HALEY ALDRICH

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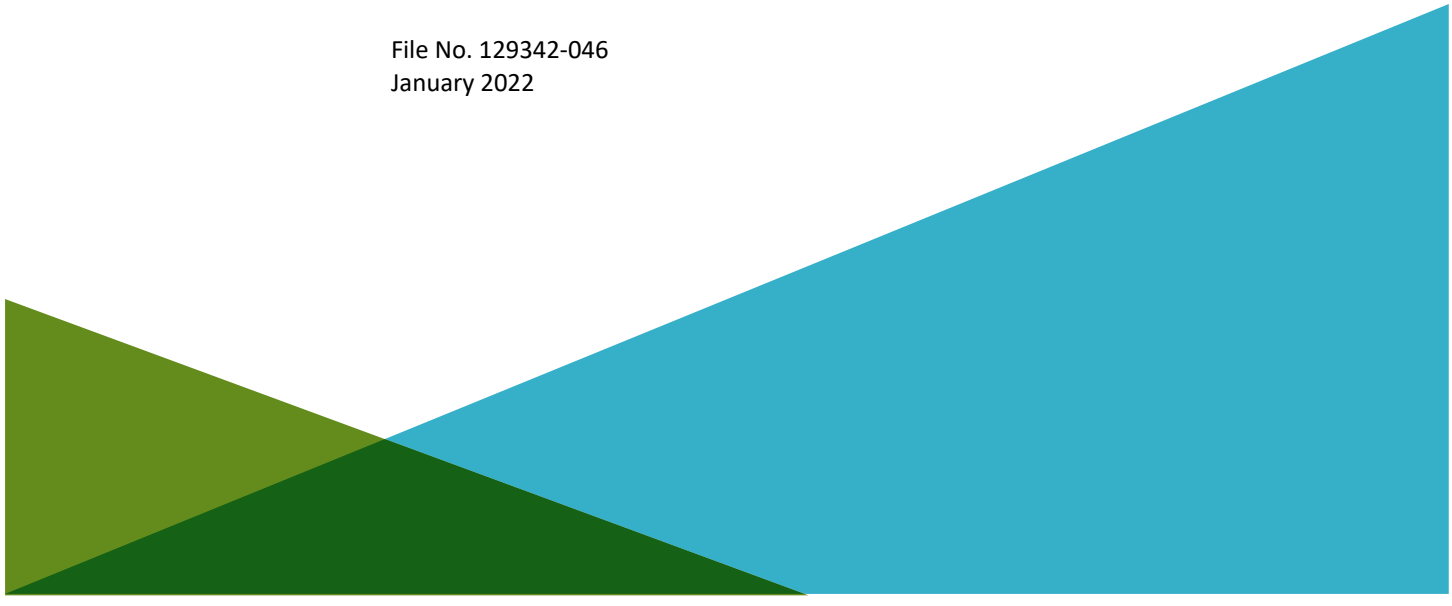
REPORT ON

ANNUAL CCR LANDFILL PE INSPECTION
UTILITY WASTE LANDFILL
NEW MADRID POWER PLANT
NEW MADRID, MISSOURI

by
Haley & Aldrich, Inc.
Cleveland, Ohio

for
Associated Electric Cooperative, Inc.
New Madrid, Missouri

File No. 129342-046
January 2022



Haley & Aldrich, Inc.
6500 Rockside Road
Suite 200
Cleveland, OH 44131-1463
216.739.0555

21 January 2022
File No. 129342-046

Associated Electric Cooperative, Inc.
New Madrid Power Plant
New Madrid, Missouri

Attention: Jenny Jones
Senior Environmental Analyst

Subject: Annual CCR Landfill PE Inspection
Utility Waste Landfill
New Madrid Power Plant
New Madrid, MO

Mrs. Jones:

Enclosed please find our report on the Periodic Structural Stability Assessment for the Associated Electric Cooperative, Inc. (AECI) coal combustion residuals (CCR) landfill referred to as the Utility Waste Landfill located at the New Madrid Power Plant in New Madrid, Missouri.

This work was performed by Haley & Aldrich, Inc. (Haley & Aldrich) on behalf of AECI in accordance with the United States Environmental Protection Agency's CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations Title 40 §257.84.

The scope of our work was to complete 1) a review of available information on the landfill, 2) a visual inspection of the landfill, 3) and prepare the enclosed report. Overall, the landfill appeared to be in good condition at the time of our inspection. We did observe ponded water at the perimeter berms that is recommended for continued monitoring and erosion along the active filling area sideslopes that is recommended for repair and continued monitoring.

Thank you for inviting us to complete this inspection and please feel free to contact us if you wish to discuss the contents of the report.

Sincerely yours,
HALEY & ALDRICH, INC.

Steven F. Putrich, P.E.
Project Principal

Enclosures

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HALEY ALDRICH

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1. Description of Project

1.1 GENERAL

1.1.1 Authority

Haley & Aldrich, Inc. (Haley & Aldrich) has been contracted by Associated Electric Cooperative, Inc. (AECI) to perform an Annual Coal Combustion Residuals (CCR) Landfill Inspection for Phase I (Cell 1) and Phase III (Cell 2) of the Utility Waste Landfill (UWL) located at the New Madrid Power Plant in New Madrid, Missouri. This work was completed in accordance with the United States Environmental Protection Agency's CCR Rule effective 19 October 2015 including subsequent revisions, specifically Code of Federal Regulations (40 CFR) §257.84.

1.1.2 Purpose of Work

The purpose of this inspection was to visually observe and evaluate the present condition of the landfill to confirm that the design, construction, operation, and maintenance of the CCR landfill is consistent with recognized and generally accepted good engineering standards. The visual inspection is intended to identify signs of distress or malfunction of the landfill, should they exist. This report addresses those items observed that are disrupting or have the potential to disrupt the operation and safety of the landfill.

The inspection was divided into three parts: 1) obtain and review readily available reports, investigations, and data pertaining to the landfill; 2) perform a visual inspection of the site; 3) prepare this report presenting our observations and recommendations for any repairs or remedial actions.

1.2 DESCRIPTION OF PROJECT

1.2.1 Location

The UWL is located approximately 1.7 miles southwest of the New Madrid Power Plant, in New Madrid, Missouri. The landfill is accessed from the plant site along a gravel access/haul road. Access to the plant and landfill is restricted by posted signage and fences and gates at the plant.

1.2.2 Owner/Operator

The landfill is owned, operated, and maintained by AECI.

	Landfill Owner / Operator
Name Mailing Address Town	AECI New Madrid Power Plant 41 St. Jude Industrial Park Marston, MO 63869

1.2.3 Purpose of the Landfill

The New Madrid Power Plant is a two-unit coal-fired power plant, with a generating capacity of approximately 1,200 Megawatts. As part of plant operations, the landfill was opened for the purpose of disposing CCRs, including fly ash, boiler slag, coal waste, excavated ponded CCR from surface impoundments, minor amounts of miscellaneous wastes, and other related wastes/byproducts produced at the New Madrid Power Plant.

1.2.4 Description of the Landfill

The UWL has an approximate total net storage airspace of 22.1 million cubic yards per the Missouri Department of Natural Resources (MDNR) approved Landfill Construction Permit Application (CPA), with an approximate expected total footprint of 250 acres. The total design capacity and footprint will be comprised of a permitted ten phases at 25 acres each. At the time of the inspection, only Phase I (Cell 1) and Phase III (Cell 2) of the landfill were operational. Phase I has nearly reached design top of waste grades and Phase III is currently receiving waste.

Phase I and Phase III of the landfill were constructed with a perimeter berm around each side. The perimeter berm, which also serves as an access road, is roughly 6 feet in height when measured to the existing topography outside of the landfill, and varied in height from 6 feet to 10 feet when measured to the interior grades of the landfill cell upon construction. The Phase I and Phase III landfill base liner system consists of a 24-inch compacted soil liner, a 60-mil textured high-density polyethylene (HDPE) geomembrane liner, a geocomposite drainage layer, and a protective soil layer (24-inches on cell bottom and 12-inches on cell side slopes). The leachate collection system is comprised 6-inch HDPE leachate collection pipes that drain to a 10-inch HDPE leachate header pipe. The leachate header pipe drains by gravity to a leachate collection manhole, located outside of the landfill, where leachate is then pumped by a submersible pump to the leachate pond. The leachate pond is equipped with a load-out structure and pump. Leachate is pumped into trucks and hauled to the landfill where it is sprayed for use as dust control.

At the time of the inspection, construction of the landfill leachate expansion was underway as construction equipment was onsite. Earthwork and excavation had not yet begun and only the original leachate pond was operational.

