Bluff Plant Class 3N Landfill

Cell Number	Year Built	Year Closed	Final Cover System	Status
1	2005	N/A	N/A	Open and Active Disposal Area
2	2007	N/A	N/A	Open and Active Disposal Area
3	2010	N/A	N/A	Open and Active Disposal Area
4	2016	N/A	N/A	Open and Active Disposal Area

2.2. Changes Made to Landfill Configuration During Reporting Period

During the reporting period, no changes were made to the landfill configuration. Waste Cells 1 through 4 are open and are actively receiving waste. No new cells were opened, and no existing cells were closed.

The landfill manager that works for the contracted landfill management company, Charah Solutions Inc. (Charah) reported improvements during the year that included repairs to slopes exhibiting rills and gullies.

3.0 WASTE VOLUME CALCULATIONS

The landfill facility has been surveyed annually since 1996. Each year's survey is compared to the previous year to compute the amount of CCR disposed. The current survey is also compared to the permitted top of waste elevations to determine remaining capacity, or airspace. Additionally, the current survey is compared to an estimated "operational" top of waste to determine the remaining operational capacity. The operational top of waste is the maximum disposal elevation that can be achieved within the open cells while maintaining the required 4:1 exterior and 3:1 interior slopes along with a top width sufficient for disposal activities. If additional operational capacity is needed, construction of an adjacent disposal cell will be required.

Disposal rates for the facility are calculated using the average of the disposal rates from the five most recent years. Disposal rates depend upon CCR production at the plant and sales of the ash. These can vary significantly year to year based on the current economic climate, weather, and how much the plant is operational.

During the reporting period, there were four waste cells (Waste Cells 1 through 4) open at the site. These areas are shown on Figure 2. Final permitted contours are illustrated on Figure 3.

Digital terrain modeling techniques were used to determine volumes of ash disposed during the current reporting period. For this report, the active disposal areas of the landfill were surveyed on December 16, 2022. The surface generated from the current survey was compared to the surface model generated from the December 13, 2021 survey, utilizing AutoCAD Civil 3D software, to estimate volume changes that have occurred over the reporting period. Table 3.1 summarizes volume changes for the current reporting period and estimated remaining capacity by waste cell.

Table 3.1: Summary of Waste Volume Calculations

Cell Number	Status	Area (ac)	DEQ Permitted Waste Capacity (cy)	2022 Net Volume Placed (cy)	Total Volume Placed (cy)	Operational Remaining Disposal Capacity (cy) [1]	Operational Remaining Life (years)
Cell 1	Active	6.0	307,500	8,900	185,000	122,500	1.7
Cell 2	Active	9.0	712,100	1,400	520,600	191,500	2.7
Cell 3	Active	9.4	557,200	11,750	349,200	208,000	3.0
Cell 4	Active	6.5	517,100	54,750	322,040	195,060	2.8
Totals		**30.9**	**2,093,900**	**76,800**	**1,376,840**	**717,060**	**10.2**

Note: [1] The operational remaining disposal capacity was calculated by comparing the December 16, 2022 survey to the operational top of waste grading, which includes an interim slope on the south side of Cell 2 and Cell 4. The operational waste grade surface was created by lowering the permitted final cover surface by 2.5' (clay cap or geomembrane cap option) combined with the interim south slope.

Based upon the most recent digital terrain model, the net volume of material placed in Waste Cells 1 through 4 during the reporting period was calculated to be approximately 76,800 cubic yards (cy). The 5-year average disposal rate, including this reporting period, is approximately 70,250 cubic yards per year, in-place. At this rate, the calculated available airspace, 717,060 cubic yards, provides approximately 10.2 years of remaining operational capacity. The remaining landfill capacity is affected by the market for ash material and may be shorter or longer depending on market conditions.

4.0 ASSESSMENT OF LANDFILL FACILITY

This section of the report provides a summary of the inspection of the Entergy Arkansas, LLC White Bluff Landfill facility that was conducted on December 6, 2021. Charah was the landfill's operations contractor during 2021. The assessment included an interview with site personnel, review of inspection reports of the facility, review of documents pertaining to the operation and compliance of the landfill, and an on-site inspection of the landfill facility. Photographs of the site inspection are included in Appendix B.

