DEPARTMENT OF ENERGY
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

EMLA-23-BF281-2-1

July 28, 2023

Mr. Ricardo Maestas
Acting Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6313

Subject: Submittal of the 2022–2023 Annual Long-Term Monitoring Status Report (July 2022 through June 2023) for the Los Alamos County Airport Landfill Cover System Replacement, Solid Waste Management Units 73-001(a,d) in Technical Area 73

Dear Mr. Maestas:

Enclosed please find two hard copies with electronic files of the "2022–2023 Annual Long-Term Monitoring Status Report (July 2022 through June 2023) for the Los Alamos County Airport Landfill Cover System Replacement, Solid Waste Management Units 73-001(a,d) in Technical Area 73." This report is being submitted as required in the approved "Long-Term Monitoring Plan for Los Alamos County Landfill Cover Replacement Solid Waste Management Units 73-001(a,d) Technical Area 73."

If you have any questions, please contact David Diehl at (505) 551-2496 (david.diehl@em-la.doe.gov) or Cheryl Rodriguez at (505) 414-0450 (cheryl.rodriguez@em.doe.gov).

Sincerely,

ARTURO DURAN

Digitally signed by ARTURO DURAN
Date: 2023.07.27 13:11:07 -06'00'

Arturo Q. Duran
Compliance and Permitting Manager
U.S. Department of Energy
Environmental Management
Los Alamos Field Office

Enclosure(s):

1. Two hard copies with electronic files:
   2022–2023 Annual Long-Term Monitoring Status Report (July 2022 through June 2023) for the Los Alamos County Airport Landfill Cover System Replacement, Solid Waste Management Units 73-001(a,d) in Technical Area 73 (EM2023-0423)

cc (letter with CD/DVD enclosure[s]):
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July 2023
EM2023-0423

2022–2023 Annual Long-Term Monitoring Status Report (July 2022 through June 2023) for the Los Alamos County Airport Landfill Cover System Replacement, Solid Waste Management Units 73-001(a,d) in Technical Area 73

N3B Los Alamos

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EM2023-0423

2022–2023 Annual Long-Term Monitoring Status Report (July 2022 through June 2023) for the Los Alamos County Airport Landfill Cover System Replacement, Solid Waste Management Units 73-001(a,d) in Technical Area 73

July 2023

Report Engineer:

Stephen F. Dwyer	Stephen F. Dwyer	Principal Engineer	Dwyer Engineering LLC	7/13/2023
Printed Name	Signature	Title	Organization	Date

Responsible Inspection Engineer

David Diehl	David Diehl	Professional Engineer	N3B	7/20/2023
Printed Name	Signature	Title	Organization	Date

Responsible Federal Project Manager:

Cheryl Rodriguez	CHERYL RODRIGUEZ Digitally signed by CHERYL RODRIGUEZ Date: 2023.07.28 11:14:35 -06'00'	Soil & Water Remediation Program Manager	DOE EM-LA	
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EXECUTIVE SUMMARY

This report summarizes the seventh year of annual monitoring of the Los Alamos County Airport Landfill cover system replacement and associated facilities. The inspections and quarterly reports (four engineering inspections performed from July 2022 to June 2023) were performed in accordance with the approved "Long-Term Monitoring Plan, Los Alamos County Landfill Cover Replacement, Solid Waste Management Units 73-001(a,d), Technical Area 73." The remedy tasks were completed as described in the applicable completion reports.

The remedy elements inspected include the final cover system referred to as an evapotranspiration (ET) cover, inclusive of water-balance and methane monitoring; surface water control features; erosion controls; the debris disposal area; and site access. Construction of these remedy elements began on October 7, 2015, and was successfully installed and completed in accordance with the New Mexico Environment Department–approved 2015 "Work Plan for the Los Alamos County Airport Landfill Cover Replacement." Settlement surveys began in October 2017. Remedy elements completed by North Wind Group and Weston Solutions, Inc., including retaining structures along the eastern perimeter of the airport landfill and the side slopes of the previously completed landfill cover, were also inspected and included in checklists.

This monitoring report includes a summary of the inspections and any findings. The inspection checklists for each respective quarterly inspection are included. The water balance monitoring of the ET cover includes data collected continually since its installation. Methane monitoring recorded zero percent of the lower explosive limit. There were no exceedances of the established 1 in./hr precipitation intensity criterion during this monitoring period.

Differential settlement of the cover system is monitored in the form of quarterly elevation surveys. Settlement survey monuments were installed on August 31, 2017, to measure and quantify any differential settlement. Two tension cracks formed as a result of differential settlement. One tension crack in the northern half of the landfill running east-west with a maximum width of about 2 in. was repaired. A second, thinner, crack along the southern perimeter (also running east-west) self-healed and has not reappeared. Continued surveys have shown that settlement has considerably slowed since 2020.

Vegetation has uniformly emerged across the entire surface of the landfill. The growth of the vegetation is good. The emerging grasses vary from a couple of inches high to about 2.5 ft (before mowing). Los Alamos County personnel periodically mow the ET cover to limit the height of vegetation and discourage burrowing animals.

Water-balance monitoring of the ET cover revealed that with each precipitation event, rainfall infiltrated to varied depths within the cover system (a few inches to a couple of feet) but quickly dried thereafter. Matric-potential (soil suction) probes were replaced on May 19, 2017, with the most advanced sensors available from Decagon Devices, Inc.

Surface water control features appear to be working as designed with no degradation noted to date. Temporary erosion controls, including the erosion control blankets around the perimeter of the ET cover, have degraded past their usefulness but performed as expected during initial establishment of vegetation. Permanent erosion-control features, including the rock check dams and riprap-lined side slope east of the landfill, are all in good condition and functioning as designed. There did not appear to be any degradation of the retaining features along the eastern perimeter of the landfill.

The debris disposal area cover system appears to be stable currently with a maturing vegetation cover and no signs of significant degradation or settlement.

The cover systems are currently in good condition and working as designed.

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Acronyms

bgs	below ground surface
DDA	debris disposal area
DOE	Department of Energy (U.S.)
EM-LA	Environmental Management Los Alamos Field Office (DOE)
ET	evapotranspiration
FAA	Federal Aviation Administration
LAC	Los Alamos County
LEL	Lower Explosive Limit
NMED	New Mexico Environment Department
PRS	potential release site
SWMU	solid waste management unit

1.0 INTRODUCTION

The Los Alamos County (LAC) Airport Landfill Cover Replacement Project [Solid Waste Management Units (SWMUs) 73-001(a) and 73-001(d)] site elements were inspected and monitored in compliance with the approved "Long-Term Monitoring Plan, Los Alamos County Landfill Cover Replacement, Solid Waste Management Units 73-001(a,d), Technical Area 73" (DOE 2017, NMED 2017) (hereafter, the 2017 Long-Term Monitoring Plan). The "Remedy Completion Report, Los Alamos County Airport Landfill Cover Replacement" (DOE 2016) (hereafter, the Remedy Completion Report) was approved with modifications on December 22, 2016, by the New Mexico Environment Department (NMED) (NMED 2016). The 2017 Long-Term Monitoring Plan (DOE 2017) was approved on March 30, 2017 (NMED 2017). Generally, landfills regulated under the Resource Conservation and Resource Act are subject to a 30-yr post-closure monitoring period. However, under Title 40 of the Code of Federal Regulations, "Protection of Environment," Subpart 265.117 (Post-Closure Care and Use of Property), the period may be reduced or increased dependent on findings, the integrity of the closure, and agreement by applicable officials and regulators. Monitoring period changes are discussed in section 1.2 of this report.

The airport landfill project consisted of the design and construction of a replacement cover for the asphaltic cover previously installed in 2007 (North Wind and Weston 2007). The new cover system is a vegetated soil cover referred to as an evapotranspiration (ET) cover (DOE 2015). Details of the landfill design are found in the construction drawings, specifications, and calculations included in the Remedy Completion Report (DOE 2016).

A project file containing records of all inspections, monitoring, and maintenance performed is maintained by the U.S. Department of Energy (DOE) Environmental Management Los Alamos Field Office (EM-LA). An annual long-term monitoring report will be prepared and provided to the NMED each year. This document is the sixth annual report satisfying this requirement.

The name, address, and telephone number for the individual to contact during the post-closure period is as follows:

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Phone: (505) 414-0450
Email: cheryl.rodriguez@em.doe.gov

1.1 Background

The LAC Airport Landfill operated from 1943 to 1973 for the disposal of solid waste consisting of household trash from the Los Alamos townsite and office trash from Los Alamos Scientific Laboratory. From 1984 to 1986, wastes were excavated from the western portion of the LAC Airport Landfill [SWMU 73-001(a), Figure 1] and placed in the debris disposal area (DDA) located east of the landfill [SWMU 73-001(d), Figure 1].

In late 2006 and early 2007, a landfill cover system composed of asphalt and concrete hangar pads allowing for expansion of the airport hangar facilities was installed at the airport landfill in compliance with an NMED-approved work plan (North Wind 2004, NMED 2004) for remediation of this landfill [SWMU 73-001(a), Figure 1]. The final remedy design and completion activities for the landfill and the DDA [SWMU 73-001(d)] were provided in the North Wind Group (North Wind) and Weston Solutions, Inc. (Weston) "Remedy Completion Report DOE-LASO TA-73 Airport Landfill SWMUs 73-001(a) and

73-001(d)" (North Wind and Weston 2007) (hereafter the North Wind/Weston Remedy Completion Report). Subsequent inspections of the landfill beginning in 2009 through 2012 identified significant problems with the site and the newly installed asphalt cover system [SWMU 73-001(a)] including differential settlement greater than 2 ft, elevated methane gas, surface cracking, ponding, poor surface drainage, and significant infiltration of water into the underlying waste through cracking in the asphalt cover. The elevated methane measurements at the landfill in 2011 reached 100% of the lower explosive limit (LEL).

