Coal Combustion Residuals
Closure Plan for Existing Landfill

Prepared for
Montana-Dakota Utilities Co.
R.M. Heskett Station

February 2024

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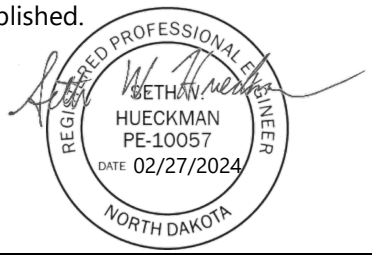
Certifications

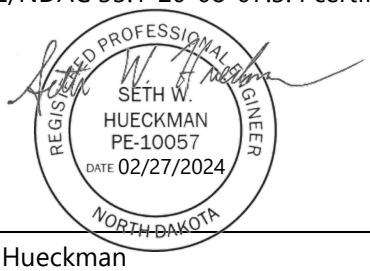
I hereby certify that I, or my agent, have examined the facility and, being familiar with the provisions of 40 CFR 257 Subpart D and NDAC 33.1-20, attest that this Coal Combustion Residuals landfill closure plan has been prepared in accordance with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR §257.102/NDAC 33.1-20-08-07.3. I certify that the plan is adequate for this facility and that procedures for recordkeeping and reporting have been established.



Seth W. Hueckman
Barr Engineering Co.
ND Registration Number PE-10057

Dated this 27th day of February 2024

I hereby certify that I, or my agent, have examined the facility and, being familiar with the provisions of 40 CFR 257 Subpart D and NDAC 33.1-20, attest that this Coal Combustion Residuals landfill design of the final cover system as described in this closure plan is in accordance with good engineering practice, including consideration of applicable industry standards and the requirements of 40 CFR §257.102/NDAC 33.1-20-08-07.3. I certify that the final cover system design is adequate for this facility.



Seth W. Hueckman
Barr Engineering Co.
ND Registration Number PE-10057

Dated this 27th day of February 2024

Revision	Date	Summary of Revisions
0	October 13, 2016	Initial Plan
1	February 5, 2021	2021 Application for Permit Modification
2	February 27, 2024	Updated Closure Schedule

1 Introduction

Montana-Dakota Utilities Co. (MDU) operates the R.M. Heskett Station (Heskett), near Mandan, North Dakota. Operations at Heskett result in the production of coal combustion residuals (CCR). CCR management is subject to Federal Standards for the Disposal of Coal Combustion Residuals in Landfills per 40 CFR 257 Subpart D. Heskett currently operates a coal ash landfill under North Dakota Department of Environmental Quality (NDDEQ) solid waste management facility Permit No. SP-087. This CCR landfill closure plan has been developed to satisfy the requirements of 40 CFR §257.102 (b) and NDAC 33.1-20-08-07.3(b), written closure plan.

MDU's coal ash landfill at Heskett was developed in two phases covering approximately 36 acres. Phase I to the north and Phase II to the south were initially designed to act as two adjacent landfills separated by a haul road. Each phase was further divided into slots; each slot covering an area consisting of a single liner construction event. Phase I (Slots 1-5) is lined with a clay liner while Phase II (Slots 6-10) is composite-lined with a clay liner overlain by a 60-mil high density polyethylene (HDPE) geomembrane liner. The areas encompassing Phase I and Phase II are shown on Figure 1 (Appendix A).

Prior to beginning Phase II construction in 2000, MDU was granted a permit modification to raise the height of the landfill and place ash fill above the haul road, thereby merging Phase I and II into one continuous landfill. Approximately 30 acres of the combined landfill is closed and capped with a cover system consisting of either a clay barrier layer and a cover soil layer or a geomembrane barrier overlain by a drainage layer overlain by a cover soil layer. The final cover slopes range from 3 percent to nearly 25 percent, but average roughly 10 percent around the perimeter.

In 2011, MDU was granted another permit modification to vertically expand the landfill to 25 percent cover slopes around the entire perimeter that included some southward expansion of the existing liner limits. However, the additional vertical airspace permitted in 2011 will no longer be fully used. In 2019, MDU announced the planned 2022 retirement of the coal-fired units at Heskett which resulted in the cessation of coal burning in early 2022. MDU submitted permit modifications in 2021 and 2023, lowering the final landfill elevation to reflect actual conditions after the last CCR and demolition waste were generated and disposed of in the landfill. In fall of 2023, the closure of the remaining approximately 6 acres of the landfill began. Final closure of the entire landfill acreage will be completed in 2024.