Stormwater runoff from the landfill is prevented by the interior perimeter swale and perimeter berms. Stormwater is collected in ditches that drain from a high point in the northeast corner of Phase I towards the low point in the southwest corner of Phase III. Stormwater is collected in the southwest corner of Phase III, in accordance with the intended design, and then passes through the landfill berm and into a ditch via a 24-inch HDPE pipe. The ditch drains to the east and empties into the southern sedimentation pond via a 24-inch HDPE pipe. The southern sedimentation pond is hydraulically connected to the northern sedimentation pond via three 24-in. diameter equalization pipes. The sedimentation pond is pumped periodically to Pond 003 at the power plant and subsequently evaporated or discharged through the existing National Pollutant Discharge Elimination System permitted outfall, consistent with the CPA.

Trucks haul CCR from the plant to the landfill for disposal via a dedicated haul road. The CCR is disposed on the top of the landfill where it is spread in 4 to 6-inch-thick lifts the following day by a Global Positioning System equipped dozer. Compaction is achieved by multiple passes of the dozer as the CCR is spread and shaped for positive drainage.

1.2.5 Landfill Size

The landfill storage volume at the time of the inspection is estimated to be approximately 1,328,000 cubic yards. This estimate is based on a volumetric comparison of the top of protective cover grades (from Phase I and Phase III Construction) with topographic survey data from November 2019 (1,177,000 cubic yards) plus disposal volumes (November 2019 to July 2021) of 151,000 cubic yards. Disposal data was provided by AECI. In-place compacted CCR's were assumed to have a density of 65 pounds per cubic foot based on laboratory testing.

1.3 PERTINENT ENGINEERING DATA

1.3.1 Design and Construction Records

Phase I of the Landfill was constructed in 2007 and began operations in 2008 after the MDNR Operating Permit was granted. Phase III of the landfill was constructed in 2016. The CPA, Phase I and Phase III construction drawings, and Phase I Operating Permit Application, as well as the Operating Permit issued by MDNR Solid Waste Management Program, were provided by AECI for review as part of this inspection.

1.3.2 Operating Records

Other than the 7-day inspection records being kept by AECI personnel there were no other landfill operational records for review at time of inspection.

2. Inspection

2.1 VISUAL INSPECTION

On 20 July 2021, Haley & Aldrich completed a visual inspection of the landfill. The following paragraphs describe the conditions observed during the inspection. In addition, refer to the photographs and checklist forms included in Appendices A, and B, respectively for additional comments.

2.1.1 General Findings

2.1.1.1 Landfill Perimeter Berms

The perimeter berms of the landfill were inspected, and no significant erosion, uncontrolled vegetation, or other signs of distress were observed on the inner or outer side slopes. Evidence of irregular slope movement, sloughing, slides, sinkholes, or settlement that would indicate instability in the perimeter berms was not observed during this inspection. In the two days prior to the site inspection, the site received over 3 inches of precipitation. The preceding rainfall events were indicated by the ponded water at the perimeter berms that was observed during the inspection.

2.1.1.2 Landfill Top

At the time of the inspection, no active CCR placement was taking place. CCRs had been disposed from trucks on the top of Phase I of the landfill to the approximate top of design grades. CCR placement in Phase III of the landfill has not yet reached an elevation matching the top of the perimeter berms (AECI is maintaining an interior swale to manage stormwater runoff within the cell). CCRs are placed in a way to promote positive drainage off the top of the landfill. In general, we did not observe standing water, settlement, significant erosion, or other signs of distress on the top of the landfill.

2.1.1.3 Landfill Side Slopes

Small erosion rills, less than 6-inches deep, and several erosion rills between 6 and 12-inches deep were observed in several locations on the landfill side slopes where intermediate cover had not been placed. No erosion was noted where there was intermediate soil cover, although the thick vegetation made visual inspection difficult. Erosion rills less than 6-inches deep are not an immediate concern but should be monitored regularly by AECI personnel. When erosion rills exceed 12-inches deep, AECI should consider repairing the area and make modifications as needed to prevent future erosion. Based on discussion with plant personnel, the side slopes are maintained and fine graded with a dozer periodically to repair erosion rills. Typical maintenance is conducted on the side slopes once CCR's in the perimeter ditches and along the side slopes are dry enough to perform the grading. At the time of this inspection, intermediate soil cover had been placed to the top of the first bench.

2.1.1.4 Sedimentation Ponds

The sedimentation ponds appeared to be operating as intended during the inspection. No water was actively being pumped. No significant erosion, uncontrolled vegetation, or other signs of distress were observed on the inner or outer side slopes of the sedimentation pond.

2.1.1.5 Leachate Collection System

The leachate collection pump system receives routine system maintenance as needed. Based on review of the 7-day inspections, the leachate collection system is operating as intended.

2.1.1.6 Leachate Collection Pond

No significant erosion, uncontrolled vegetation, or other signs of distress were observed at the leachate collection pond. The level in the pond was below the posted acceptable operating level. Based on discussion with AECI personnel, the leachate pond is periodically pumped into a haul truck and sprayed on the landfill for dust control. Plant personnel have not encountered problems keeping the water level in the leachate pond controlled, even during rainy periods. Plant personnel report that beyond normal maintenance of the leachate pump system, no operational issues have been encountered.

As mentioned previously, an expansion to the leachate pond is currently under construction to facilitate needs caused by the opening of subsequent landfill phases (cells).

2.2 CARETAKER INTERVIEW

We spoke with Mr. Dennis Cox and Mr. Kevin Farmer of AECI concerning the operations and maintenance of the landfill. Information provided by AECI personnel has been incorporated into this report.

2.3 OPERATIONS AND MAINTENANCE

The landfill is currently operated and maintained by AECI personnel. Operation of the landfill includes CCR hauling and placement, maintenance, and weekly inspections. Weekly inspections are performed by AECI personnel.

The AECI qualified personnel monitor and inspect the landfill every 7 days and keep inspection records in the operating record as required by 40 CFR Part 257. These 7-day inspections generally include:

- Observation of landfill for signs of instability;
- Observation of stormwater management system;
- Observation of leachate collection system and leachate collection pond;
- Evidence of run-off of CCR's

Haley & Aldrich reviewed the 7-day inspection records as part of the annual inspection.

2.4 STRUCTURAL STABILITY

The landfill was visually observed to be stable with no sloughing, slides or evidence of settlement observed. Some minor erosion rills were observed at several locations along the upper side slopes of the landfill (where intermediate cover had not been placed) and these should be monitored in the future and repaired if they continue to erode. Evidence of irregular slope movement, sloughing, slides, sinkholes, or settlement that would indicate instability in the landfill was not observed during this inspection.

3. Assessments and Recommendations

3.1 ASSESSMENTS

Based on our visual observations, no items were observed to have the potential to create structural weakness which could affect the operation and safety of the landfill, and the operation and maintenance of the CCR unit is consistent with recognized and generally accepted good engineering standards.

3.2 RECOMMENDATIONS

We recommend the following items be monitored as part of on-going CCR unit operation:

- Pond of water in perimeter berms should be monitored to ensure that swales and associated pipes are operating in accordance with the design.
- Consistent with current AECI maintenance and operation procedures, erosion rills should be monitored along landfill side slopes and maintenance should be conducted to repair areas where erosion rills greater than 12 inches become apparent. We recommend that AECI evaluate causes of erosion (e.g. stormwater flow paths) and determine if measures or re-direction of that flow path are appropriate to limit the erosion development.
- Grassy vegetation on the landfill side slopes should be maintained at a height that facilitates visual inspections. Any and all woody vegetation from the landfill side slopes should be removed.

4. Certification

The assessment of the general condition of the landfill is based upon available data and visual observation. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of this report.

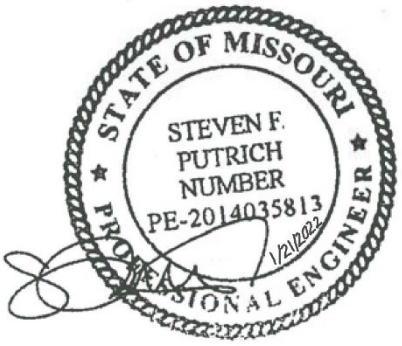
In reviewing this report, it should be realized that the described condition of the landfill is based on observations of field conditions at the time of inspection, along with other data available to the inspection team.

It is important to note that the condition of a landfill depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the landfill will continue to represent the condition of the landfill at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions will be detected.

Signed: _____
Consulting Engineer

Print Name: Steven F. Putrich
Missouri License No.: 2014035813
Title: Project Principal
Company: Haley & Aldrich, Inc.

