GOLDER

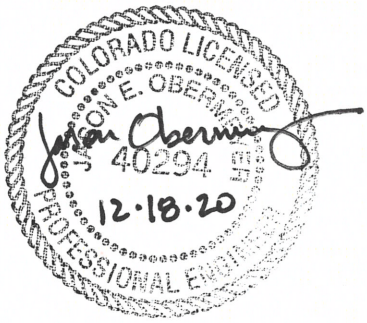
REPORT

Coal Combustion Residuals Landfill Annual Inspection

Nucla Station Ash Disposal Facility

Submitted to:

Tri-State Generation and Transmission Association, Inc.
1100 West 116th Avenue Westminster, Colorado 80234



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December 18, 2020

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APPENDICES

1.0 INTRODUCTION

1.1 Background

Golder Associates Inc. (Golder) has prepared this annual inspection report for Tri-State Generation and Transmission Association, Inc. (Tri-State) to summarize our review of available information and visual observation of the Nucla Station Ash Disposal Facility (the facility). Since 1987, the facility has served as the location for final deposition of coal combustion residuals (CCRs) generated at Tri-State's Nucla Station, a retired coal-fired electric generation plant located near Nucla, Colorado. Nucla Station was retired from service in September 2019.

The facility classifies as an existing CCR landfill under 40 CFR 257. The purpose of Golder's review of available information and visual observation was to satisfy the requirements of 40 CFR 257.84(b)(1), which prescribes periodic completion of these activities by a qualified professional engineer to verify that the design, construction, operation, and maintenance of the facility are consistent with recognized and generally accepted good engineering practice. Golder's visual observations took place on December 3, 2020.

This report presents a description of the facility (Section 1.0), a summary of Golder's review of available information about the facility (Section 2.0), the findings from Golder's visual observation of the facility (Section 3.0), and Golder's conclusions and recommendations (Section 4.0).

1.2 Facility Description

The facility is located in Montrose County, approximately 5.5 miles southeast of Nucla, Colorado. Tri-State historically disposed fly ash and bottom ash at the facility and continues to accept permitted non-hazardous utility-related wastes[1]. The Colorado Department of Public Health and Environment (CDPHE) and the Montrose County Board of Commissioners originally approved construction of the facility on a 40-acre parcel in October of 1987. Pursuant to a March 2002 application submittal, Tri-State expanded the facility laterally onto an adjacent 40-acre parcel under a Certificate of Designation granted by Montrose County in April 2004 and a Special Use Permit via Notice of Decision dated July 2005. Filling began in the expansion area in 2006, and the current disposal footprint encompasses approximately 61 acres. The facility is regulated by CDPHE under 6 CCR 1007-2, Part 1, "Regulations Pertaining to Solid Waste Sites and Facilities."

Disposal of ash at the facility initially occurred behind starter dikes that encompassed the deposition area. Over time, the height of the facility was increased gradually as needed to contain the ash being generated. The height was increased with containment berms that were periodically constructed around the perimeter of the facility. Each individual containment berm was constructed atop and slightly inside of the previous containment berm to form the embankment slopes. At approximate 20-foot vertical intervals, the containment berms were inwardly offset an additional 10 feet to establish benches with terrace channels for storm water management. The resulting composite slope is approximately 3 horizontal to 1 vertical, with a slope between benches of approximately 2.5 horizontal to 1 vertical. The design intent was that the containment berms were constructed with sufficient thickness of suitable material and appropriately vegetated so that they also serve as the final cover system on the embankment slopes. The final cover system has been constructed over approximately 22 acres of embankment slope area and approximately 17 acres of top surface area.

[1] For simplicity, the term "ash," where used in this document, encompasses all permitted wastes.