2 Closure Narrative

Closure of the landfill will be accomplished by leaving existing CCR in-place and constructing a final cover system compliant with 40 CFR, Part §257.102 (d)(3)/NDAC 33.1-20-08-07.3(d)(3). A 25-percent maximum closure grade was selected to maximize airspace, accommodate settling and subsidence of the CCR material, and promote surface water run-off from the site. Existing final cover areas have been constructed in phases as closure grades are reached to limit the amount of open area and leachate generation in the landfill during the filling process. The current active landfill area will be closed during one final phase.

3 Final Cover System Design

Two different cover systems for the Phase I and Phase II portions of the landfill have been included in final closure. The Phase I portion of the landfill utilized a soil barrier layer and the Phase II portion of the landfill will utilize a geomembrane barrier layer. The remaining small active area of the landfill will utilize the Phase II geomembrane cover system.

Closure of Phase I consisted of placement of a low permeability cover system as follows (from the top down):

- Vegetative cover consisting of 6 inches (minimum) of suitable plant growth material (SPGM) topsoil;
- 30 inches (minimum) of plant rooting zone soil;
- 24 inches of compacted clay soil material with a saturated hydraulic conductivity of 1 x 10^-7 cm/sec; and
- Buffer layer over the subgrade soils to provide a suitable subgrade for the cover system, if needed.

Closure of Phase II will consist of placement of a low permeability cover system as follows (from the top down):

- Vegetative cover consisting of 6 inches (minimum) of SPGM topsoil;
- 12 inches (minimum) of plant rooting zone soil;
- 12 inches of granular drainage material;
- 40-mil (minimum) geomembrane hydraulic barrier layer; and
- Buffer layer over the subgrade soils to provide a suitable subgrade for the geomembrane layer and cover system, if needed.

4 Final Cover System Performance

The following subsections describe the performance for the differing final cover systems for Phase I and Phase II closure.

4.1 Phase I Final Cover System

The Phase I final cover design meets the requirements of 40 CFR §257.102 (d) as described below:

(d)(1)(i)/d(1)(a) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

The permeability of the final cover system will be less than or equal to the permeability of the bottom liner system and will be graded with up to a 25-percent (maximum) slope to promote surface water run-off.

(d)(1)(ii)/d(1)(b) Preclude the probability of future impoundment of water, sediment, or slurry;

The 24-inch-thick clay hydraulic barrier component of the final cover system will preclude infiltration of precipitation. The final cover will be installed with up to a 25-percent (maximum) slope and will tie into the perimeter embankment, thereby promoting surface water run-off from the site.

(d)(1)(iii)/d(1)(c) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;

The final cover will be installed with a vegetated 25-percent (maximum) slope that meets stability requirements.

(d)(1)(iv)/d(1)(d) Minimize the need for further maintenance of the CCR unit, and;

The final cover will be vegetated to minimize erosion and the need for maintenance.

(d)(1)(v)/d(1)(e) Be completed in the shortest amount of time consistent with recognized and generally good engineering practices.

Final cover will be constructed in phases as closure grades are reached to limit the amount of open area in the landfill.

(d)(3)/d(3) Final cover system.

The final cover system for Phase I is considered a standard final cover design and meets the requirements described in 40 CFR §257.102 (d)(3)(i).

(d)(3)(i)(A) The permeability of the final cover system must be less than or equal to the permeability of any bottom liner system or natural subsoils present, or a permeability no greater than 1x10^-5 cm/sec, whichever is less.

(d)(3)(a)[2] A second layer of twelve inches [30.5 centimeters] or more of clay-rich soil material suitable for serving as a plant root zone must be placed over the compacted layer. This layer is not required if the CCR unit contains only bottom ash.

Phase I was lined with a 5-foot-thick clay barrier layer. The clay barrier layer for Phase I closure will be constructed to a saturated hydraulic conductivity of 1 x 10^-7 cm/sec or less which will be less than or equal to the permeability of the bottom clay liner and will provide an adequate plant rooting zone.

(d)(3)(i)(B)/d(3)(a)[1] The infiltration of liquids through the closed CCR unit must be minimized by the use of an infiltration layer that contains a minimum of 18 inches of earthen material.

A 24-inch-thick clay barrier layer with a saturated hydraulic conductivity of 1 x 10^-7 cm/sec is included in the final cover design for Phase I closure, which meets the requirement.