Professional Engineer's Seal and date:



Steven F. Putrich
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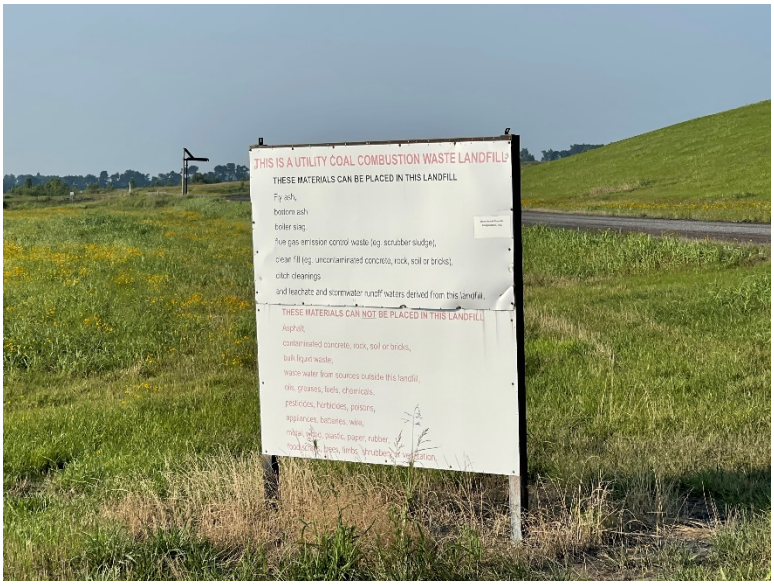
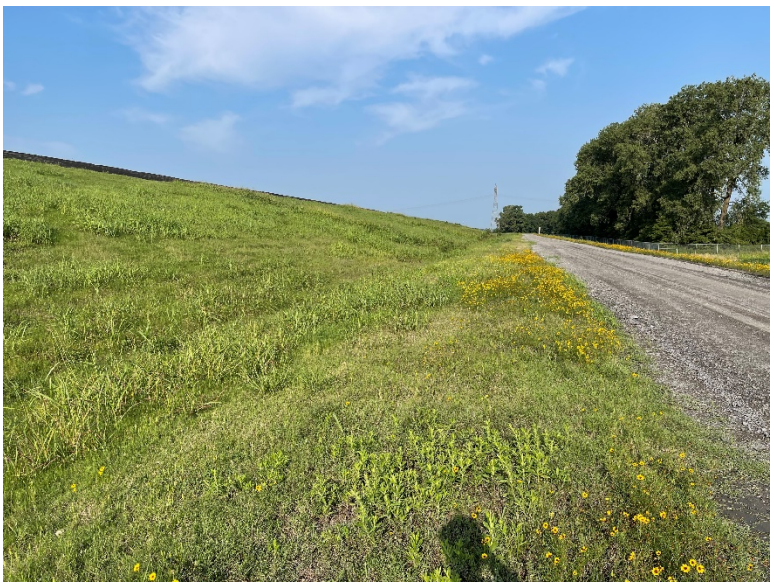
HALEY ALDRICH

APPENDIX A

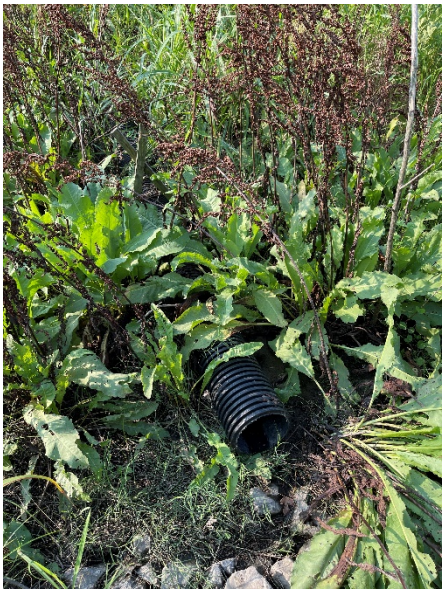
Photographs



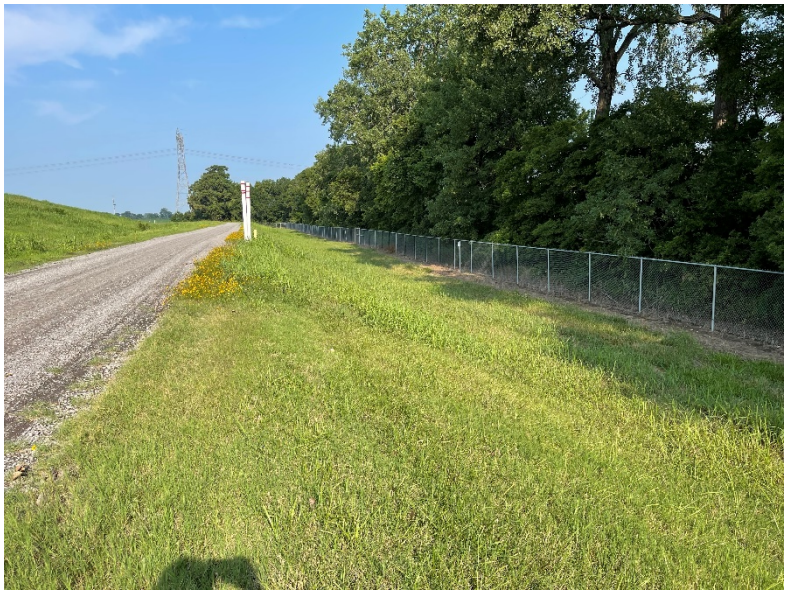
Photograph No. 1
UWL
Sign posted at haul road entrance to landfill



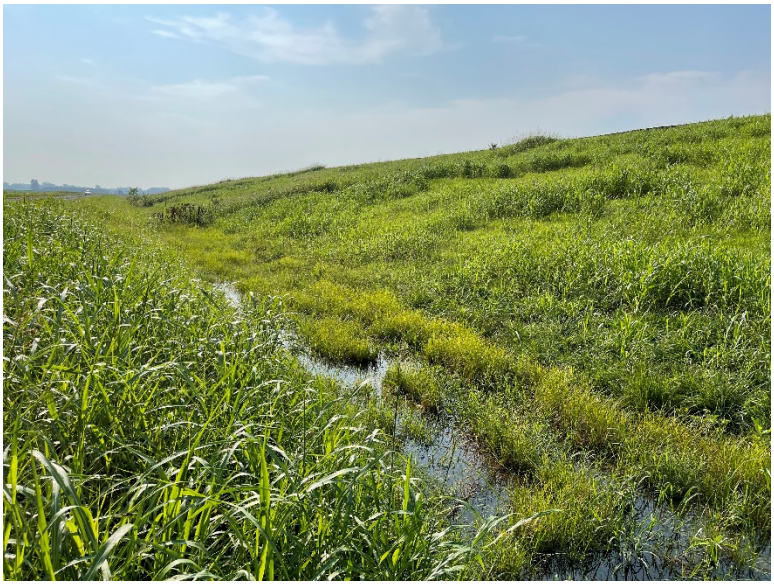
Photograph No. 2
UWL
Phase I northern landfill face and perimeter berm/road



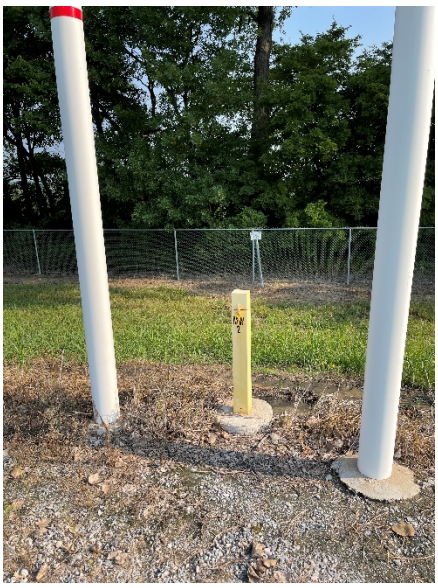
Photograph No. 3
UWL
Letdown pipe surrounded by vegetation on Phase I northern face



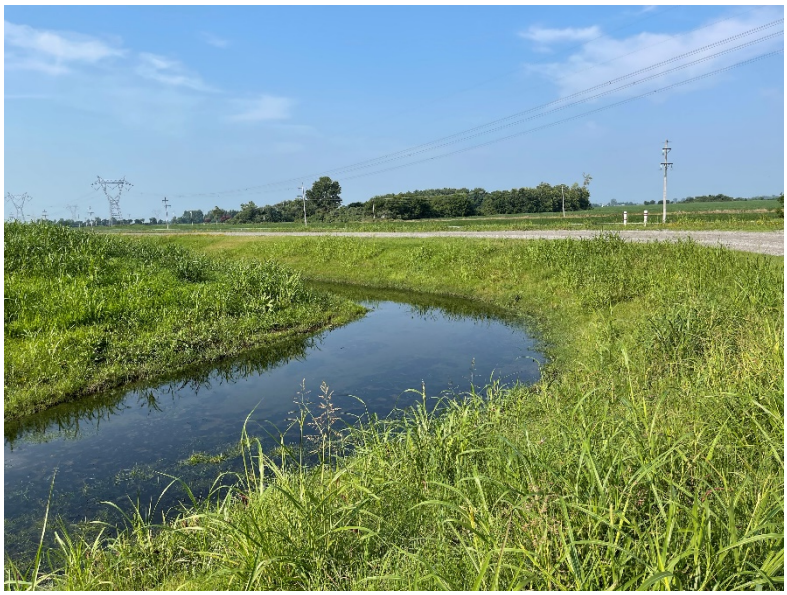
Photograph No. 4
UWL
Downstream slope of Phase I northern perimeter berm