A site evaluation in 2012 (DOE 2012) determined that the cover system had severely degraded and required replacement. A work plan to replace the cover system was submitted to NMED in August 2015 (DOE 2015) with NMED approval with modifications received on August 14, 2015 (NMED 2015). The remedy included removal of the previously placed asphaltic cover and concrete hangar pads, relocation of waste from the far western portion to the remaining footprint within the landfill, placement of a new concrete hangar pad over the western portion from where the waste was relocated, and closure of the landfill with a cover system referred to as an ET cover. The replacement cover was successfully installed and completed in accordance with the NMED-approved work plan (NMED 2015) by July 1, 2016. Final design and completion activities are provided in the approved Remedy Completion Report (DOE 2016, NMED 2016). Figure 2 shows the replacement cover and associated facilities, along with the remaining 2007 remedy elements (North Wind and Weston 2007). Long-term monitoring began in October 2016 after completion of the replacement cover and is continuing under the NMED-approved 2017 Long-Term Monitoring Plan (DOE 2017; NMED 2017). This report satisfies the annual long-term reporting requirement specified in the 2017 Long-Term Monitoring Plan.

1.2 Purpose

The LAC Airport Landfill Cover Replacement Project site elements (Figure 2) were inspected in accordance with the approved 2017 Long-Term Monitoring Plan (DOE 2017, NMED 2017). The purpose of the inspections is to identify any areas of the site closure that may require repair to restore the intended functionality of the closure. The landfill cover as well as erosion and sedimentation control measures are inspected quarterly to assess the general condition of the closure system and identify any maintenance or repair issues. In addition to quarterly inspections, additional site inspections are conducted following significant precipitation events that exceed 1 in. in any given hour (the 100-yr, 1-hr design storm event is 2.17 in./hr).

An annual long-term monitoring report covers the annual period from July to June of the subsequent year and will be prepared and submitted to NMED by July 30. The annual report will include all inspection reports and all monitoring performed during the July to June period covered along with information related to any maintenance and/or repairs performed and a summary describing the cover performance for the period.

The approved Long-Term Monitoring Plan (DOE 2017; NMED 2017) specifies that water balance monitoring and cover inspections be performed on a quarterly basis for the 5-yr monitoring period. Water-balance monitoring is continuous with data downloaded from the data loggers during each quarterly inspection and reported in the respective quarterly inspection reports on the agreed-upon schedule. There are two water balance monitoring locations (Figure 3). At each water balance monitoring location there are five moisture content probes and five matric potential (soil suction) probes buried at intervals between 12 in. below ground surface (bgs) and 3.5 ft bgs (Figure 4). The intent of the probes is to monitor moisture movement within the cover profile.

The 2017 Long-Term Monitoring Plan (DOE 2017; NMED 2017) also specifies that methane monitoring be performed on a quarterly basis for the first 2 yr of long-term monitoring and that the frequency can be

reduced to a semiannual basis if the levels of methane recorded are below 25% of the LEL. Quarterly methane measurements were collected for 3 yr and were all 0% of LEL. The monitoring frequency was reduced to semiannual during the fourth year of monitoring and levels remained at 0% of LEL. The Long-Term Monitoring Plan further allowed for a further reduction to annual methane monitoring if methane levels remained below 25% of the LEL; consequently, the annual inspection reports starting with the fifth-year report all report on annual methane monitoring events.

2.0 SCOPE OF ACTIVITIES

In accordance with the 2017 Long-Term Monitoring Plan requirements (DOE 2017), this report summarizes the inspection of the following closure elements at the airport landfill:

- ET cover system including water balance, methane, biointrusion, and differential-settlement/crack monitoring;
- stormwater control system;
- airport fencing;
- retaining walls;
- erosion and sedimentation control measures;
- site access;
- site after significant precipitation event inspections; and
- DDA cover system

The results of the 2022–2023 monitoring and inspections are summarized in this report. The completed inspection checklists along with applicable photos are provided in Attachment A. A summary of the water balance monitoring performed to date is provided in Attachment B. Methane monitoring results are provided in Attachment C. Reports after high-intensity storm events (if any) are provided in Attachment D. Differential settlement survey and tension crack monitoring results (if any) are provided in Attachment E.

2.1 Evapotranspiration Cover and Debris Disposal Area Monitoring

The installed ET cover system was inspected quarterly (see Table 1) as described in section 4.1 of the Long-Term Monitoring Plan (DOE 2017). The monitoring activities are intended to verify the continued acceptable performance and identity any problems. Additionally, the formerly closed DDA cover system is also monitored visually to identify any potential issues that may arise. Details of the DDA closure are summarized in the North Wind/Weston Remedy Completion Report (North Wind and Weston 2007). Refer to Figures 1 and 2 for the location of inspected elements.

3.0 SUMMARY OF PERFORMANCE MONITORING RESULTS

The following subsections describe the specific elements inspected.

3.1 Evapotranspiration Cover

The general integrity of the ET cover system was inspected during each quarterly inspection. The top slope and side slopes of the landfill were examined for degradation of the cover system, such as erosion (as evidenced by rilling or gullying), quality and quantity of vegetation establishment, areas of subsidence,

biointrusion, cracking, slope instability, and wet areas. No significant erosion or significant biointrusion was identified. A significant surface crack appeared in the northern half of the cover system extending from west to east (refer to Attachment E for details). The crack appeared directly above and parallel to the waste trench that was part of the landfill. This crack was up to 1.5 in. wide and about 150 ft long. This crack was repaired with the final repair inspected on September 1, 2022. This area will be carefully inspected on all subsequent inspections.

Vegetation in seeded areas including the cover system was inspected for success based on type of vegetation and for approximate surface coverage based on visual observation and area of native vegetation seeded during the cover installation. Vegetation has uniformly emerged across the entire landfill. The growth of the vegetation is good although there is some unevenness in size. Existing subsurface moisture appears to be the dominant variable related to vegetation height at this time; this unevenness should diminish with time. The emerging grasses vary from a couple of inches high to over 2.0 ft (before mowing). Grasses are taller in areas that were wetter at the time of inspection, while the grass in the drier areas has relied predominantly on precipitation for its growth to date. The vegetation was visually monitored for continued robustness and unintended stresses such as oxygen deprivation due to excessive landfill gas. No unusual plant distress was identified.

3.1.1 Water Balance Monitoring

Water balance monitoring data of the ET cover were downloaded. These data are continually collected and stored on data loggers located at the monitoring locations until the data are manually downloaded during each quarterly inspection. This monitoring includes water content and soil suction within the cover profile at varied depths. Matric potential (soil suction) probes were replaced on May 19, 2017, with the most advanced sensors available via Decagon Devices, Inc. The second-generation sensor was designed to be more accurate in drier soils such as those expected at the site. The multiple probes within each location allow for monitoring of moisture movement within the cover profile. Two locations within the cover system are instrumented (Figure 3). The two locations provide south- and north-slope differences as well as duplication in case of instrumentation or software errors. Each set of probes is connected to on-site data loggers that compile the data to be downloaded. The summary and analysis of the data are submitted with this report as Attachment B.

Monitoring equipment at each of the two locations includes the following:

- Five each – 5TM water content probes by Decagon Devices, Inc.
- Five each – MPS-2 water potential probes by Decagon Devices, Inc.
- Two each – EM50 data loggers by Decagon Devices, Inc.

The water content probes allow for examination of water movement within the cover profile. The soil suction probes measure the matric potential in the soil and relate it to wetting fronts. The water balance monitoring to date shows infiltration immediately following precipitation events within the cover profile and subsequent drying of the cover soon after. The general trend of the cover appears to be drying (see Attachment B, Figures B-4 and B-5).

3.1.2 Methane Monitoring

Methane monitoring is performed at four locations (Figure 3). The methane monitoring consists of a single instantaneous measurement via a single-read calibrated instrument at each monitoring location for each inspection. The measurement units are reported in percent of LEL. Methane monitoring station #1 was placed within an area where waste was removed. Waste from the footprint of the newly constructed

concrete hangar pad was removed and relocated within the landfill before its installation. Waste was left in place (Figure 2) west of the northern edge of the concrete hangar pad. Methane monitoring station #1 is located to detect the potential migration of methane gas produced from this remaining waste into the removal area near the hangar, which could pose a hazard.

A vertical polyethylene liner was placed between the landfill waste and removal area where the new hangar pad was installed. This liner is intended to stop the potential lateral migration of methane gas from the landfill toward the airport hangars. Methane monitoring station #2 is in a clean area intended to identify methane migration from the landfill toward the hangars.

Methane monitoring station #3 is located on the landfill within the measurement zone for a prior methane measuring location (PS-2), which consistently received high methane measurements. Methane monitoring station # 4 is also located on the landfill within the measurement zone for another prior methane measuring location (PS-5), which also consistently received high methane measurements. Methane monitoring stations # 3 and # 4 each include a vertical riser installed into the underlying waste that rises above ground level where measurements are made. The methane was measured at the exit point of each methane riser on the established periodic basis to quantify methane release from the landfill.