(d)(3)(i)(C)/d(3)(a)[3] The erosion of the final cover system must be minimized by the use of an erosion layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth.

A 36-inch-thick erosion layer (SPGM topsoil and plant rooting zone soil) capable of sustaining native plant growth is included in the final cover design, which exceeds the minimum of 6 inches of earthen material required.

(d)(3)(i)(D)/d(3)(a)[4] The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

Ash will be placed in lifts uniformly across the landfill to allow for settlement and subsequent backfilling of areas where differential settling and subsidence are observed. Construction of the final cover system will not commence until suitable cover subgrade is observed. As a result, minimal differential settlement and subsidence is expected following final cover construction so that performance of the clay barrier layer or cover system as a whole will not be affected.

4.2 Phase II Final Cover System

The Phase II final cover design meets the requirements of 40 CFR §257.102 (d) as described below:

(d)(1)(i)/d(1)(a) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere;

The permeability of the final cover system will be less than or equal to the permeability of the bottom liner system and will be graded with up to a 25-percent (maximum) slope to promote surface water run-off.

(d)(1)(ii)/d(1)(b) Preclude the probability of future impoundment of water, sediment, or slurry;

The geomembrane hydraulic barrier component of the final cover system will preclude infiltration of precipitation. The final cover will be installed with up to a 25-percent (maximum) slope and will tie into the perimeter embankment, thereby promoting surface water run-off from the site.

(d)(1)(iii)/d(1)(c) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure care period;

The final cover will be installed with a vegetated 25-percent (maximum) slope that meets stability requirements.

(d)(1)(iv)/d(1)(d) Minimize the need for further maintenance of the CCR unit, and;

The final cover will be vegetated to minimize erosion and the need for maintenance.

(d)(1)(v)/d(1)(e) Be completed in the shortest amount of time consistent with recognized and generally good engineering practices.

Final cover will be constructed in phases as closure grades are reached to limit the amount of open area in the landfill.

The final cover system for Phase II closure is considered an *alternative final cover system design* and meets the requirements described in 40 CFR §257.102 (d)(3)(ii).

(d)(3)(ii)(A) The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in paragraphs (d)(3)(i)(A) and (B) of this section.

d(3)(b)[1] The design of the final cover system must include an infiltration layer that achieves an equivalent reduction in infiltration as the infiltration layer specified in items 1 and 2 of subparagraph a or an average long-term percolation rate less than 0.2 inches [5.0 millimeters] per year.

Geomembrane hydraulic barriers of equivalent performance are used in the Phase II liner system and the final cover system proposed.

(d)(3)(ii)(B)/d(3)(b)[2] The design of the final cover system must include an erosion layer that provides equivalent protection from wind or water erosion as the erosion layer specified in this section.

An 18-inch-thick minimum erosion layer (SPGM topsoil and plant rooting zone soil) capable of sustaining native plant growth is included in the Phase II final cover design, which exceeds the minimum of 6 inches of earthen material required.

(d)(3)(ii)(C)/d(3)(b)[3] The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

Ash will be placed in lifts uniformly across the landfill to allow for settlement and subsequent backfilling of areas where differential settling and subsidence are observed. Construction of the final cover system will not commence until suitable cover subgrade is observed. As a result, minimal differential settlement and subsidence is expected following final cover construction so that performance of the geomembrane cover layer or cover system as a whole will not be affected.

5 Closure Procedures and Methods

Prior to starting final closure construction activities, a notification of intent to close the landfill was prepared that included the certification by a qualified professional engineer for the design of the final cover system as required by 40 CFR §257.102 (d)(3)/NDAC 33.1-20-08-07.3.d.(3). The notification was completed when it was placed in the facility's operating record as required by 40 CFR §257.105 (i)(7)/ NDAC 33.1-20-08-08.1.i(7). In addition, MDU notified the NDDEQ of the upcoming closure project at least five working days prior to initiation of closure activities.

Final closure commenced when it was reasonable to mobilize construction equipment and crews after final receipt of CCR and plant demolition waste. Final cover was placed as soon as practical, factoring in the timing constraints imposed by late fall, winter, and early spring weather conditions. Construction of the final cover system proceeded as follows:

1. Grade and smooth ash fill subgrade surface as needed;
2. Place, grade, and smooth surface buffer soil layer (if buffer layer is needed);
3. Install geomembrane cover and drainage material;
4. Place plant rooting zone soil;
5. Place SPGM topsoil layer;
6. Install permanent stormwater run-off controls (if needed), and;
7. Seed, fertilizer, and mulch.