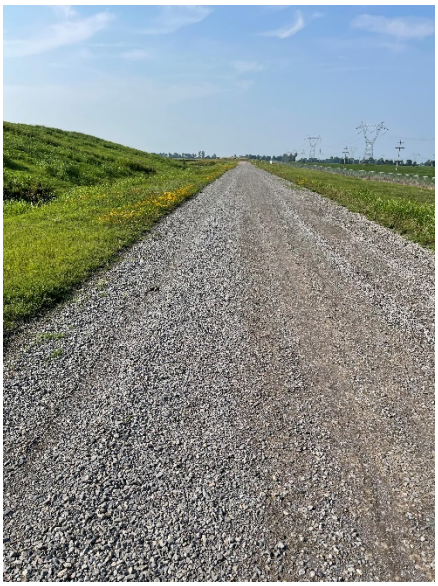
Photograph No. 5
UWL
Standing water in ditch along upstream slope of Phase I northern perimeter berm



Photograph No. 6
UWL
Monitoring well MW-2 at Phase I northern perimeter



Photograph No. 7
UWL
Standing water in ditch along upstream slope of Phase I northwestern perimeter berm



Photograph No. 8
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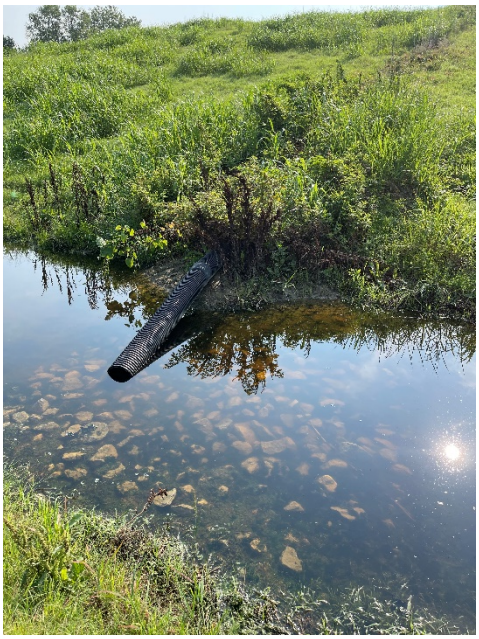
Phase I western perimeter berm/road



Photograph No. 9
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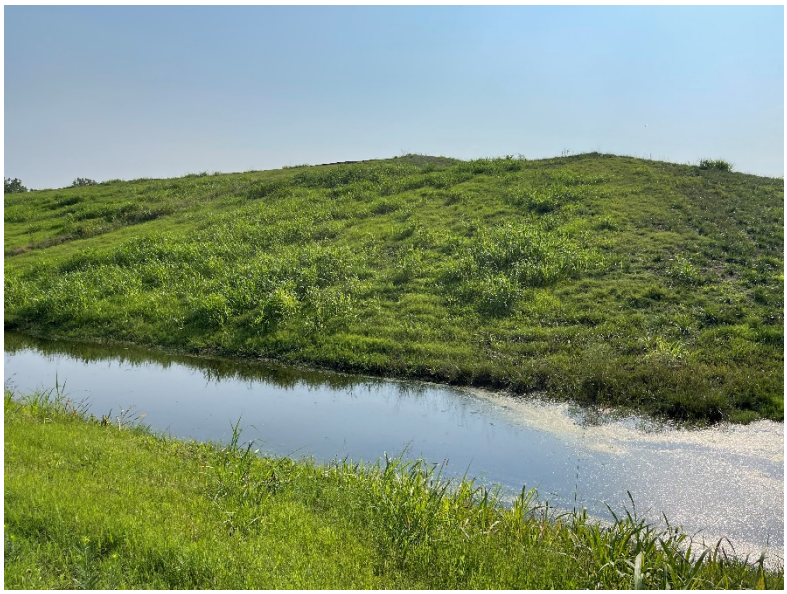
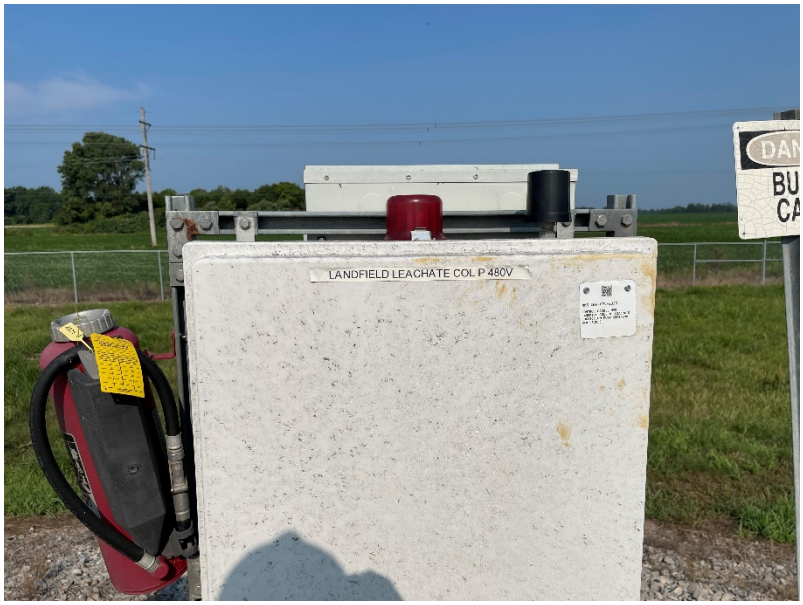
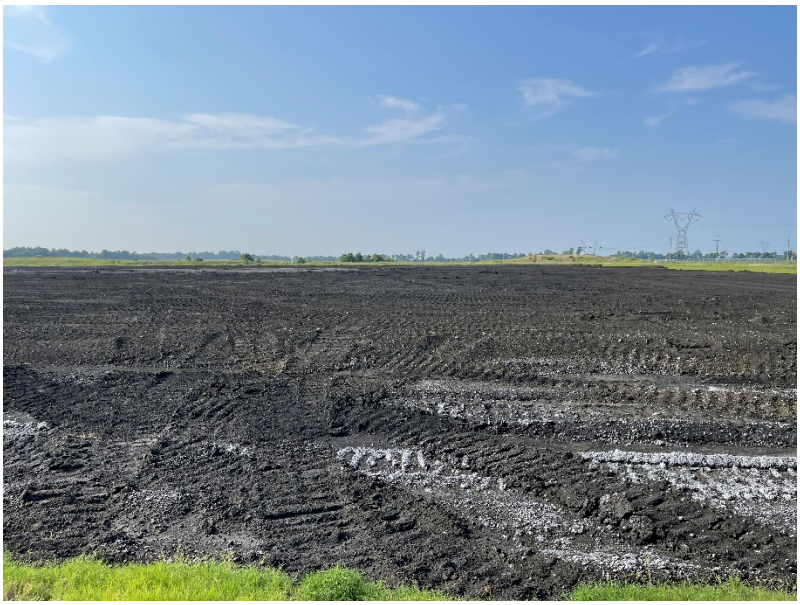
Letdown pipe and standing water in ditch at western perimeter of Phase I



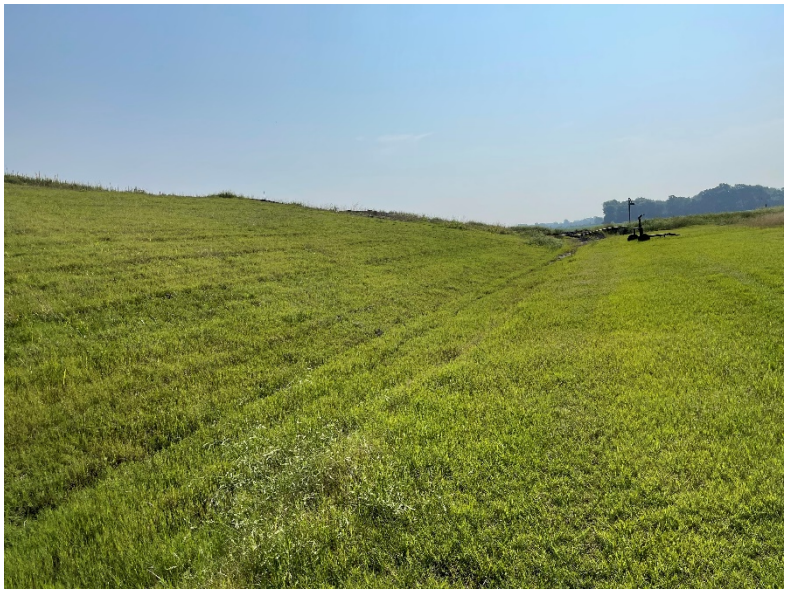
Photograph No. 10
UWL
Standing water in ditch at southwestern perimeter of Phase I