If combustible gas-level measurements exceed 25% of the LEL in any riser near the airport hangar pad, or 100% of the LEL at the risers on the landfill, the owner or operator will do the following:

- immediately take all necessary steps to ensure protection of public health, welfare, and the environment and notify NMED;
- within 7 days of detection, record the methane gas levels detected and a description of the steps taken to protect public health, welfare, and the environment and report them to NMED.

To date, all measurements have been zero. Refer to Attachment C for details.

3.1.3 Biointrusion Monitoring

The ET cover surface layer is composed of a mixture of 25% rock to 75% soil by volume that discourages burrowing but does not prevent it. The Federal Aviation Administration (FAA) requires nearby fields including this landfill surface to be mowed to ensure that vegetation is less than 1 ft tall. The mowing is to be performed under the direction of the LAC airport manager and has multiple advantages for the cover system. Its purpose is to disrupt the landscape required for burrowing animals to effectively survive. The taller vegetation acts as a canopy to hide the smaller animals from predators such as coyotes and birds. The FAA requires the mowing, thus discouraging burrowing by smaller animals, because the presence of predators is a safety hazard with the airport boundary. A second advantage of the mowing is that it encourages the establishment of thinner and shallower rooting vegetation such as grasses and discourages the establishment of deeper, woody rooted plants including trees. The large woody roots of trees can provide preferential flow paths through soil covers. Significant burrowing will be reported in the attached inspection checklists (Attachment A) as well as to the LAC airport manager. Any animal burrows larger than 3 in. in diameter will be reported. These large burrow holes will also be filled as soon as possible with soil, meeting the cover soil specifications contained in the technical specifications section 02200 (Earthwork) of the Remedy Completion Report (DOE 2016).

As part of each inspection, the ET cover surface was visually monitored for animal or insect burrowing. To date, minimal biointrusion has been noted in the ET cover. Several animal burrows, generally 2-in. diameter or less, were noted on the side slopes. These occurrences are within expected tolerances and do not pose significant risk to the performance of the side-slope cover system.

3.1.4 Differential Settlement/Crack Monitoring

Differential settlement is a concern for the cover system because it is reflective of the subsurface conditions of the landfill including waste biodegradation and settlement. Furthermore, significant differential settlement can produce ponding and thus concentrated infiltration of surface water and potentially produce surface tension cracks that can allow for preferential flow through the cover system.

The surface of the landfill cover is surveyed quarterly. An evenly spaced grid was set up on the landfill cover whereby the elevation of each of 60 points making up this grid is surveyed each quarter. The change in elevation (drop in elevation) of the cover allows for the quantification of differential settlement along with the rate of settlement.

Attachment E includes summaries of quarterly settlement surveys conducted during the previous year. The settlement of the various point locations surveyed during the reporting period ranges from 0.0 ft to 1.44 ft. In general, the western portion of the landfill has experienced the least settlement, ranging from approximately 0.1 ft to 0.2 ft. The amount of settlement increases from west to east with the eastern portion settlement ranging from approximately 0.4 ft to 0.5 ft. This is consistent with waste being shallow on the west and increasing in depth toward the east. There is one location (point 34 – middle of the landfill about halfway down the northern slope) that experienced approximately 1.44 ft of settlement soon after placement of the ET cover. This isolated area still has positive drainage (no ponding). Positive drainage has been maintained during the entire of life of the ET cover to date even in the area of point 34 (Figure 6). In March 2018, a surface crack was seen in the general area. The crack was subsequently filled in with loose cover soil. Since this repair, the crack has reemerged. The surface crack is likely caused by surface tensile stresses from localized settlement. The crack runs along the perimeter of the presumed underlying waste trench. The crack was repaired and inspected in September 2022. (Refer to Attachment E for details.) Three quarterly inspections have been performed since the crack repair with no visible signs of the cracking reappearing (Attachment A).

3.2 Storm Water Control Systems

The storm water control systems, including perimeter ditches and other drainage controls, were noted to be in proper working condition with no degradation observed. The visual inspection looked for evidence of, or the potential for, degradation of the storm water conveyance system and/or pollutants entering the system.

If any of the issues are observed to be significant by the inspection engineer (New Mexico professional engineer), they are to be repaired as soon as weather permits. Repairs (if any) requiring additional material, such as riprap or soil, shall use locally available materials that meet the design technical specifications contained in the Remedy Completion Report (DOE 2016).

The general integrity of the landfill drainage channels and culverts was inspected. No degradation or problems were identified. The channels and the transition of the channels to Pueblo Canyon were inspected for evidence of degradation, erosion, subsidence, sediment accumulation, undercutting, obstructions, slope instability, and other disturbances to the channels.

3.3 Fencing

There were no fencing deficiencies identified. Fencing consists of airport perimeter fencing. The integrity of all fencing adjacent to the landfill and eastern retaining wall structures was inspected. This length of fencing was inspected for any damage, including but not limited to bent posts, loose posts, broken links or

wire, and damaged gates. Any damage noted will be noted in the inspection report and repaired as soon as weather permits.

3.4 Retaining Walls

No issues or deficiencies were identified in the retaining wall inspections. Visual inspections to assess for signs of degradation were performed for both the concrete and gabion retaining walls. Inspections include identifying the existence and extent of any cracks that may exist in the concrete wall. Inspections also look for any distortion in the wall due to unexpected settlement or soil piping.

3.5 Erosion and Sediment Control

The condition of permanent erosion control measures was inspected. This included the drainage channels, rock check dams, terraces, and riprap protecting the areas around the retaining structures along the eastern portion of the landfill. There was no damage or degradation noted. If any degradation or damage is observed in future inspections, this will be noted in the inspection reports along with recommended repair or maintenance for each occurrence. These reports or maintenance items are to be performed as soon as weather permits.

Condition of perimeter drains/berms, culverts, and drop inlets was inspected for presence of sediments, breaches in berms, presence of vegetation or debris, and changed conditions since the last inspection. No sediment or issues were identified. Identified sediments, vegetation, or debris retarding stormwater runoff in future inspections will be reported to the appropriate LAC and DOE personnel and then removed as needed.

3.6 Site Access

A permanent road dedicated to the landfill does not exist. However, access to continued monitoring, maintenance, and repairs, as necessary, has been granted by LAC. Access to the site through the locked gate is adequate and provides for desired isolation of the site. Prior notice must be given to the LAC airport manager before any maintenance or work is performed.

3.7 Site after Significant Precipitation Event Inspections

There were no high-intensity storm events (storms with intensity greater than 1 in. of precipitation per hour) during the 2022/2023 monitoring period. DOE's precipitation gauge station RG038 is located on the south side of the airport and is used for determination of precipitation at the landfill.

3.8 Debris Disposal Area Cover System

The DDA cover system is an earthen cover located east of the ET cover (Figures 1 and 2). It is approximately 5 acres in size and consists of a 12-in.-thick soil cover seeded with native vegetation. This work was completed before 2007 and is described in the North Wind/Weston Remedy Completion Report (North Wind and Weston 2007).

The cover appeared in good condition with no signs of ponding or vegetation distress. Vegetation is generally mature on the site and is mowed to comply with the maximum height of vegetation allowed per the FAA (approximately 12 in.). The minimal biointrusion noted on the DDA cover included a single ant hill and an approximately 2-in.-diameter animal burrow hole.

4.0 CONCLUSIONS AND RECOMMENDATIONS

The LAC Airport Landfill cover replacement and associated facilities are in good condition and performing as designed. All methane monitoring recorded zero percent of the LEL to date. The ET cover is in good condition with no signs of erosion, while vegetation is emerging as expected. There was not significant biointrusion in the cover systems. Stormwater controls are effective at controlling surface runoff from the site and efficiently routing it off-site though designated release points. The site access is effectively controlled by the airport fencing and locked access.

Differential settlement identified to date is as expected and has not created any ponding (Figure 6). The areas with the deepest amounts of buried waste have seen the most settlement. The area near point 34 (Attachment E) where about 1.44 ft of settlement was measured has stabilized. There has been no settlement in this area since late 2020 (Figure 5). The areas near point 20 also showed some continued settlement into 2021, but this settlement has essentially stopped since 2022 (Figure 5).

A surface tension crack caused by differential settlement was repaired and inspected in September 2022. The crack was directly above and parallel to one of the waste trenches that make up the airport landfill (Attachment E). Three quarterly inspections have been performed since the repair was made with no visible sign of the crack reappearing (Attachment A). Refer to Attachment E for details on settlement and repair of the crack.

The water balance data reveal that moisture infiltrates within the cover profile following precipitation events and quickly dries. The water balance data show that the landfill appears to be drying with an upward trend in matric potential in the cover system (Attachment B, Figures B-4 and B-5). Matric potential (soil suction) increases as moisture content decreases. This demonstrates the advantage of an ET cover for closure of the landfill because, as the soil suction increases, the energy gradients pulling moisture up and away from the waste increase. Continued measurement of the water balance of the cover systems should provide defensible data for the continued use of ET covers for closure of sites in the Los Alamos, New Mexico area.