4.1. General Operations

The operations contractor uses Waste Cell 1 for production of a product named "flex-base". CCR materials including bottom-ash and fly-ash are stockpiled, blended to make the "flex-base", and loaded to trucks in this area. Active disposal was conducted primarily in Waste Cells 2, 3, and 4.

The side-slopes of the landfill are generally at the required 4:1 external and 3:1 interior slope. The slopes in the larger Waste Cells 2 and 3 are set back from the landfill perimeter berm. This allows stormwater runoff from the slopes to be collected and routed to the cell discharge points. Waste Cell 3 discharges leachate to Waste Cell 4, which contains a leachate collection system.

No tension cracks, seeps, or other features that indicate a potential slope failure were observed during the site inspection. In addition, no active seeps were noted.

The general operations of the landfill facility are being performed in a safe manner and the overall maintenance of the facility is in good condition.

4.2. Landfill Cover System

As noted, no final cover system has been installed on Waste Cells 1 through 4. However, and as previously discussed, older portions of the landfill that received CCR and were closed prior to the effective date of the Rule (October 2015) have been closed per the permit requirements in effect at the time of closure. Figure 3 presents contours for the currently permitted cover system for the permitted active cells.

All four active cells remain open. Interim cover soil has not been placed on any of the existing side slopes. A large quantity of soil has been stockpiled near the landfill during previous construction projects for future interim cover placement.

4.3. Leachate Collection System

Waste Cells 1 through 3 do not have leachate collection systems. Waste Cells 1 and 2 are graded to drain to the southeast corner of Cell 2 where leachate discharges to an adjacent stormwater channel, as required by the 2000 permit under which they were constructed.

Waste Cell 4 was designed with a leachate collection and removal system. Additionally, new collection lines were installed along the west and south sides of the existing Waste Cell 3. These new collection lines were connected to the new Waste Cell 4 leachate collection system, which was designed to handle leachate from both cells. The automated pumping system removes the Waste Cell 3 and Waste Cell 4 leachate from a sump in the southern corner of Waste Cell 4. The leachate is pumped via a dual-contained underground pipeline and discharged to the plant's Surge Pond. Weekly inspections during the reporting period noted the automated leachate pump was not working and that a temporary pump has been added to keep leachate levels in

compliance. During the site inspection the temporary pump was working and keeping the leachate from leaving Waste Cell 4.

4.4. Stormwater Control System

Stormwater at the landfill site flows south and then east to the plant Surge Pond. To prevent run-on, a lined stormwater channel was constructed along the north side of the landfill, routing storm water east or west around the landfill. Additionally, clay perimeter berms prevent both run-on and run-off, except at designated discharge points as described in Section 4.3.

The White Bluff plant is permitted to discharge storm water to the Arkansas River under NPDES Permit No. AR0036331, as issued by the DEQ effective March 1, 2020. Ash disposal runoff is listed as a potential constituent of discharges from Outfall 002, overflow from the plant Clear Water Holding Pond. Discharges, when they occur, are monitored daily for flow, total suspended solids (TSS), oil and grease (O&G), total iron, total copper and pH. Discharges, if they occur, are also monitored quarterly for E-coli and require acute WET testing.

4.5. Facility Roads

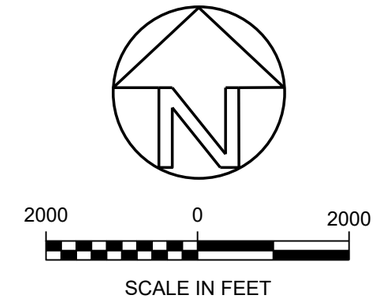
The facility roads were well maintained at the time of the inspection. The disposal access road to the active cells is paved, and it was in excellent condition at the time of the inspection. The perimeter access road has an all-weather surface coarse and was in good condition.

4.6. Fugitive Dust Control

The facility is operated as outlined by the CCR Fugitive Dust Control Plan, prepared in October 2015.