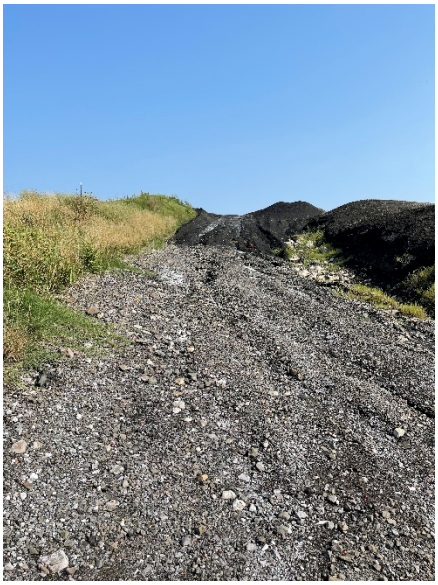
Photograph No. 11
UWL
Electrical control box related to landfill leachate pump



Photograph No. 12
UWL
Open landfill cell - Phase III from Phase I southern berm



Photograph No. 13
UWL
Phase I southern face and perimeter berm



Photograph No. 14
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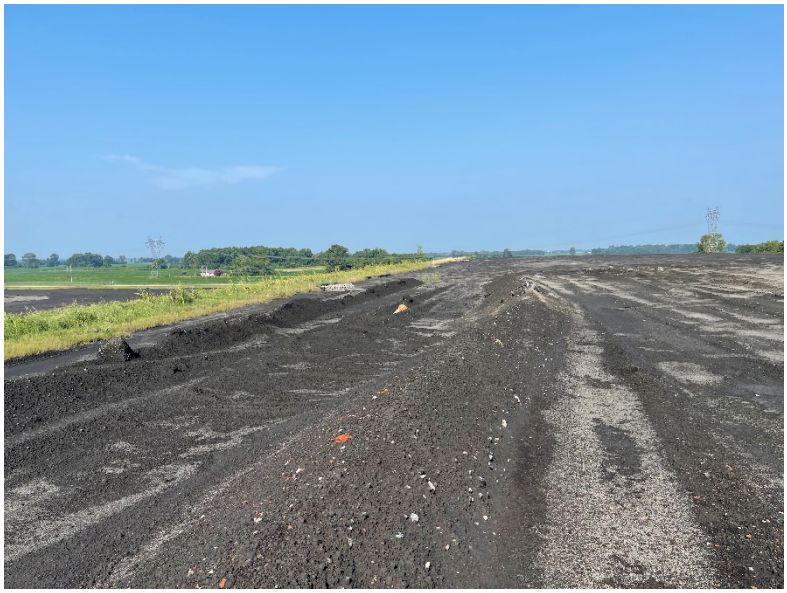
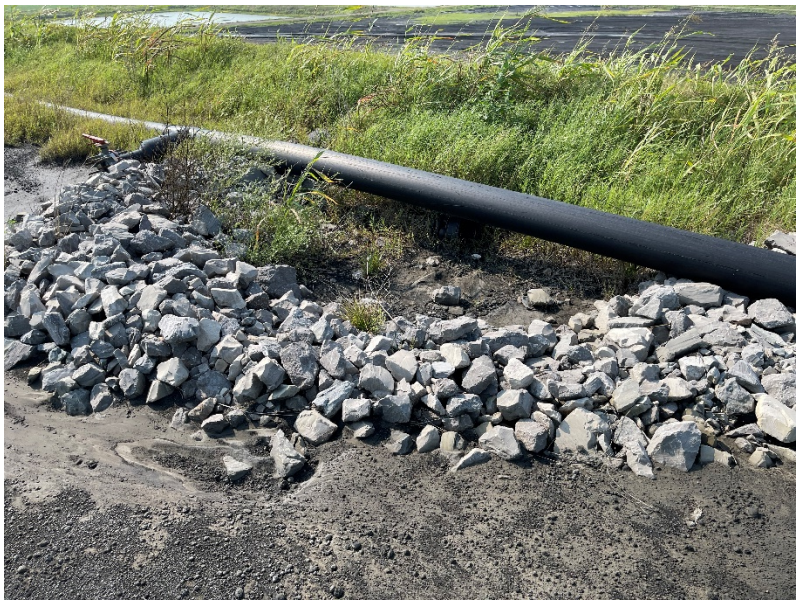
Phase I haul road to top of landfill



Photograph No. 15
UWL
Phase I top of landfill



Photograph No. 16
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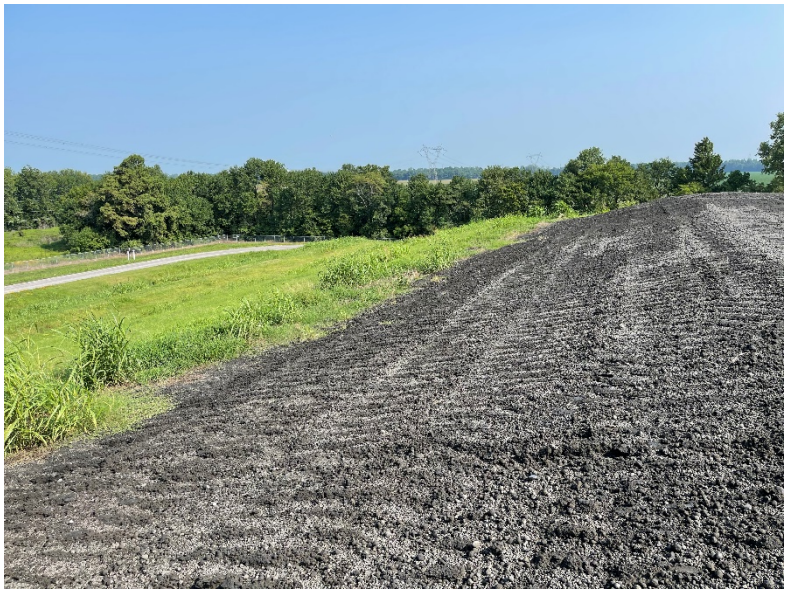
Catch basin and associated stormwater pipe at top of Phase I



Photograph No. 17
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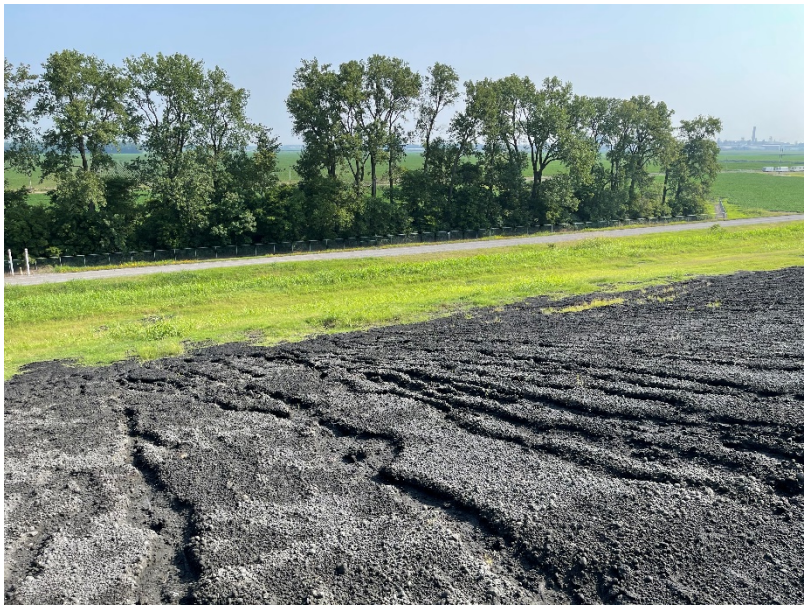
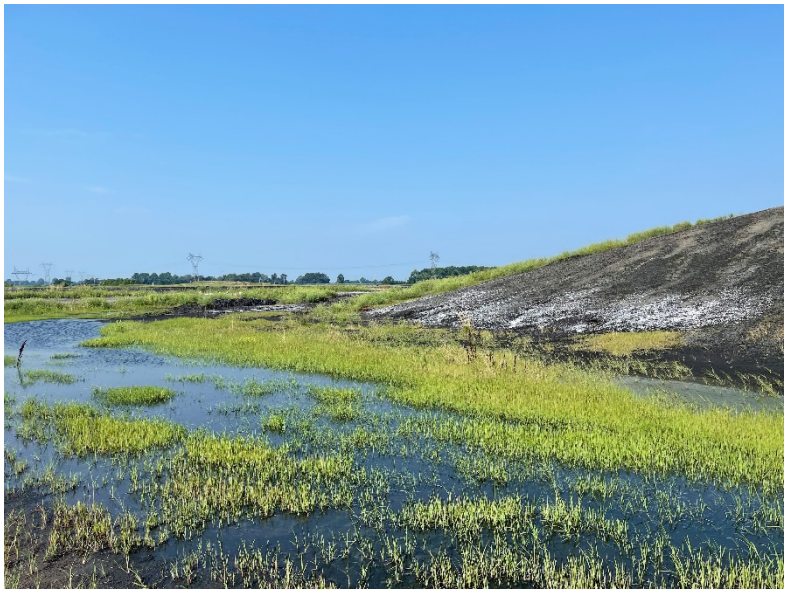
Exposed CCR at top of western face of Phase I