Closure activities are being carried out by a qualified earthwork contractor and geomembrane liner installer. Construction plans and specifications were prepared for each phase of closure to direct the contractor's work.

Construction of the various components of the final cover will be tested and documented in accordance with the document titled "Article 5 - Quality Assurance for Construction of Landfill and Surface Impoundment Liners, Caps and Leachate Collection Systems" developed by the NDDEQ and included in the facility's permit. A closure construction documentation report will be prepared and submitted to the NDDEQ after completion of an incremental closure event. The report will contain descriptions of the construction process, record drawings, survey and material test data, pertinent correspondence, and photographs of important aspects of construction. The report will be signed by a professional engineer, registered in the state of North Dakota, stating that to the best of their knowledge and according to their records, cover construction has been completed in accordance with the approved plans, specifications, and permit requirements.

A notification of closure will be prepared within 30 days of the completion of closure of the entire landfill. The notification will include the certification by a qualified professional engineer verifying that closure has been completed in accordance with the closure plan as required by 40 CFR §257.102 (f)(3). The notification will be complete when it has been placed in the facility's operating record as required by 40 CFR §257.105 (i)(8).

A notation on the deed to the property must be recorded following complete closure of the landfill. *"The notation on the deed must in perpetuity notify any potential purchaser of the property that: (i) The land has been used as a CCR unit; and (ii) Its use is restricted under the post-closure care requirements as provided by 40 CFR §257.104 (d)(1)(iii)."* A notification stating that the notation has been recorded will be prepared within 30 days of recording a notation on the deed to the property. The notification will be complete when it has been placed in the facility's operating record as required by 40 CFR §257.105 (i)(9).

6 CCR Inventory and Maximum Closure Area Estimates

Phase I and Phase II combined contain approximately 1.85 million cubic yards (mcy) of CCR. The vertical expansion permitted in 2011 was designed to add an additional 1.42 mcy of capacity; however, only approximately 0.168 mcy of the expansion capacity were consumed due to early plant retirement in 2022. The estimated maximum inventory of CCR ever on-site over the active life of the CCR unit is approximately 2.018 mcy. Approximately 6 acres, the current area undergoing closure, will be the largest remaining area ever requiring final cover for the remaining life of the CCR landfill.

7 Estimated Closure Schedule

Final landfill closure was initiated following final coal burning and plant demolition activities in 2023. The current unclosed limits of the landfill make up approximately 6 acres, which is the maximum area requiring final cover. Closure of this area was not completed prior to the end of the 2023 construction season due to wintery weather conditions and will be completed in 2024. A demonstration requesting a time extension to complete closure activities was submitted February 26, 2024 and is included in Appendix B.

8 Recordkeeping

40 CFR §257.102 (b)(2), Written closure plan, states, *"No later than October 17, 2016, the owner or operator of the CCR unit must prepare an initial written closure plan."* The plan is considered complete when it is placed in the MDU facility operating record.

After October 17, 2016, MDU will maintain a copy of the most recent version of the closure plan in the facility's operating record. According to 40 CFR §257.102 (b)(3)/NDAC 33.1-08-07.3.b(3), *MDU "must amend the written closure plan whenever: there is a change in the operation of the CCR unit that would substantially affect the written closure plan in effect; or before or after closure activities have commenced, unanticipated events necessitate a revision of the written closure plan."* MDU *"must amend the closure plan at least 60 days prior to a planned change in the operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise an existing written closure plan. If a written closure plan is revised after closure activities have commenced for a CCR unit, the owner or operator must amend the current closure plan not later than 30 days following the triggering event."* The amended plan is considered complete when it has been placed in the MDU facility operating record.