Because the cover settlement has slowed or stopped and all elements are functioning as intended, DOE recommends that future inspections be conducted semiannually, in the spring (March or April) and the fall (September or October) seasons. Inspections following significant precipitation events should continue. The proposed inspection schedule will provide verification of system element efficacy following the most influential weather seasons. The spring inspection will provide verification that the freeze/thaw cycles experienced during the winter have not negatively impacted the cover and adjacent erosion control structures. The fall inspections and significant precipitation event inspections will be used to verify that no damage was incurred during the summer monsoon season.

The next annual report will be submitted to NMED by July 30, 2024.

5.0 REFERENCES

DOE (U.S. Department of Energy), August 2012. “Los Alamos County Airport Technical and Feasibility Study,” report prepared by Dwyer Engineering, LLC, for DOE Environmental Management Los Alamos Field Office, Los Alamos, New Mexico (DOE 2012).

DOE (U.S. Department of Energy), August 2015. “Work Plan for the Los Alamos County Airport Landfill Cover Replacement,” report prepared by Dwyer Engineering, LLC, for DOE Environmental Management Los Alamos Field Office, Los Alamos, New Mexico (DOE 2015).

DOE (U.S. Department of Energy), October 2016. "Remedy Completion Report, Los Alamos County Airport Landfill Cover Replacement," report prepared by Dwyer Engineering, LLC, for DOE Environmental Management Los Alamos Field Office, Los Alamos, New Mexico (DOE 2016).

DOE (U.S. Department of Energy), March 2017. "Long-Term Monitoring Plan, Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001(a,d), Technical Area 73," report prepared by Dwyer Engineering, LLC, for DOE Environmental Management Los Alamos Field Office, Los Alamos, New Mexico (DOE 2017).

NMED (New Mexico Environment Department), September 2, 2004. "Notice of Approval with Modifications of Phase II Work Plan for Los Alamos Site Office TA-73 Airport Landfill," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and G.P Nanos (LANL) from N. Schiavo (NMED-HWB) (NMED 2004).

NMED (New Mexico Environment Department), August 14, 2015. "Approval with Modifications Work Plan for Los Alamos County Airport Landfill Cover Replacement, Los Alamos National Laboratory," New Mexico Environment Department letter to C. Gelles, (DOE Los Alamos Field Office) from J.E. Kieling (NMED-HWB) (NMED 2015).

NMED (New Mexico Environment Department), December 22, 2016. "Approval with Modifications Submittal of the Remedy Completion Report for Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Unit 73-001 (a) Los Alamos National Laboratory," New Mexico Environment Department letter to D. Hintze (EM-LA) from J.E. Kieling (NMED-HWB) (NMED 2016).

NMED (New Mexico Environment Department), March 30, 2017. "Approval, Long-Term Monitoring Plan for the Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001(a,d) Technical Area 73, Los Alamos National Laboratory," New Mexico Environment Department letter to D. Hintze (EM-LA) from J.E. Kieling (NMED-HWB) (NMED 2017).

North Wind Group, April 2004. "Phase II Work Plan for Los Alamos Site Office TA-73 Airport Landfill," North Wind document number NW-ID-2004-031 (North Wind 2004).

North Wind Group and Weston Solutions, Inc., April 2007. "Remedy Completion Report DOE-LASO TA-73 Airport Landfill SWMUs 73-001(a) and 73-001(d)," North Wind document number NWI-4212-001 (North Wind and Weston 2007).

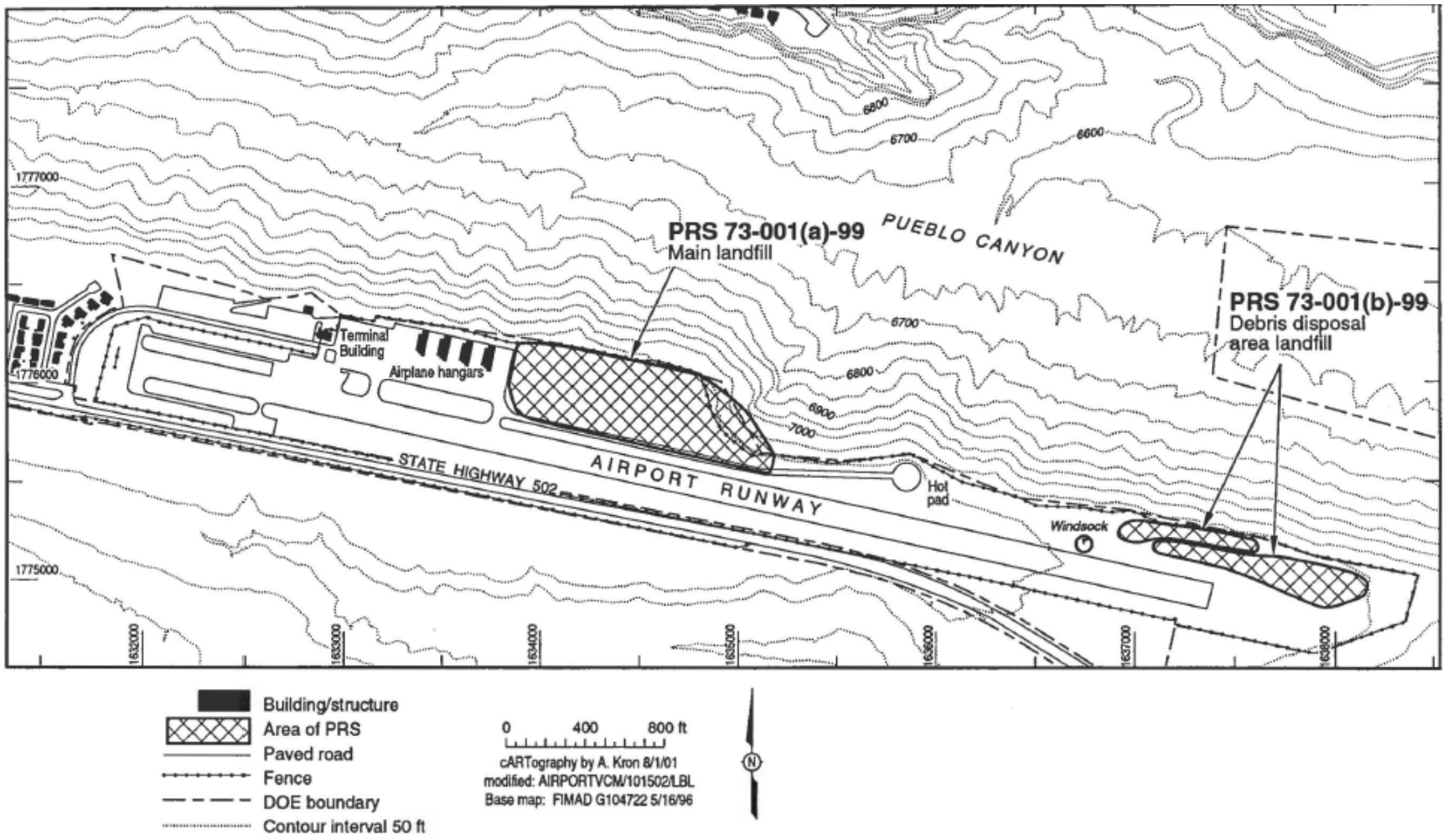


Figure 1 Airport landfill and debris disposal area locations

Figure 2 **Aerial photograph of the Los Alamos Airport runway including the landfill and portion of the debris disposal area**