Photograph No. 18
UWL
Erosion in exposed CCR on top of northern face of Phase I



Photograph No. 19
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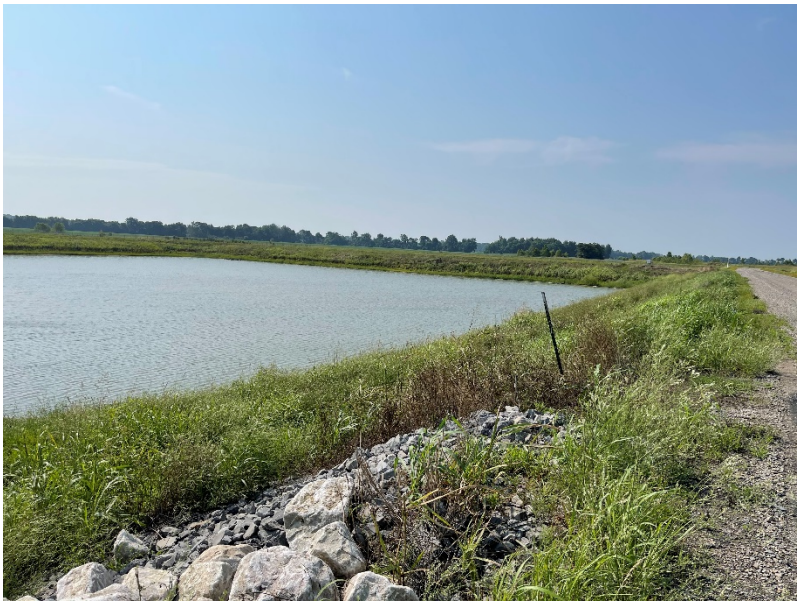
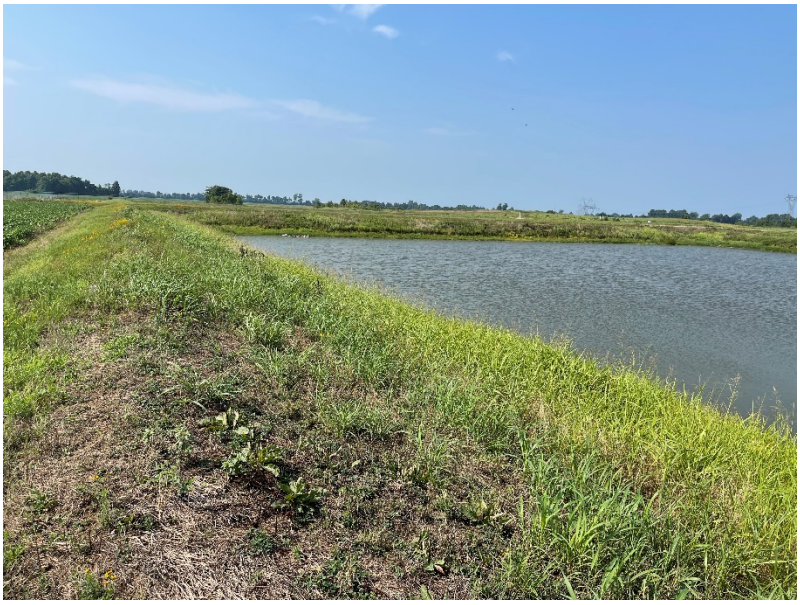
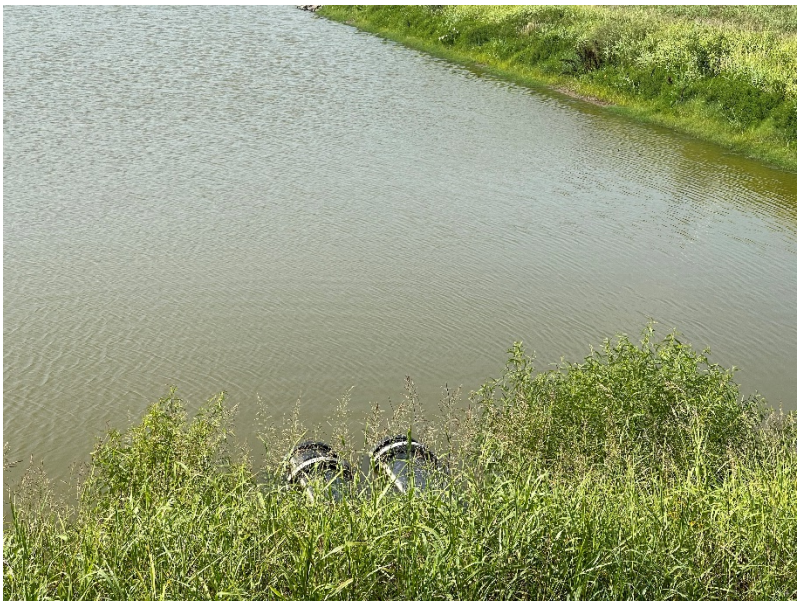
Standing water at southeastern corner of Phase I



Photograph No. 20
UWL
Northern sedimentation pond western side slope



Photograph No. 21
UWL
Northern sedimentation pond eastern side slope



Photograph No. 22
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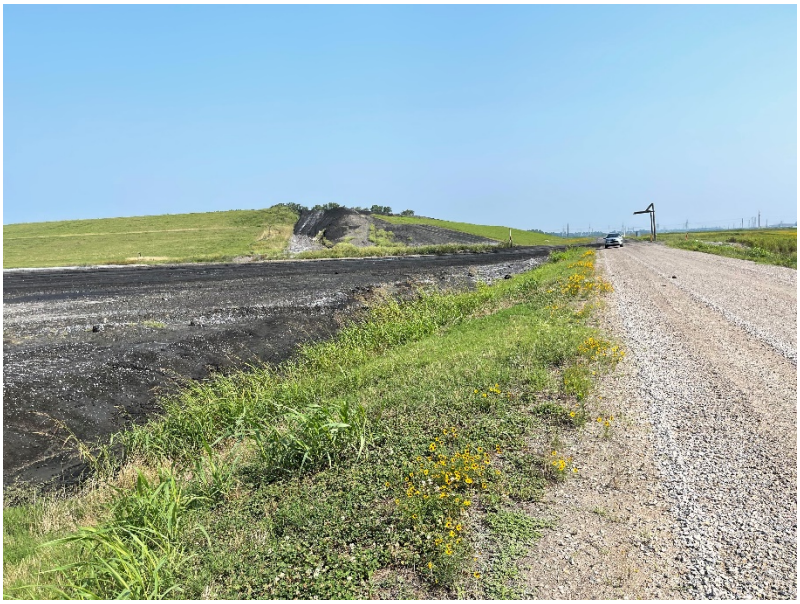
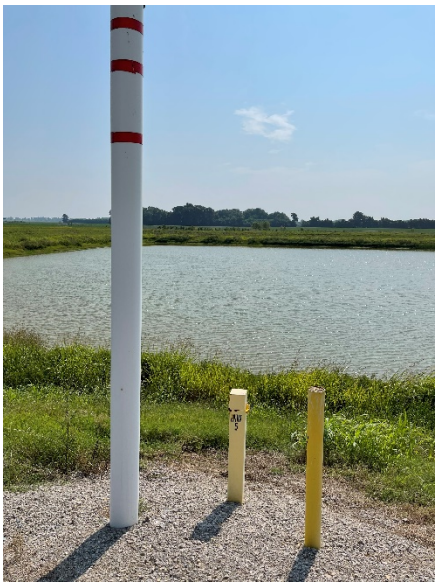
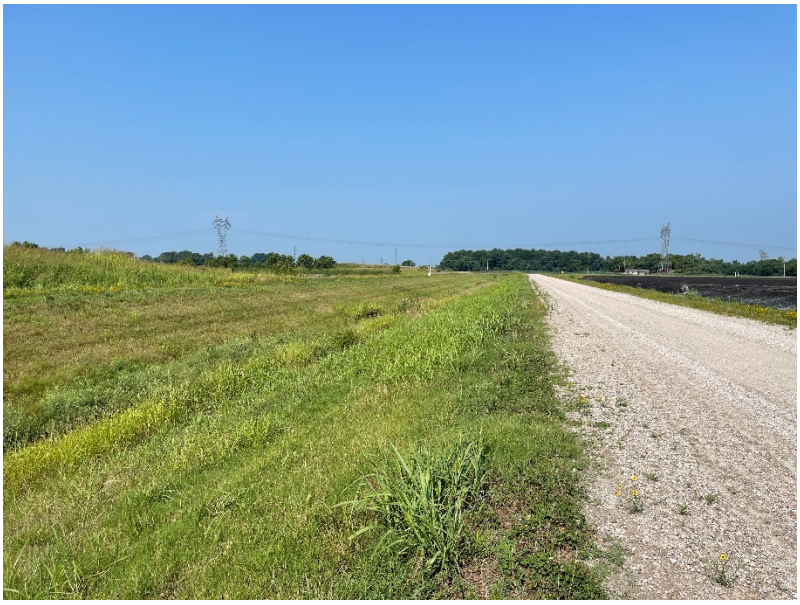
Sedimentation ponds equalization pipes