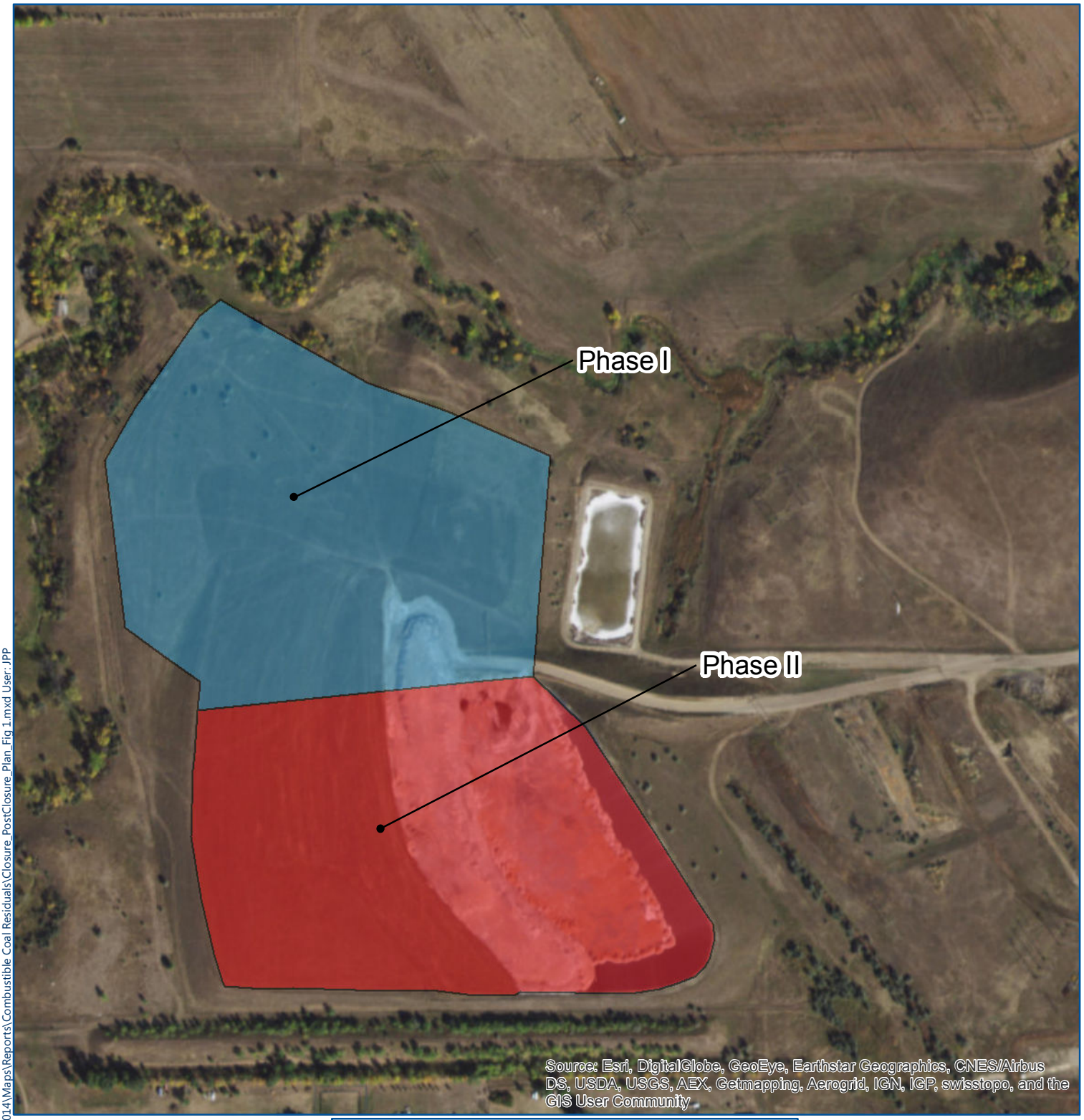
MDU will retain a copy of each applicable file derived from this closure plan *"for at least five years following the date of each occurrence, measurement, maintenance, corrective action, report, record, or study,"* in accordance with 40 CFR §257.105 (b)/NDAC 33.1-20-08-08.1.b; however, *"only the most recent closure plan must be maintained in the facility's operating record irrespective of the time requirement specifie*d" in 40 CFR §257.105 (b)/NDAC 33.1-20-08-08.1.b.