The landfill was actively disposing of CCR during the December site visit. Fly ash is transported to the landfill and dumped using bottom-dump trailers to minimize fugitive dust issues. Bottom ash, in a moist condition, is hauled to the landfill using dump trucks. Economizer ash is loaded to covered dump truck prior to transfer to the landfill. A windsock is used to visually gauge wind direction and intensity. Water is applied, when necessary, for dust suppression on roads and the landfill using a water truck. The landfill access roads have enforced posted speed limit of 25 mph. Within the landfill boundary, a 5 mph speed limit is enforced.

APPENDIX A
FIGURES



NOTES:

ORTHO IMAGERY OBTAINED FROM GOOGLE EARTH, DATED MARCH 16, 2022.

REV	DATE	DRA. BY	APP. BY	DESCRIPTION
0	-	-	-	-

PREPARED FOR: entergy

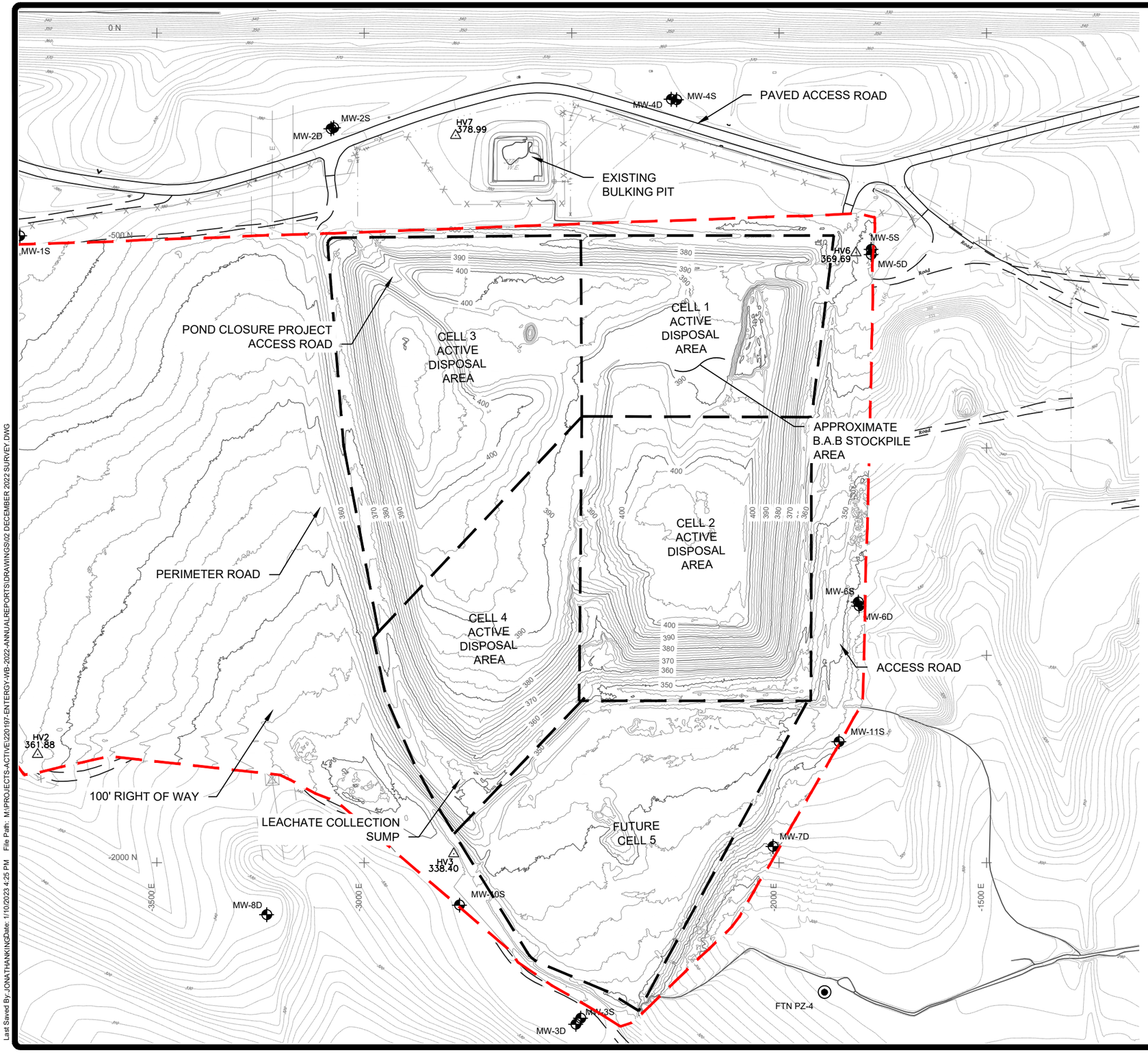
PREPARED BY: PROMUS ENGINEERING www.promusengineering.com