2.0 REVIEW OF AVAILABLE INFORMATION

2.1 Information Reviewed

40 CFR 257.84(b)(1)(i) requires the annual inspection to include a review of information pertaining to the status and condition of the facility, including files that are available in the operating record. Golder has reviewed information provided by Tri-State as part of our duty to verify that the design, construction, operation, and maintenance of the facility are consistent with recognized and generally accepted good engineering practice. The information Golder has reviewed includes the following:

- The engineering design and operations report for ash disposal on the initial 40-acre parcel (Colorado-Ute Electric Association, Inc., 1987)
- The hydrogeologic investigation report for ash disposal on the initial 40-acre parcel (Western Colorado Testing, Inc., and J.F.T. Agapito & Associates, Inc. 1987)
- The design and operations report for ash disposal on the 40-acre lateral expansion parcel (Geo-Trans Inc. 2002)
- The fugitive dust control plan for the facility (Golder Associates Inc. 2015)
- Previous annual inspection reports for the facility (Golder Associates Inc. 2016a, 2017, 2018a, 2018b, and 2019)
- The run-on and run-off control system plan for the facility (Golder Associates Inc. 2016b)
- The closure plan for the facility (Golder Associates Inc. 2016c)
- Weekly inspection forms documenting weekly inspections conducted by qualified persons employed by Tri-State between December 18, 2019, and November 25, 2020

The weekly inspection forms provided valuable information regarding the status and condition of the facility throughout 2020, as well as the repair and maintenance activities that were completed.

2.2 Changes in Facility Geometry

40 CFR 257.84(b)(2)(i) requires the annual inspection report to include a summary of changes in facility geometry since the previous annual inspection. The geometric design criteria, ash placement limits, and construction methodology for the facility did not change in 2020. No CCRs were produced from power generation in 2020, but ash that was encountered in a historical deposition location on the power plant site was relocated to the facility from late 2019 through February 2020. Ash placement resulted in increased surface elevations within a relatively small area in the southern half of the facility.

2.3 Ash Volume Contained in the Facility

40 CFR 257.84(b)(2)(ii) requires the annual inspection report to include an estimate of the volume of CCRs contained within the facility at the time of the inspection. The volume of ash contained in the facility at the time of the previous annual inspection was estimated as 4,698,000 cubic yards (Golder 2019). Tri-State's estimate of the volume of ash placed in the facility from that time to the date of the inspection was 47,000 cubic yards, based on an in-place dry density of 66 pounds per cubic foot. Golder calculates that the volume of ash contained within the facility is approximately 4,745,000 cubic yards as of the date of the inspection.

2.4 Changes Affecting Stability or Operation

40 CFR 257.84(b)(2)(iv) requires the annual inspection report to include a summary of changes that may have affected the stability or operation of the facility since the previous annual inspection. Our review of the weekly inspection forms completed between December 18, 2019, and November 25, 2020, indicates that changes affecting the stability or operation of the facility have not been identified during the weekly inspections. The weekly inspection forms indicate that minor issues, such as erosion rills and surface cracking, are being addressed proactively. Indications of changes that affect stability or operation of the facility were not identified during Golder's visual observations on December 3, 2020 (refer to Section 3.0).

3.0 VISUAL OBSERVATION

3.1 Overview

40 CFR 257.84(b)(1)(ii) requires the annual inspection to include visual observation of the facility that is intended to identify signs of distress or malfunction. 40 CFR 257.84(b)(2)(iii) requires the annual inspection report to include a description of appearances of structural weakness at the facility, in addition to existing conditions that are disrupting or have the potential to disrupt the operation and safety of the facility. These requirements are addressed in this section.

3.2 Visual Observation Terminology

Terms used in this section are defined as follows:

Condition of Facility Component

Good:	A condition that is generally better than the minimum expected condition based on the design criteria and maintenance performed at the facility.
Fair:	A condition that is generally consistent with the minimum expected condition based on the design criteria and maintenance performed at the facility.
Poor:	A condition that is generally worse than the minimum expected condition based on the design criteria and maintenance performed at the facility.

Severity of Deficiency

Minor:	An observed deficiency where the current condition is worse than the minimum expected condition but does not currently pose a threat to structural stability.
Significant:	An observed deficiency where the current condition is worse than the minimum expected condition and could pose a threat to structural stability if it is not addressed.
Excessive:	An observed deficiency where the current condition is worse than the minimum expected condition and either hinders the ability of an inspector to evaluate the facility component or poses a threat to structural stability.

3.3 Findings

Golder conducted a visual observation of the facility on December 3, 2020. Golder observed the condition of the deposition area, embankment slopes, embankment crest, embankment toe, and storm water control features. The annual inspection form is included in Appendix A. The locations and orientations of photographs presented in this section are shown on the annual inspection form.