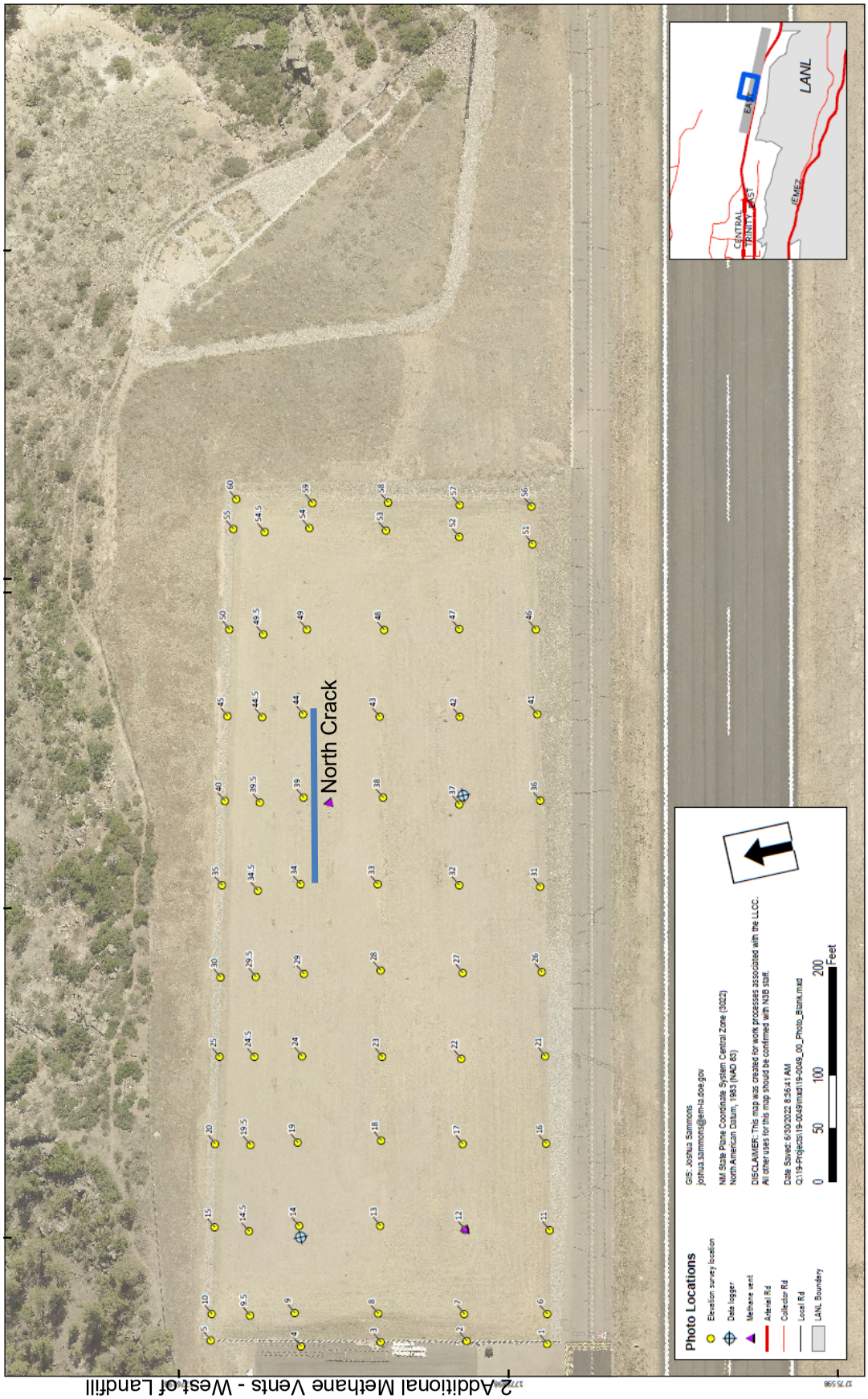


Figure 3 Instrumentation locations

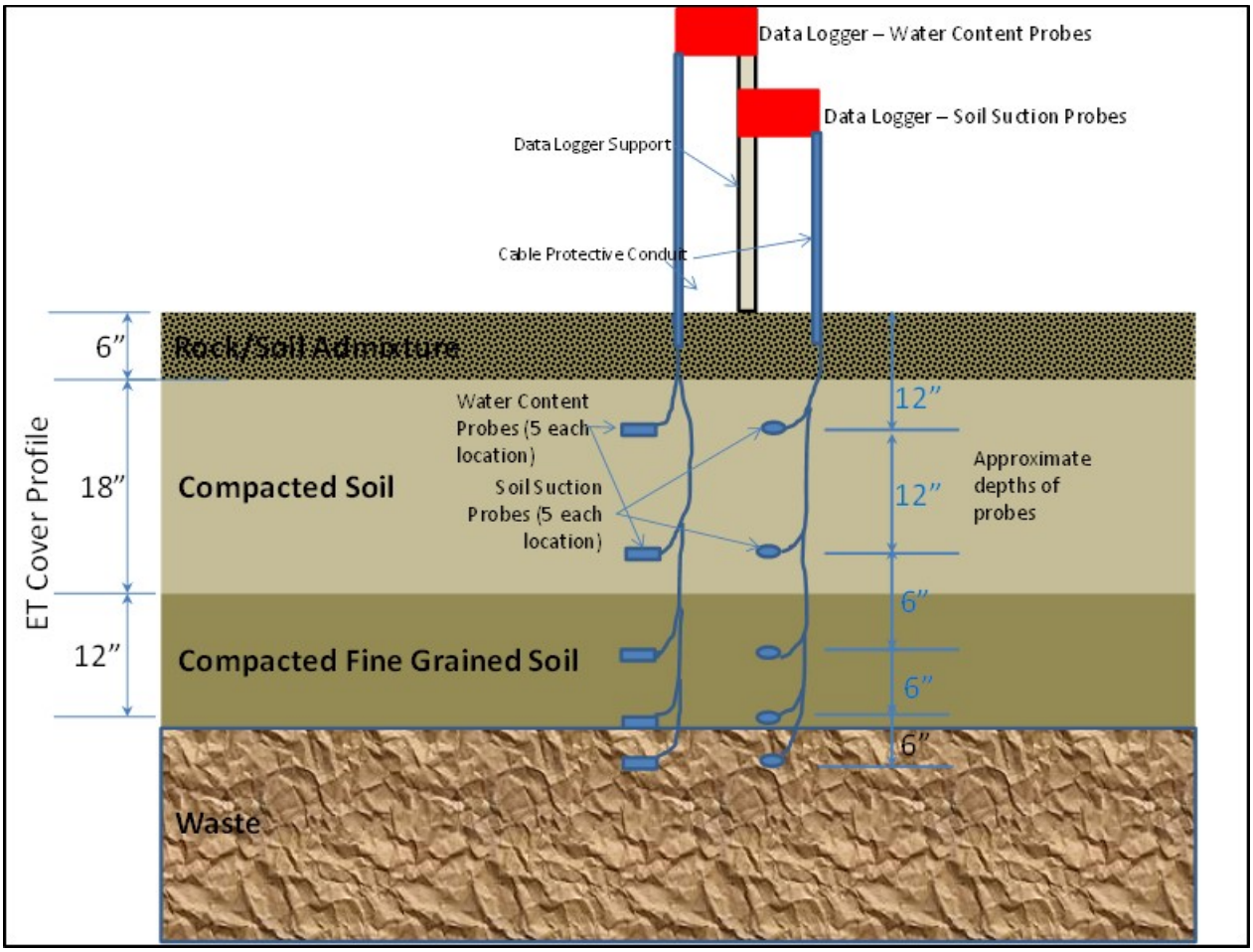


Figure 4 **Water balance instrumentation (figure not to scale)**

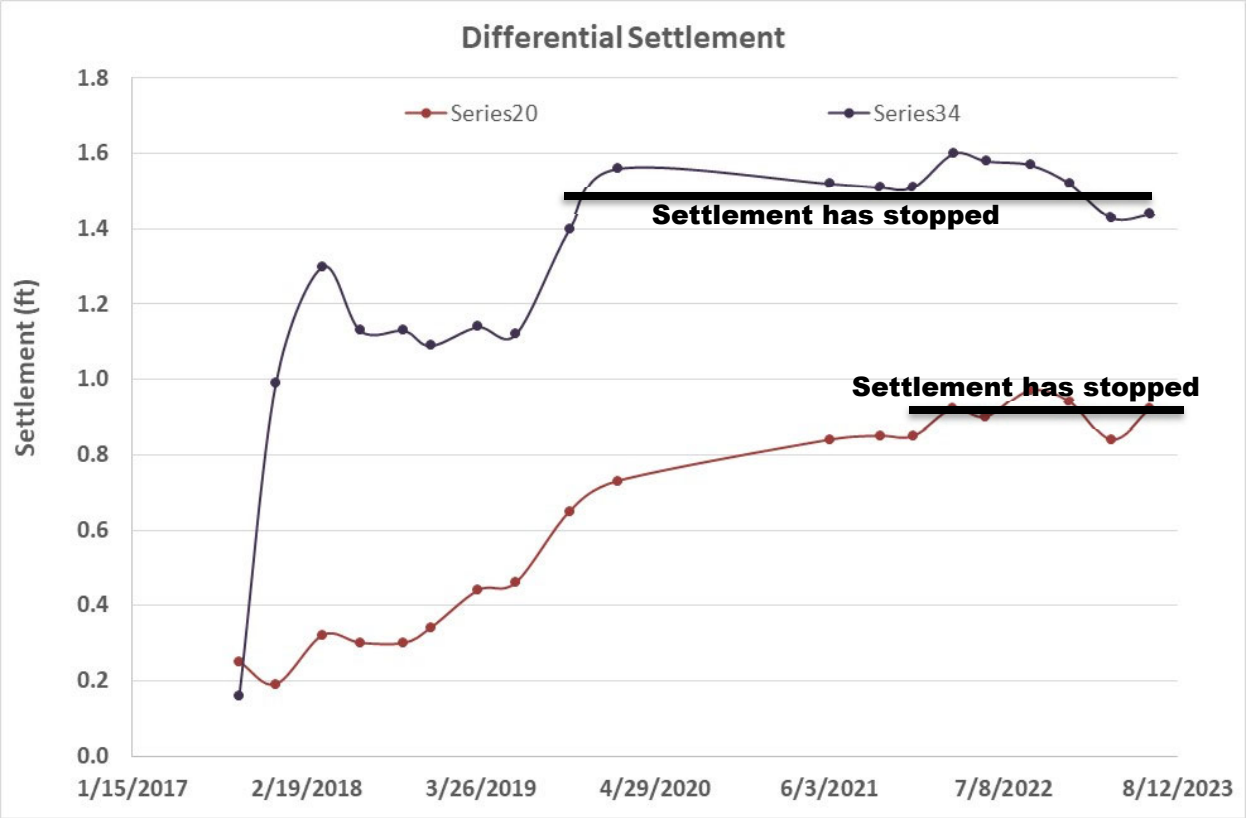
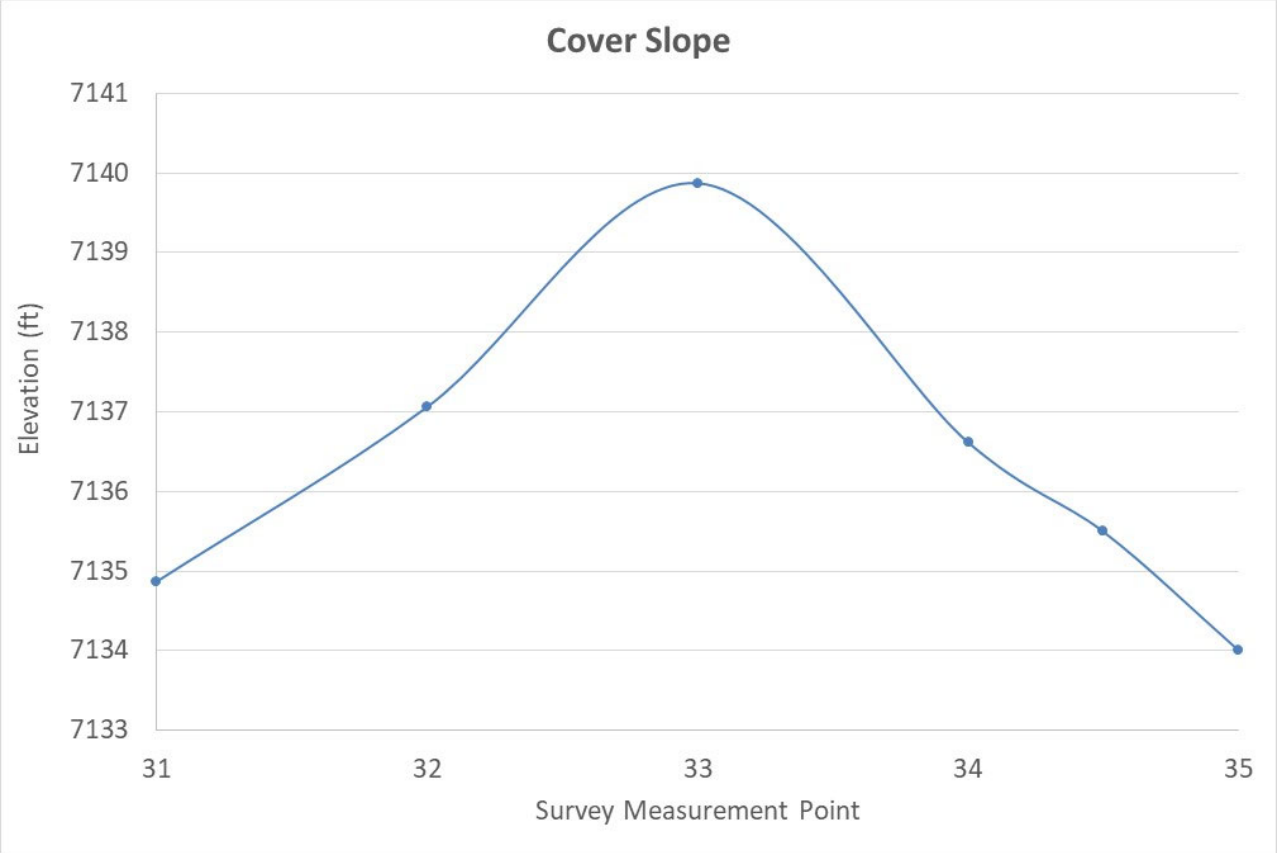