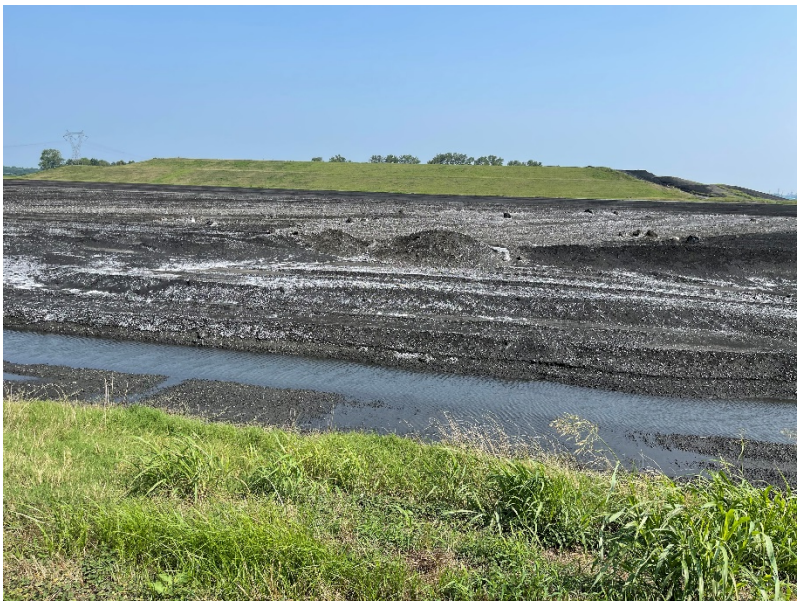
Photograph No. 23
UWL
Phase III eastern perimeter berm/road
Phase I in background



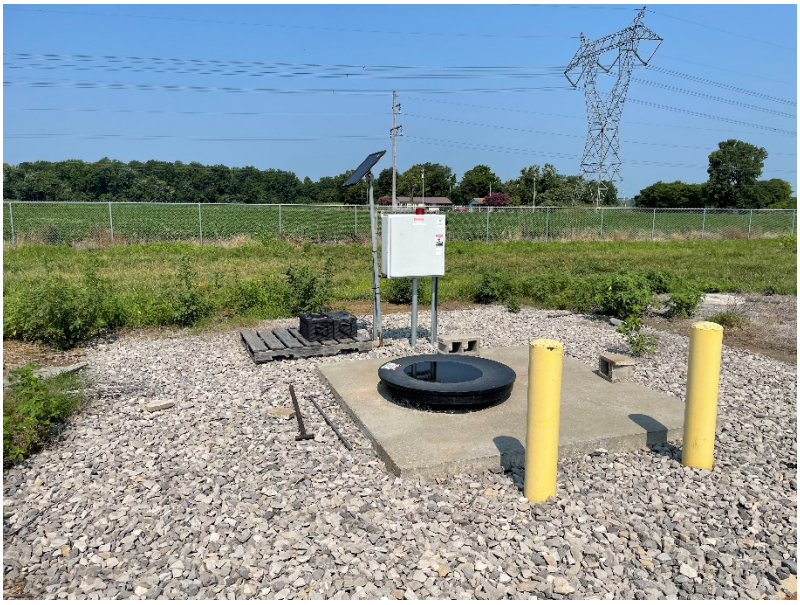
Photograph No. 24
UWL
Monitoring well MW-5
Sedimentation pond in background



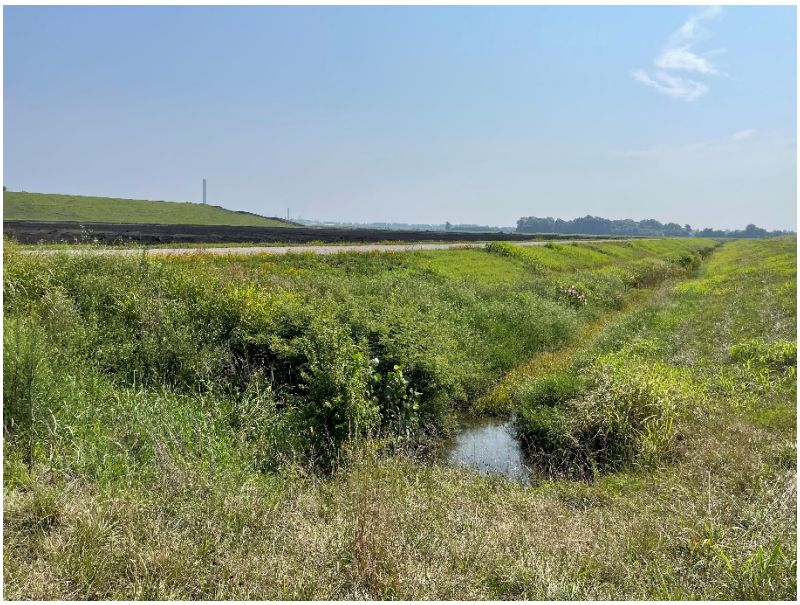
Photograph No. 25
UWL
Downstream slope of southern perimeter berm/road of Phase III



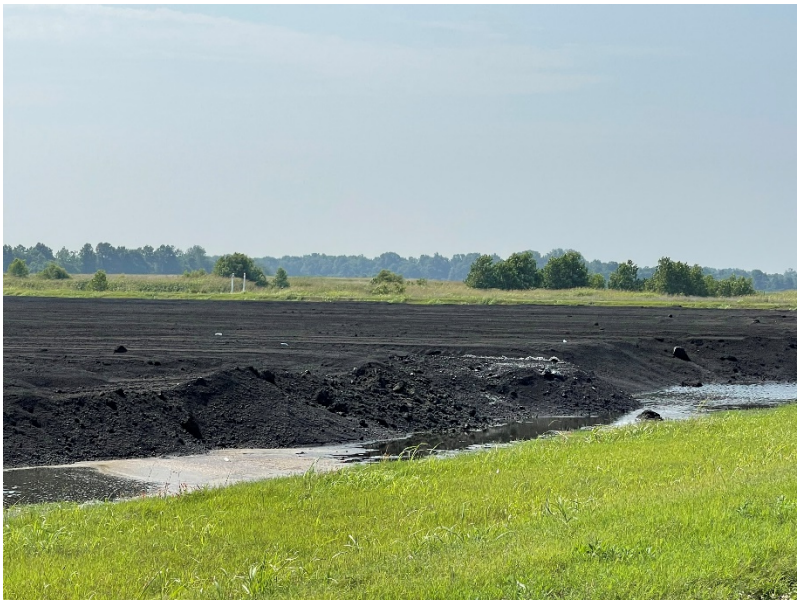
Photograph No. 26
UWL
Placement of CCR in open Phase III