3.3.1 Deposition Area

The deposition area was observed to be in good condition (refer to Appendix A for the deposition area location). Signs of ground movement, such as sloughing or sliding, cracking, subsidence, or bulging, were not observed in the deposition area. No deposition was occurring at the time of the visual observation. The deposition area was appropriately graded so that ash contact water would collect and be contained within the deposition area. A berm that was several feet in height was in place around the perimeter of the deposition area to prevent migration of ash contact water out of the deposition area. Fugitive dust was not observed in the deposition area. The typical condition of the deposition area is depicted in Photograph 1.

Photograph 1: Typical Deposition Area Condition

3.3.2 Embankment Crest

The embankment crest was observed to be in good condition. Cracking that would be indicative of ground movement was not observed along the embankment crest. Low areas that would be indicative of differential settlement were not observed along the embankment crest. The typical condition of the embankment crest is depicted in Photograph 2.

Photograph 2: Typical Embankment Crest Condition

3.3.3 Embankment Slopes

The embankment slopes were observed to be in good condition. Signs of ground movement, such as sloughing or sliding, cracking, subsidence, or bulging, were not observed on the embankment slopes. Evidence of significant or excessive erosion or slope deterioration was not observed on the embankment slopes. It was apparent from visual observation that repair of embankment slopes is being performed as needed, and the weekly inspection forms confirm that repair work was completed on several occasions in 2020 (refer to Appendix A for specific repair locations). Native vegetation has been established on the embankment slopes. The embankment slopes had adequate vegetative coverage at the time of the visual observation, with more mature vegetation on the east, north, and west slopes than on the south slopes. Reestablishment of vegetation in repair locations should be monitored in 2021. Unusually poor or thriving vegetative growth was not observed on the embankment slopes. No trees or woody vegetation were observed on the embankment slopes. Two animal burrows were observed on the embankment slopes, but there was no evidence of recent animal burrowing (refer to Appendix A for animal burrow locations). The typical condition of the embankment slopes is depicted in Photograph 3.

Photograph 3: Typical Embankment Slope Condition

3.3.4 Embankment Toe

The embankment toe was observed to be in good condition. Signs of seepage, such as springs or boggy areas, were not observed along the embankment toe. The typical condition of the embankment toe is depicted in Photograph 4.

Photograph 4: Typical Embankment Toe Condition

3.3.5 Storm Water Control Features

The storm water control features at the facility were observed to be in good condition. Downchute channels and energy dissipation basins at the facility are constructed with riprap. Some of the downchute channels had small shrubs growing in the flow path, and Golder recommends that the shrubs be removed periodically if they become large enough to impede flow or cause riprap to shift. However, the shrubs do not pose a threat to structural stability and did not impact Golder's ability to inspect the facility. The typical condition of the downchute channels is depicted in Photograph 5. Terrace channels at the facility are provided at approximate 20-foot vertical intervals. Erosion control wattles have been installed to control erosion and capture sediment in the terrace channels at appropriate intervals. The typical condition of the terrace channels is depicted in Photograph 6. Perimeter channels are in place around the facility where they are needed to control storm water. Perimeter channels at the facility are generally constructed with soil and rock. Erosion control wattles have been installed at appropriate intervals in the perimeter channels to control erosion and capture sediment. The typical condition of the perimeter channels is depicted in Photograph 7. During the visual observation, Golder observed that debris (mainly tumbleweeds) has built up in the perimeter channel along the east side of the facility, at the downstream ends of the culverts that pass beneath the site entrance road, as shown in Photograph 8 (refer to Appendix A for the

location of the debris buildup). Golder recommended that Tri-State remove this debris as soon as practical. This should be done periodically to remove potential flow impediments. The debris does not pose a threat to structural stability and did not impact Golder's ability to inspect the facility.

Photograph 5: Typical Downchute Channel Condition

Photograph 6: Typical Terrace Channel Condition

Photograph 7: Typical Perimeter Channel Condition

Photograph 8: Buildup in the East Perimeter Channel at the Downstream Ends of the Culverts

4.0 CONCLUSIONS AND RECOMMENDATIONS

Golder completed an annual inspection of the Nucla Station Ash Disposal Facility to address the requirements of 40 CFR 257.84. The facility is in good condition overall. Signs of distress or malfunction of the facility were not observed, and appearances of actual or potential structural weakness of the facility were not identified. Current facility maintenance practices, including control of burrowing animals, repair of embankment slopes, establishment of suitable vegetation on embankment slopes, control and containment of ash contact water, and establishment of positive storm water drainage away from the facility, should continue as the need is indicated by weekly inspections conducted in accordance with 40 CFR 257.84(a).