Figure 5 **Measured settlement at points 20 and 34**



Note: Cross section through cover surface including point 34 where most settlement has been measured indicates there is positive drainage – no ponding.

Figure 6 Elevation cross-section through area with most settlement

Table 1
Cover Inspections Performed

Monitoring Period	Inspection No.	Date
Year 7, Quarter 1 (Jul–Sep)	Inspection 25	September 8, 2022
Year 7, Quarter 2 (Oct–Dec)	Inspection 26	December 8, 2022
Year 7, Quarter 3 (Jan–Mar)	Inspection 27	March 15, 2023
Year 7, Quarter 4 (Apr–Jun)	Inspection 28	June 12, 2023

Note: Quarterly inspections are performed annually in March, June, September, and December.

Attachment A

Inspection Checklists and Photographs

1. Year 7, Quarter 1 Inspection 25 September 7, 2022
2. Year 7, Quarter 2 Inspection 26 December 8, 2022
3. Year 7, Quarter 3 Inspection 27 March 15, 2023
4. Year 7, Quarter 4 Inspection 28 June 12, 2023

Date: November 17, 2022 N3B-2022-0452

Cheryl Rodriguez
Soil and Water Remediation Federal Cleanup Director
U.S. Department of Energy
Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400
Los Alamos, New Mexico 87544

Subject: Contract Number 89303318CEM000007 – Submittal of the Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 1

Dear Ms. Rodriguez:

Enclosed please find the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) submittal of the quarterly inspection and maintenance report for the first quarter of monitoring year 7 for the Los Alamos County Airport Landfill cover and adjoining areas.

If you have any questions or need additional information, please contact David Diehl at (505) 551-2496 (david.diehl@em-la.doe.gov).

Sincerely,

Troy Thomson
Program Manager, Environmental Remediation

KR:ht

Enclosure(s): Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 1 (EM2022-0779)

cc: (letter and enclosure[s] emailed)
M. Lee Bishop, EM-LA
Sarah Eli Gilbertson, EM-LA
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LOS ALAMOS COUNTY AIRPORT LANDFILL INSPECTION AND MAINTENANCE REPORT: MONITORING YEAR 7, QUARTER 1

SUMMARY

This is the report of the twenty-fifth inspection (Monitoring Year 7, Quarter 1—inspection date: September 7, 2022) of the evapotranspiration (ET) cover and associated project elements for the Los Alamos County Airport Landfill. The inspections are performed in accordance with the "Long-Term Monitoring Plan, Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001(a,d), Technical Area 73" (March 2017). The construction of the cover system was completed in July 2016.

The spring of 2022 was drier than average in Los Alamos county. Rainfall during the 2022 summer monsoon season was at or above average and included one storm that was considered a significant precipitation event (greater than one inch in an hour) and triggered an interim inspection. No damage or areas requiring maintenance were observed during the significant precipitation event inspection. An inspection report was prepared and will be included in the annual summary report for monitoring year 7.

Two tension cracks on the landfill cover, detailed in previous inspection reports, were repaired in the period between the last inspection and this inspection. Following the repairs, the cover design Engineer of Record reviewed the repair records and visited the landfill for a visual inspection of the work. All conditions of the repair and revegetation were acceptable. A repair report was prepared and will be included in the annual summary report for monitoring year 7.

All features of the closure are currently in good condition. Vegetation is dense and thriving following the monsoon rain. No erosion issues were observed on the cover or side slopes. Minor biointrusion by small burrowing animals, not requiring attention at this time, was observed on the ET cover; no biointrusion was observed at the debris disposal area. The cover surface has eroded to a "desert pavement" surface and has stabilized with the growth of cover vegetation. All drainage systems are in good working condition.

Annual methane monitoring was not conducted during this inspection. Methane vents were intact and in good working condition. Three of the four water balance monitoring stations (soil moisture and soil suction) were in good working condition. One of the four water-balance monitoring stations was partially damaged by wildlife activity – one moisture probe cable was severed by wildlife (assumed to be an onsite coyote) and a second cable was dislodged from the datalogger. The severed cable and probe will be replaced before or during the next inspection; the dislodged cable was reconnected and confirmed to be operating properly. Soil moisture data was successfully downloaded from all of the dataloggers.

The ET cover elevation survey was performed to quantify differential settlement. The annual differential settlement values will be computed from the survey results, and will be included in the annual long-term monitoring report. In general, it appears there was no significant increase in differential settlement across the ET cover from the previous inspection survey.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1

Site Name: Los Alamos County Airport Landfill Cover Replacement	**Date of Inspection:** September 7, 2022
City: Los Alamos	**Weather:** Sunny
State: New Mexico	**Temperature:** 75 °F
Agency: U.S. Department of Energy	**Inspector:** David Diehl, PE
Site Element	Remarks
ET Cover	
Settlement (differential): ☒ Yes ☐ No **Low Spots (ponding):** ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Based on visual inspection, some differential settlement has occurred, predominantly soon after placement of the cover. Continued surveying of the site shows that settlement has slowed significantly. There does not appear to be any ponding associated with the settlement to date. The settlement survey grid was established to quantify differential settlement. The area with the highest differential settlement in past surveys is north of survey point 34, near the center of the northern half of the cover.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1 (continued)