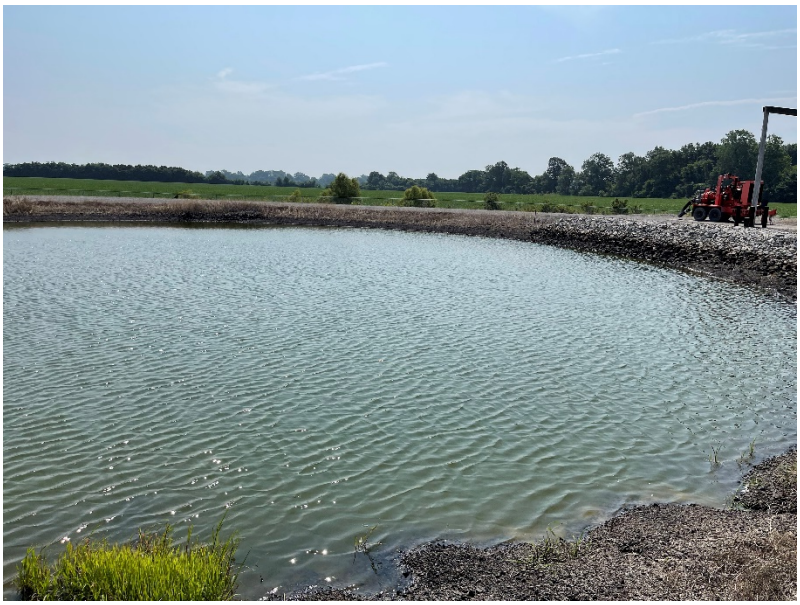
Photograph No. 27
UWL
Manhole and electrical control box associated with Phase III pump



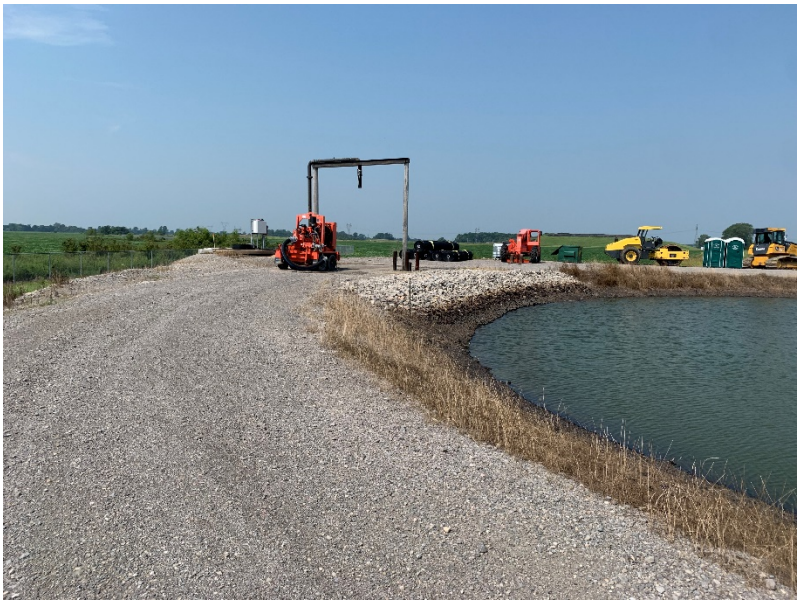
Photograph No. 28
UWL
Stormwater ditch at southwestern perimeter of Phase III



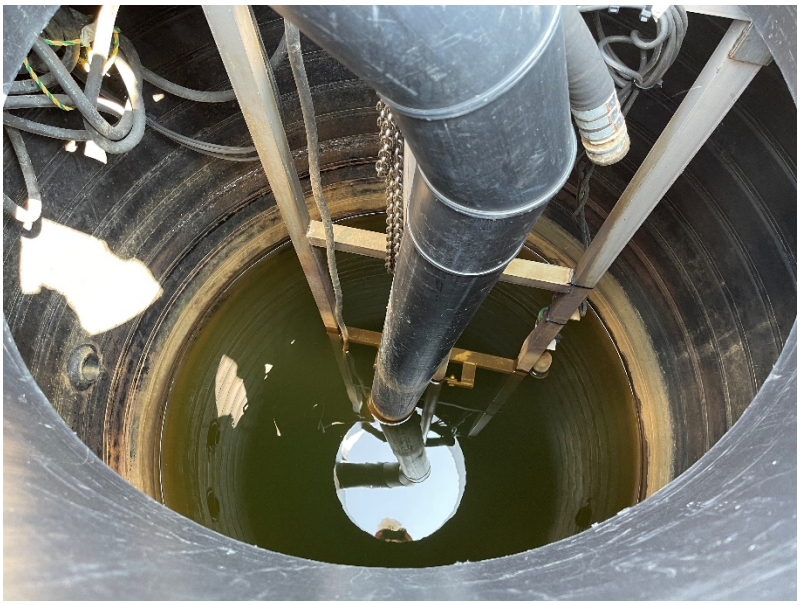
Photograph No. 29
UWL
Placement of CCR in Phase III
Upstream slope of west berm in foreground



Photograph No. 30
UWL
Leachate Pond



Photograph No. 31
UWL
Leachate Pond perimeter berm and loadout structure



Photograph No. 32
UWL
Leachate Pond loadout structure manhole

APPENDIX B

Inspection Forms

Annual CCR Landfill Inspection Report

Facility Name: AECI NMPP UWL Inspection Date: 20 July 2021

Owner/Operator: AECI New Madrid Power Plant

Persons Present During Inspection		
Name	**Title/Position**	**Representing**
Andy Lucas	Senior Engineer	Haley & Aldrich
Matthew Krakora	Staff Engineer	Haley & Aldrich
Person Responsible for Inspection		
Steven F. Putrich, P.E.	Principal Consultant	Haley & Aldrich

Operations Record Review				
Item	**Comments/Observations**	NO ACTION	MONITOR	REPAIR
Are weekly inspections being performed and records kept in the facility record?	Yes, weekly inspections and reports are performed by AECI and kept in the landfill operating record.	x		
Has facility record been reviewed as part of this inspection?	Yes, 7-day inspection records were reviewed.	x		

Facility Operations	**Comments/Observations**	NO ACTION	MONITOR	REPAIR
Is facility access restricted by fences, gates, etc. to control access?	Yes, access is restricted by posted signage and a perimeter fence and gates.	x		
Is CCR placement consistent with design plans?	Yes, placement of CCR and configuration of the landfill appears to be in accordance with Phase I and Phase III Construction Drawings and Construction Permit Application.	x		
Is CCR being placed in lifts and compactive effort applied?	Yes, CCR is trucked in and spread in 4-6 inch lifts. Compactive effort is achieved through dozer compaction.	x		
Is CCR being placed in a manner to promote positive drainage?	Yes, positive drainage was being maintained.	x		
Is there evidence of water ponding in the active fill area?	No evidence of water was observed at the time of the inspection.	x		
Is the liner system and leachate collection system being maintained and operating properly?	Yes. The leachate collection system, including the Phase I and Phase III pump and the leachate collection pond loadout pump were operating as designed, per discussion with plant personnel.	x		
Are haul roads properly maintained and generally in good condition?	Yes. No further comment.	x		

Facility Operations (cont'd)	Comments/Observations	NO ACTION	MONITOR	REPAIR
Are stormwater run-on and run-off controls being maintained?	Yes. Perimeter berms control both run-on and run-off. Over 3-in. of precipitation occurred on the two days prior to the site inspection, which was exhibited by pooling water near the perimeter berms during the inspection.		x	
Is there evidence of discharges to Waters of the U.S. ?	No. Run-off is controlled by perimeter berms.	x		

Stability	Comments/Observations	NO ACTION	MONITOR	REPAIR
Is there evidence of erosion on fill slopes or in-active landfill areas?	Erosion rills in CCR of approximately 6-12 inches were observed on side slopes where intermediate cover was not present. Small erosion rills should be monitored.		x	x
Is there evidence of surface cracking at top of CCR fill or along any slope benches?	None observed at the time of the inspection.	x		
Is there evidence of sinkholes or animal burrows?	None observed at the time of the inspection.	x		
Are fill slopes in accordance with design plans?	Yes, fill slopes were estimated to be roughly 4(h):1(v) in accordance with the design plans.	x		
Is there evidence of slides, sloughs or scarps?	None observed at the time of the inspection.	x		
Is there any evidence of water seepage through fill slopes or at toe of fill slopes?	None observed at the time of the inspection.	x		
Is there evidence of movement, erosion, or instability in any soil embankments retaining CCR at the landfill?	No evidence of movement, erosion, or instability in the perimeter berms was observed.	x		
Is vegetation present in in-active/closed landfill areas? Comment on density, height, and type.	Vegetation was in good standing in areas where intermediate cover had been placed. Areas of vegetation exceeding 6-in. (up to several feet high in some areas) on the Phase I sideslope exist		x	x

Additional Comments:

See photos/figures in inspection report for further documentation. Continue to monitor smaller erosion rills and consider repair, consistent with current side-slope maintenance operations, if they exceed 12" or more deep. Maintain grassy vegetation and remove any woody vegetation on landfill sideslopes.