5.0 REFERENCES

Colorado-Ute Electric Association, Inc. 1987. Nucla Station Fly Ash, Bottom Ash, Slag and Flue Gas Emission Control Waste Disposal Facility Engineering Design and Operations Report. Report prepared for the Colorado Department of Health. February 6.

Geo-Trans Inc. 2002. Design and Operations Report, Nucla, Colorado, Ash Disposal Facility. Report prepared on behalf of Tri-State Generation and Transmission Association, Inc., for the Colorado Department of Public Health and Environment. March 21.

Golder Associates Inc. 2015. Nucla Generating Station Coal Combustion Residuals Fugitive Dust Control Plan. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. 2016a. Coal Combustion Residuals Landfill Annual Inspection Report, Nucla Station Ash Disposal Site. Report prepared for Tri-State Generation and Transmission Association, Inc. January.

Golder Associates Inc. 2016b. Run-on and Run-off Control System Plan, Nucla Station Ash Disposal Facility. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. 2016c. Nucla Station Ash Disposal Facility Closure Plan. Plan prepared for Tri-State Generation and Transmission Association, Inc. October.

Golder Associates Inc. 2017. Coal Combustion Residuals Landfill Annual Inspection Report, Nucla Station Ash Disposal Site. Report prepared for Tri-State Generation and Transmission Association, Inc. January.

Golder Associates Inc. 2018a. Coal Combustion Residuals Landfill Annual Inspection Report, Nucla Station Ash Disposal Site. Report prepared for Tri-State Generation and Transmission Association, Inc. January.

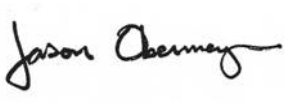
Golder Associates Inc. 2018b. Coal Combustion Residuals Landfill Annual Inspection, Nucla Station Ash Disposal Site. Report prepared for Tri-State Generation and Transmission Association, Inc. December.

Golder Associates Inc. 2019. Coal Combustion Residuals Landfill Annual Inspection, Nucla Station Ash Disposal Facility. Report prepared for Tri-State Generation and Transmission Association, Inc. December.

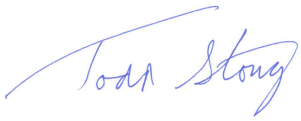
Western Colorado Testing, Inc., and J.F.T. Agapito & Associates, Inc. 1987. Geological and Geohydrological Evaluation of Dry Storage Site, Nucla CFB Demonstration Project. Report prepared on behalf of Colorado-Ute Electric Association, Inc., for the Colorado Department of Health. July.

Signature Page

Golder Associates Inc.



Jason Obermeyer, PE
Associate and Senior Consultant



Todd Stong, PE
Associate and Senior Consultant

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https://golderassociates.sharepoint.com/sites/122669/project files/6 deliverables/reports/3-r-2020_annual_inspection/3-r-0/20138863-3-r-0-2020_nucla_landfill_annual_inspection_18dec20.docx

APPENDIX A

Annual Inspection Form

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION
NUCLA STATION ASH DISPOSAL FACILITY
ANNUAL INSPECTION FORM

Inspection Date: December 3, 2020	**Inspection Time:** 9:00 to 11:00 am	**Legend:** Y Yes; N No; NI Not inspected; NA Not applicable; RA Requires action
Inspector(s): Jason Obermeyer, PE	**Title(s):** Senior Consultant	
Reviewer: Todd Stong, PE	**Title:** Senior Consultant	

Instructions: Complete each part of the annual inspection form. Indicate areas of concern on the plan view on page 3. Elaborate on deficiencies in Section J.