SITE LOCATION MAP

ANNUAL ENGINEERING INSPECTION REPORT
WHITE BLUFF
REDFIELD, ARKANSAS

PROJECT NO.: 220197

1



LEGEND

- WASTE BOUNDARY
- 100 — EXISTING CONTOURS
- HV7 378.99 — PERMAMENT SITE BENCHMARK
- -1000 — SITE SPECIFIC GRID MARKER
- MW-1 — GROUNDWATER MONITORING WELL
- LIMIT OF DECEMBER 16, 2022 SURVEY

NOTES:

EXISTING CONTOURS SHOWN ON THIS DRAWING, WITHIN THE LIMIT OF SURVEY, REPRESENT TOPOGRAPHIC SURVEY DATA COLLECTED BY T. BAKER SMITH ON DECEMBER 16, 2022. EXISTING CONTOURS SHOWN ON THIS DRAWING, BEYOND LIMITS OF DECEMBER 2022 SURVEY, REPRESENT PREVIOUS YEARS SURVEYS PROVIDED BY CLIENT AND ARE FOR VISUAL PURPOSES ONLY.

REV	DATE	DRA. BY	APP. BY	DESCRIPTION
0	-	-	-	-

PREPARED FOR: entergy

PREPARED BY: PROMUS ENGINEERING
www.promusengineering.com

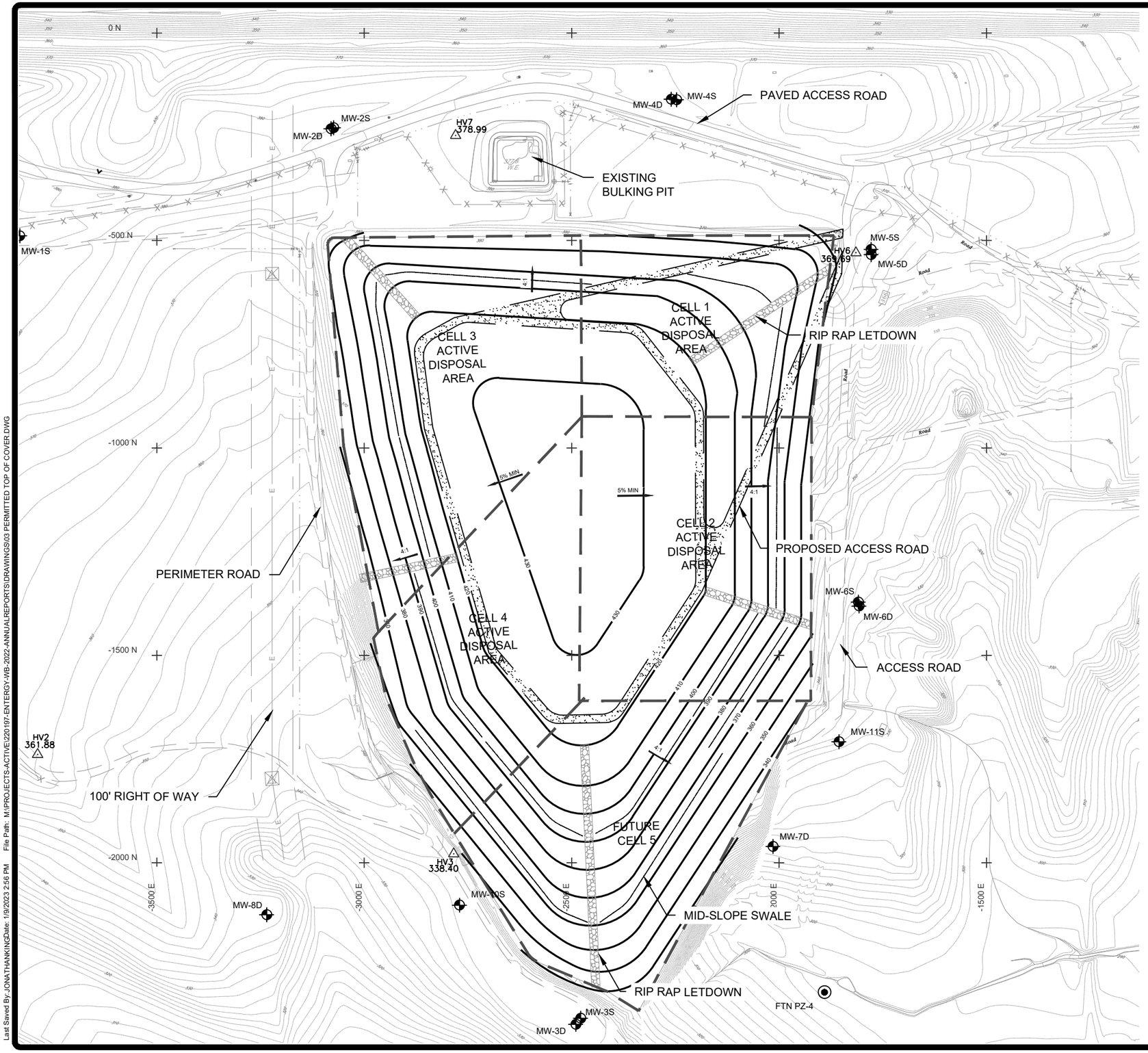
DECEMBER 16, 2022 SURVEY

ANNUAL ENGINEERING
INSPECTION REPORT
WHITE BLUFF
REDFIELD, ARKANSAS

PROJECT NO.:
220197

2

Last Saved By: JONATHANKING Date: 1/10/2023 4:25 PM File Path: M:\PROJECTS-ACTIVE\220197-ENTERGY-WB-2022-ANNUALREPORTS\DRAWINGS\02 DECEMBER 2022 SURVEY.DWG



250 0 250

SCALE IN FEET

LEGEND

- WASTE BOUNDARY
- 100 — EXISTING CONTOURS
- 100 — PERMITTED FINAL COVER CONTOURS
- HV7 378.99 — PERMAMENT SITE BENCHMARK
- -1000 — SITE SPECIFIC GRID MARKER
- MW-1 — GROUNDWATER MONITORING WELL

NOTES:

PROPOSED GRADING SHOWN ON THIS DRAWING REPRESENTS PERMITTED FINAL COVER GRADES DESIGNED BY FTN. EXISTING FEATURES AND BOUNDARIES PROVIDED BY CLIENT.

REV	DATE	DRA. BY	APP. BY	DESCRIPTION
0	-	-	-	-

PREPARED FOR: entergy

PREPARED BY: PROMUS ENGINEERING www.promusengineering.com

PERMITTED FINAL COVER

ANNUAL ENGINEERING INSPECTION REPORT
WHITE BLUFF
REDFIELD, ARKANSAS

PROJECT NO.: 220197

3

Last Saved By: JONATHANKING Date: 1/9/2023 2:56 PM File Path: M:\PROJECTS-ACTIVE\220197-ENTERGY-WB-2022-ANNUAL REPORTS\DRAWINGS\03 PERMITTED TOP OF COVER.DWG

APPENDIX B

PHOTOS OF ANNUAL ENGINEERING INSPECTION

Photo No. 1
Looking west along the north slope of Cell 1 and Cell 3.

Photo No. 2
Access road on the northwest corner of the Landfill at Cell 3.

Photo No. 3
Looking south at the west slope of Cell 1 and Cell 2.

Photo No. 4
Looking north at the south slope of Cell 2.

Photo No. 5
Looking northwest at southern slope of Cell 4.

Photo No. 6
Looking northeast at the leachate collection sump at Cell 4. Charah was using a 2-inch floating pump to dewater the sump area. The discharge hose to the floating pump was connected to the Cell 4 sump riser.

Photo No. 7
Looking northeast at the west slope of Cell 3.

Photo No. 8
Looking north at active working area on top deck of Landfill near Cell 4.

Photo No. 9
Looking west at active working area in Cell 3 and Cell 4.