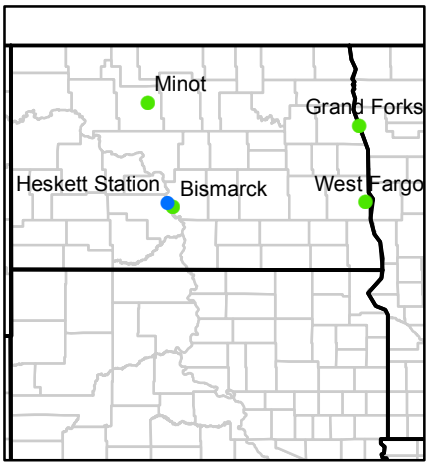
9 Reporting

When the initial plan, and successive amendments to the plan, are placed in the operating record they will be made publicly available on the MDU CCR website in compliance with 40 CFR §257.107 (i)(4)/NDAC 33.1-08-08.3.e, Publicly Accessible Internet Site Requirements. Additionally, to comply with 40 CFR §257.106 (i)(4)/NDAC 33.1-20-08-08.2.e, Notification Requirements/Record Submission Requirements, MDU will *"notify the State Director… when [the closure plan] has been placed in the operating record and on the owner or operator's publicly accessible internet site."* Notification to the State Director will be made to solidwaste@nd.gov as requested by the North Dakota Department of Environmental Quality.

Appendix A

Figure





Heskett Station

Landfill Sequence

Phase I

Phase II

N

Feet

0 150 300 600

BARR

Heskett Station
CCR Landfill
Montana-Dakota Utilities Co.
Mandan, North Dakota

FIG 1 - LANDFILL SEQUENCE

Barr Footer: ArcGIS 10.4, 2016-10-13 15:03 File: I:\Projects\34\30\014\Maps\Reports\Combustible Coal Residuals\Closure_PostClosure_Plan_Fig 1.mxd User: JPP

Appendix B

Closure Extension Demonstration

MONTANA-DAKOTA
UTILITIES CO.
A Subsidiary of MDU Resources Group, Inc.

400 North Fourth Street
Bismarck, ND 58501
701-222-7900

February 26, 2024

Ms. Diana Trussell
North Dakota Department of Environmental Quality
Division of Waste Management
4201 Normandy Street
Bismarck, ND 58503

Re: Montana-Dakota Utilities Co. R.M. Heskett Station Landfill – Special Waste Landfill Permit No. SP-087 – File for Extension to Complete Closure Activities

Dear Ms. Trussell:

As stated in the Notice of Intent to Close dated 10/6/2023, construction of final cover on the R.M. Heskett Station Coal Combustion Residual (CCR) Landfill began in the fall of 2023. Construction of the final cover will not be completed within 6 months, as required by 40 CFR 257.102(f)(1)/NDAC 33.1-20-08-07.3.f(1). In accordance with the requirements 40 CFR 257.102(f)(2)(i)/NDAC 33.1-20-08-07.3.f(2), this letter serves as a demonstration that completion of closure activities was not feasible within the prescribed 6-month timeframe, therefore a 1-year extension to complete closure is required.

Early retirement of the coal-fired boilers at R.M. Heskett Station in 2022 ended generation of CCR at the facility, and subsequently moved up the timeline for closure of the facility's landfill. As a result, finished height of the landfill was lowered in the 2021 and 2023 permit modification applications, reducing total storage capacity. Remaining storage capacity was filled with wastes generated during demolition of the coal-fired boilers which was substantially completed in September 2023. Construction of final cover began soon after. However, as demonstrated in the following section, completion of closure within 6 months of starting was not feasible.

Closure of the landfill could not begin until demolition of the coal-fired boilers was completed, and the final wastes were delivered to the landfill. Because this did not occur until September, the start of construction was delayed until late in the construction season. Poor weather conditions (snow/freezing conditions) ended the construction season before all work was completed, and the contractor suspended work mid-December 2023. Prior to suspending work, the subgrade was prepared/graded, geomembrane cover deployed, and sand drainage layer placed over the geomembrane. Remaining work that will be completed in 2024 includes the placement of cover soils over the drainage layer and seeding/mulching. This work will resume as soon as conditions allow in the spring/summer of 2024 and are scheduled to be completed in two to four weeks.

MDU hereby requests a 1-year extension to complete closure of the CCR Landfill, in accordance with 40 CFR 257.102(f)(2)/NDAC 33.1-20-08-07.3.f(2). Final receipt of waste in

the CCR landfill occurred late in the construction season, and weather conditions prohibited all work from being completed. Weather conditions are not expected to allow for construction to resume until April or May, exceeding the 6 months to complete closure activities as required by 40 CFR 257.102(f)(1)/NDAC 33.1-20-08-07.3.f(1). These factors outside the facility's control prevented closure from being completed within the timeframes prescribed.

Certification

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this demonstration and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Best regards,

Brandon Schafer
Environmental Specialist

Cc: Andy McDonald, Manager of Environmental Compliance
Abbie Krebsbach, Director of Environmental

Attachments: None