A. Previous Open Items						
1. List open items from the previous year's annual inspection form (Section I.) and indicate whether or not the open items have been resolved:						
a. Clear out the sediment and debris buildup at the downstream ends of the culverts that pass beneath the site entrance road.	Y	N	NI	NA	**RA**	If N and/or RA, please elaborate.
b.	Y	N	NI	**NA**	RA	If N and/or RA, please elaborate.
c.	Y	N	NI	**NA**	RA	If N and/or RA, please elaborate.
B. Atmospheric Conditions						
1. Briefly describe precipitation conditions (rainy, dry, snowy) or notable precipitation events over the last five days: Dry						
2. Briefly describe wind (calm, breezy, windy, gusty) and weather (cold, warm, cloudy, sunny) conditions during the inspection: Calm, cold (~30°F), sunny						
C. Facility Access						
1. Are facility access roads (including the turn from FF31 Road) in good condition?	**Y**	N	NI	NA	RA	If N and/or RA, please elaborate.
2. Are facility access controls (signage, fencing, gates) in good condition?	**Y**	N	NI	NA	RA	If N and/or RA, please elaborate.
3. Do you observe signs of unauthorized access or disposal?	Y	**N**	NI	NA	RA	If Y and/or RA, please elaborate.
D. Deposition Area						
1. Where are ash and/or other materials currently being deposited (indicate on the plan view on page 3 or write N/A)? N/A						
2. Do you observe signs of ground movement in the deposition area?	Y	**N**	NI	NA	RA	If Y and/or RA, please elaborate.
If Y, circle those that apply: Slough or Slide Cracking Subsidence Bulging						
3. Do you observe ponding in the deposition area (if Y, sketch on the plan view on page 3)?	Y	**N**	NI	NA	RA	If RA, please elaborate.
4. Does it appear that fugitive dust (deposition area and roads) is being adequately controlled?	**Y**	N	NI	NA	RA	If N and/or RA, please elaborate.
5. Are controls in place to keep ash contact water from migrating outside the deposition area?	**Y**	N	NI	NA	RA	If N and/or RA, please elaborate.
E. Embankment Crest						
1. Do you observe cracks along the embankment crest?	Y	**N**	NI	NA	RA	If Y and/or RA, please elaborate.
2. Do you observe differential settlement (low areas) along the embankment crest?	Y	**N**	NI	NA	RA	If Y and/or RA, please elaborate.
3. Are the roads around and on the facility in good condition?	**Y**	N	NI	NA	RA	If N and/or RA, please elaborate.