Site Element	Remarks
Surface Cracks: ☐ Yes ☒ No Length: See remarks Width: See remarks Depth: See remarks Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** During a previous inspection (fourth quarter of monitoring, year four), a surface crack in the ET cover was observed in the north-central area of the cover. The crack was linear and oriented in an east-west direction, and extended from near survey grid point 34 to near survey grid point 44. A second, smaller tension crack along the southern boundary of the cover was also observed. The cracks were repaired in accordance with recommendations from the ET cover design Engineer of Record (Photos 1 and 2). The Engineer of Record has inspected the repairs and determined that the repairs and revegetation are acceptable.
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No significant erosion noted to date. The gravel/soil admixture top layer (6 in. thick), referred to as a “desert pavement,” has developed and appears to be working as designed to minimize erosion. The side slopes of the old landfill cover are in good condition with signs of only minor erosion. Erosion control measures that were installed during Year 3 of long-term monitoring are still intact and continue to function as intended.
Biointrusion Holes: ☒ Yes ☐ No Areal Extent: discrete locations scattered across the landfill cover Depth: unknown Suspected Cause (Rodent/Other): groundhogs Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Minor signs of biointrusion (small animal burrows) were noted on the ET cover. However, the size and extent of burrows do not require attention at this time.
Vegetation Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain: .	**Remarks:** Vegetation has full coverage on the cover system. The vegetation is predominantly native grasses, alfalfa, and clover. The summer monsoon season has been very active; the vegetation has recovered from the dry spring conditions and is thriving (Photos 3 to 6). The side slope of the older prescriptive cover appears to be well established and is dominated by grasses mixed with forbs. This area is not mowed because of the steepness of the slope. (Photo 7). The vegetation on the Debris Disposal Area (DDA) is active and has good coverage following the summer rains (Photos 8 and 9).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1 (continued)

Site Element	Remarks
Rill/Gully: ☐ Yes ☒ No Areal Extent: N/A Depth: N/A Suspected Cause: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No new erosion was noted during the inspection.
Wet Areas: ☐ Yes ☒ No Ponding: ☐ Yes ☒ No Areal Extent: Seeps: ☐ Yes ☒ No Areal Extent: Estimated Flow Rate: Soft Subgrade: ☐ Yes ☒ No Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The cover was uniformly dry during the inspection. No unusual wet areas were noted on the cover.
Slope Instability: ☐ Yes ☒ No Areal Extent: N/A Suspected Cause: Exposed Cover: ☐ Yes ☒ No Components: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No slope instability has been noted to date.
Water Balance Instrumentation: Functioning Properly: ☐ Yes ☒ No Damage: ☒ Yes ☐ No Repairs necessary: ☒ Yes ☐ No If yes, explain: The northwestern 6-in.-deep moisture-content probe requires replacement.	**Remarks:** One moisture-content probe appears to have failed and will require replacement. The other probes are in working condition. Moisture-monitoring data was successfully downloaded from the four dataloggers during the inspection.
Methane Monitoring Instrumentation: Functioning Properly: ☒ Yes ☐ No Damage: ☐ Yes ☒ No Repairs necessary: ☐ Yes ☒ No If yes, explain	**Remarks:** In accordance with the approved Long-Term Monitoring Plan (March 2017), methane monitoring is performed annually. The monitoring was not performed during this inspection. All of the methane vents are in good condition.
Rip Rap Lined Drainage Channels	
Settlement (Low Spots): ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Visual inspection confirmed that the drainage channels are in good condition and that no noticeable differential settlement has occurred (Photos 10 to 14).
Material Degradation: ☐ Yes ☒ No Material Type: Areal Extent: Degree of Degradation Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No material degradation was noted.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1 (continued)

Site Element	Remarks
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No erosion was noted.
Undercutting: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No undercutting was noted.
Obstructions: ☐ Yes ☒ No Type: Areal Extent: Size: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No obstructions were noted.
Slope Instability: ☐ Yes ☒ No Type: Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No slope instability was noted.
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was noted.
Drop Inlet Structures: Working Properly: ☒ Yes ☐ No Condition: Good Extent of Damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Drop inlet structures are in good condition (Photo 15).
Concrete Culvert	
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was noted.
Concrete Condition and Joints: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☐ Yes ☒ No If yes, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Concrete is in good condition.
Grating Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☒ Yes ☐ No If yes, explain: Sections of grating were removed, presumably stolen, from the north end of the culvert. Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement. Temporary plywood covers have been installed in the interim.	**Remarks:** Grating is in good condition. However, as noted in previous inspection reports, several sections of grating were missing from the north end of the culvert. The opening created by the missing grates was covered with plywood by airport personnel. This does not impact the performance of the culvert because the top of the culvert is above the surrounding terrain.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1 (continued)

Site Element	Remarks
Fencing	
Airport Fence Adjacent to Landfill: Bent posts: ☐ Yes ☒ No Loose posts: ☐ Yes ☒ No Broken links or wire: ☐ Yes ☒ No Damaged gates: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Airport fencing is in good condition and securing the site. This fencing is maintained by the County of Los Alamos.
Retaining Wall	
Retaining Wall Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain:	**Remarks:** Retaining walls are in good condition. No damage or issues were noted (Photos 16, 17, 20, and 23).
Retaining Wall Damage Description (if any): Issues Observed: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Repairs Necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Permanent Erosion & Sedimentation Control Measures	
Rip Rap Berm near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rip-rap drainage on the side slope is in good condition (Photos 18 and 19).
Rock Check Dams near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, displaced rock, or other damage: ☐ Yes ☒ No Description of damage: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rock check dams are in good condition (Photos 20 and 21).
Landfill Terrace above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The landfill terrace above the retaining walls is in good condition (Photo 22).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 1 (continued)

Site Element	Remarks
Drainage Channels adjacent to Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The drainage channels adjacent to the retaining wall appear to be in good condition and working properly (Photos 20, 22, and 23).
Gabion above Drainage Channels adjacent to Retaining Wall: Functioning: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The gabions above the drainage channels adjacent to the retaining walls are in good condition (Photos 24 and 25).
Site Access	
Access Restrictions: ☒ Yes ☐ No Description: Secured fence with keyed lock Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The site has controlled access with a security fence and locked gates.
Debris Disposal Area (DDA)	
Debris Disposal Area Condition: ☒ Good Condition ☐ Poor Condition Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The surface of the DDA cover system is in good condition (Photos 8 and 9). There is no observed degradation of the site.
General	
Vandalism: ☒ Yes ☐ No Description of damage: Steel grates missing (see "Concrete Culvert" section, above). Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement	**Remarks:** Concrete culvert steel grates are missing and presumed stolen.
Land Use Change: ☐ Yes ☒ No Description: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No land use changes.
Summary of Recommended Maintenance and/or Repairs	
Maintenance/Repairs Necessary: ☒ Yes ☐ No If yes, explain: Metal grates missing from the concrete culvert need to be replaced. One heat dissipation probe in the northwest instrument cluster requires replacement.	**Remarks:**
Other	
Continue monitoring erosion control devices (wattles) on the east slope of the old landfill cover.	

Figure 1 Locations and direction of photos on and around the ET cover

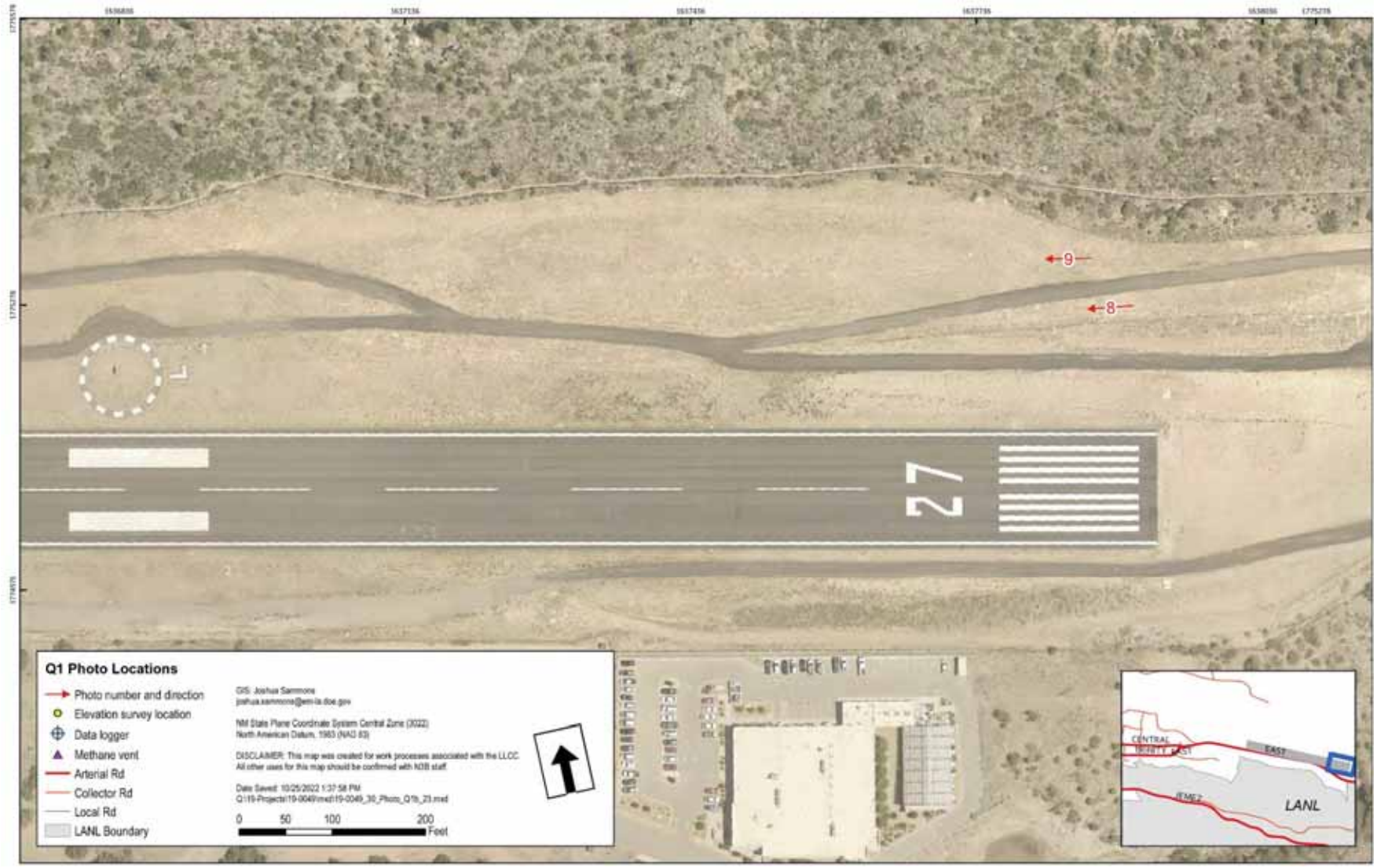

Figure 2 Locations and direction of photos at the Debris Disposal Area

Photo 1 Trenching during landfill cover crack repair. Photo taken August 15, 2022.