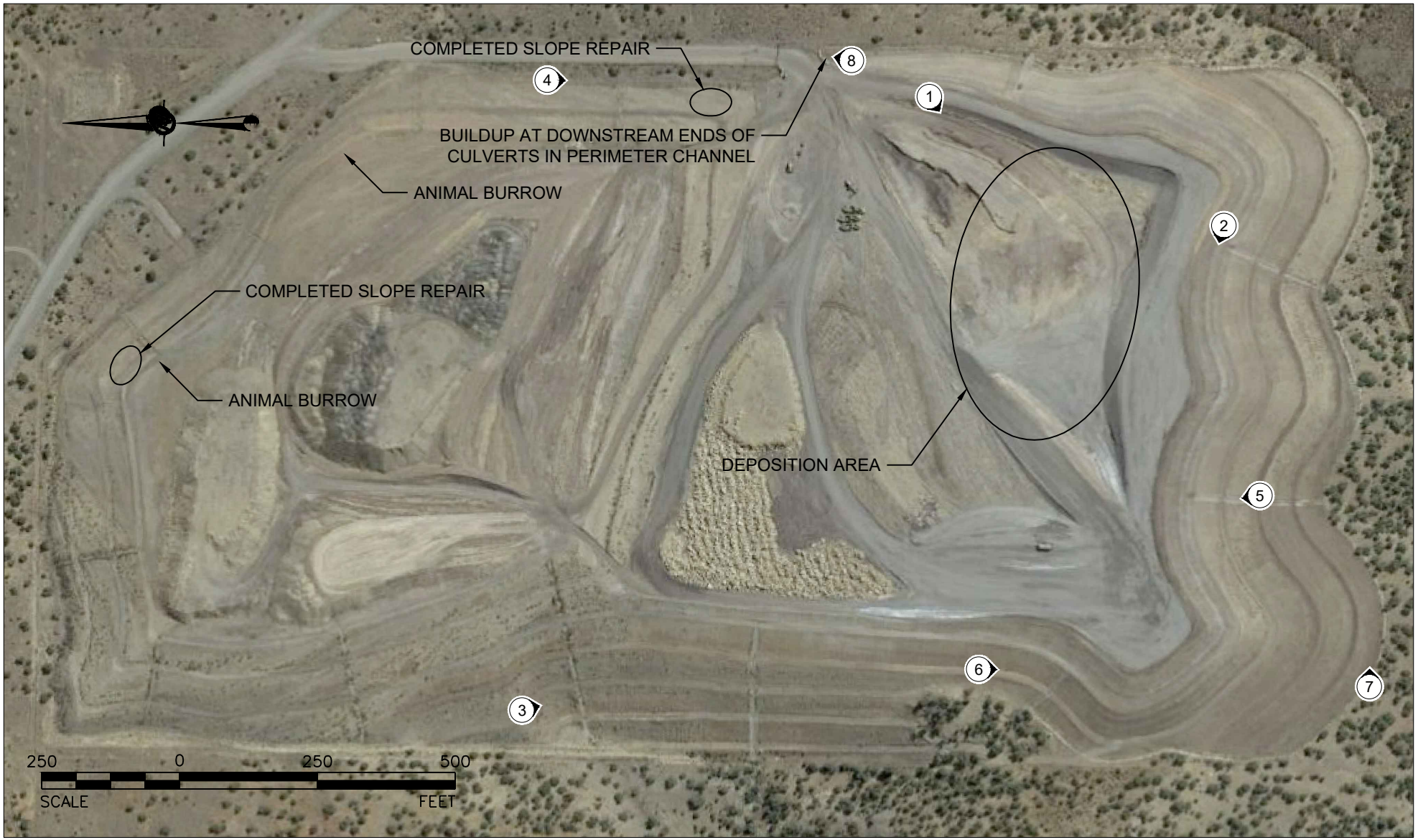
F. Embankment Slopes						
1. Briefly describe ground conditions (wet, dry, soft, firm). North: Snowy, firm East: Dry/snowy, firm South: Dry, slightly loose West: Dry, firm						
2. Do you observe signs of movement or instability on the embankment slopes?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
If Y, circle those that apply: Slough or Slide Cracking Subsidence Bulging						
3. Do you observe signs of excessive erosion or slope deterioration?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
4. Do you observe unusual vegetative growth (thriving or poor growth) or woody vegetation?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
5. Do you observe animal burrows on the embankment slopes?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
G. Embankment Toe						
1. Do you observe signs of seepage (springs or boggy areas) at the embankment toe?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
2. Do you observe ash outside of the disposal footprint?	Y	N	NI	NA	RA	If Y and/or RA, please elaborate.
H. Storm Water Control Features						
1. Are rundowns (downchute channels) and energy dissipation features in good condition?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
2. Are terrace channels in good condition and providing positive drainage toward rundowns?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
3. Are perimeter channels and discharge outfalls in good condition?	Y	N	NI	NA	RA	If N and/or RA, please elaborate.
I. Open Items						
1. List unresolved items from previous annual inspections (RA in Section A.) and new items identified during the annual inspection (RA in Sections B. through H.):						
a. A.1.a./H.3. Clear out the sediment and debris buildup at the downstream ends of the culverts that pass beneath the site entrance road.						
b.						
c.						
d.						
e.						

J. Elaboration

Identify the specific item number (for instance, F.2.) and elaborate on each deficiency or issue identified during the annual inspection. Attach documentation (photographs or sketches) if practical.

A.1.a./H.3. Debris (primarily consisting of tumbleweeds) remains at the downstream ends of the culverts in the location shown on page 3. It is unclear whether the debris was removed after the 2019 annual inspection. If so, it has accumulated again. The debris does not pose a stability concern but could reduce the hydraulic capacity of the culverts. Golder recommended removing the debris at the next practical opportunity and observing this area during weekly inspections to see if more frequent cleanout may be needed.

F.5. Two animal burrows were observed at the locations shown on page 3. There was no evidence of recent burrowing activity. The burrows do not currently present a stability concern and do not require action at this time.



Aerial Image: Google Earth Pro, April 2015.

LEGEND

(2) PHOTOGRAPH LOCATION AND DIRECTION

ANNUAL INSPECTION FORM

TRI-STATE GENERATION AND TRANSMISSION ASSOCIATION
NUCLA STATION ASH DISPOSAL FACILITY

GOLDER

Inspection Date: December 3, 2020

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