Photo 2 Repaired landfill cover tension crack. Photo taken August 16, 2022.

Photo 3 Vegetation on the north-western section of the ET cover, looking west

Photo 4 Vegetation on the central section of the ET cover, looking south

Photo 5 Vegetation on the north-central section of the ET cover, looking west

Photo 6 Vegetation on the east-central section of the ET cover, looking west

Photo 7 Vegetation on the eastern side slope, looking northwest

Photo 8 Southern side of Debris Disposal Area, looking west

Photo 9 Northern side of Debris Disposal Area, looking west

Photo 10 Northern drainage channel, looking east

Photo 11 Northern drainage channel, looking west

Photo 12 Eastern drainage channel, looking south

Photo 13 Eastern drainage channel, looking north

Photo 14 Southern drainage channel, looking west

Photo 15 Southern drainage channel drop inlet structure

Photo 16 Concrete retaining wall, looking northwest

Photo 17 Concrete retaining wall, looking southeast

Photo 18 Rip-rap berm (side-slope berm) above retaining wall, looking north

Photo 19 Rip-rap berm (side-slope berm) above retaining wall, looking west

Photo 20 Drainage channel, concrete retaining wall, and rock check dams, looking northwest

Photo 21 Rock check dams, looking northwest

Photo 22 Eastern terrace and drainage channels, looking northwest

Photo 23 Drainage channels adjacent to retaining wall, looking northwest

Photo 24 Southern gabion wall, looking south

Photo 25 Northern gabion wall, looking south

Date: N3B-2023-0046

Cheryl Rodriguez
Soil and Water Remediation Federal Cleanup Director
U.S. Department of Energy
Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400
Los Alamos, New Mexico 87544

Subject: Contract Number 89303318CEM000007 – Submittal of the Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 2

Dear Ms. Rodriguez:

Enclosed please find the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) submittal of the quarterly inspection and maintenance report for the second quarter of monitoring year 7 for the Los Alamos County Airport Landfill cover and adjoining areas.

If you have any questions or need additional information, please contact David Diehl at (505) 551-2496 (david.diehl@em-la.doe.gov).

Sincerely,

Troy Thomson
Program Manager, Environmental Remediation

KR:ht

Enclosure(s): Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 2 (EM2023-0072)

cc: (letter and enclosure[s] emailed)
M. Lee Bishop, EM-LA
Sarah Eli Gilbertson, EM-LA
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Brenda Bowlby
Juan Griego, N3B
Kim Lebak, N3B
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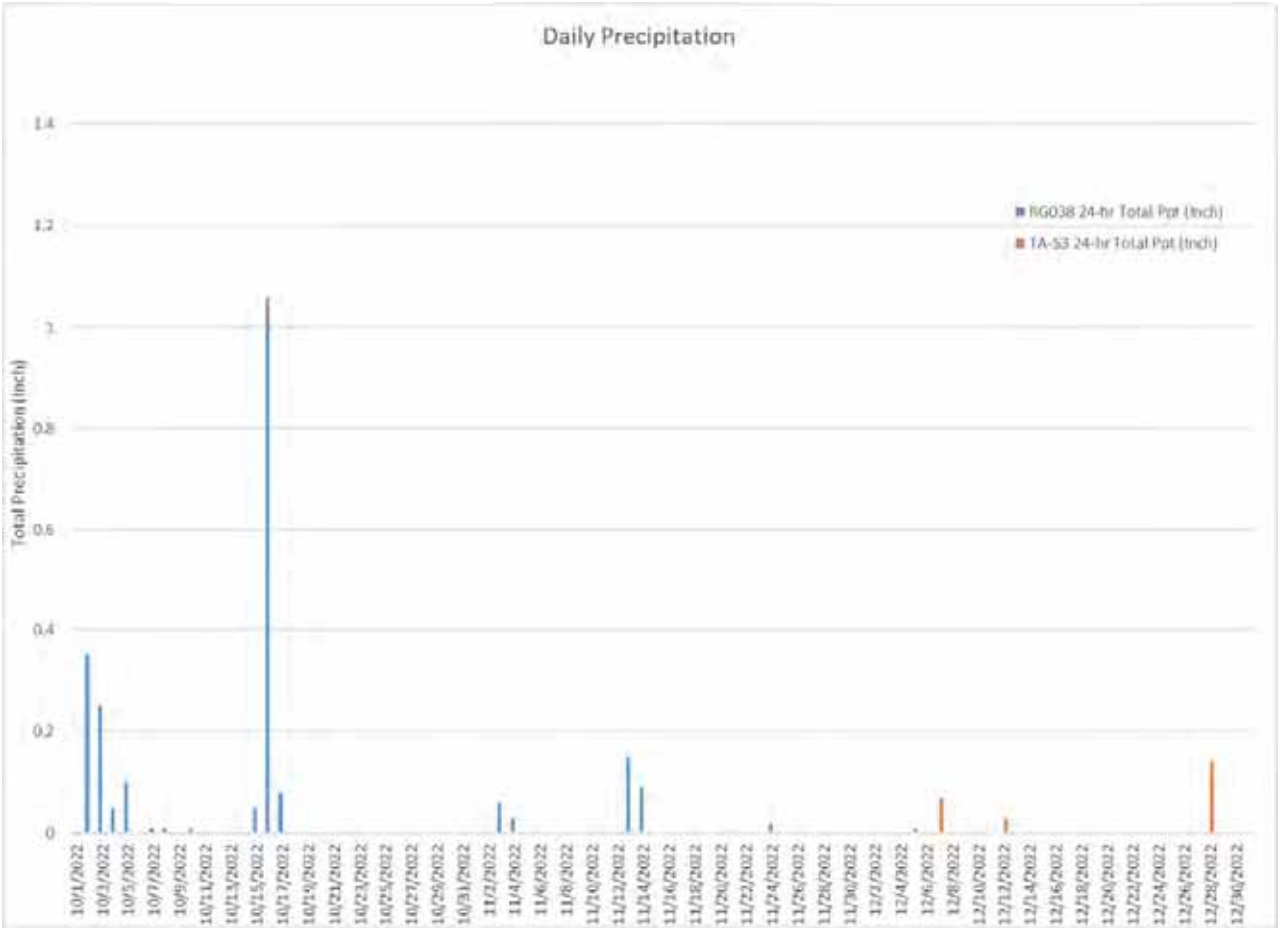
LOS ALAMOS COUNTY AIRPORT LANDFILL INSPECTION AND MAINTENANCE REPORT: MONITORING YEAR 7, QUARTER 2

SUMMARY

This is the twenty-sixth inspection (Monitoring Year 7, Quarter 2—inspection date: December 8, 2022) of the evapotranspiration (ET) cover and associated project elements for the Los Alamos County Airport Landfill. The inspections are performed in accordance with the "Long-Term Monitoring Plan, Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001 (a,d), Technical Area 73" (March 2017). The construction of the cover system was completed in July 2016.

During the monitoring period from October to December there was a total of 2.57 in. of precipitation as recorded at the RG038 and Technical Area 53 (TA-53) meteorological stations. The RG038 rain gage is shut down during the winter and the closest winter precipitation monitoring station is the TA-53 station. Precipitation for October and November were reported by RG038 and December was reported by TA-53. There were 19 precipitation events and the highest total precipitation of 1.06-in. occurred on October 16, 2022. This event was a low-intensity, long-duration event with a maximum 1-hr intensity of 0.27 in./hr. This intensity is well below the 1 in./hr inspection threshold. November and December were relatively dry with 0.53 in. of precipitation recorded over the 2-month period. No significant precipitation event inspections were triggered during the quarter.



All features of the closure are currently in good condition. The areas where tension cracks were repaired in August 2022 showed no returning signs of cracking. There were no other cracks on the landfill cover. The vegetation was mowed in the fall and was dormant. There are no erosion issues on the cover or side slopes. Minor biointrusion by small burrowing animals, not requiring attention at this time, was observed on the ET cover, and no biointrusion was observed at the debris disposal area (Figures 1 and 2). The cover surface has eroded to a desert pavement surface and has stabilized. All drainage systems are in good working condition.

Methane monitoring is performed annually and was not scheduled for this quarter. Therefore methane monitoring was not conducted during this inspection. Methane vents were intact and in good working condition. The four water balance monitoring (soil moisture and soil suction) stations were inspected. The southern station that measures soil matric potential was damaged by wildlife in late October and is currently offline. The other three stations were in good working condition and soil moisture data was successfully downloaded from all of the data loggers.

The ET cover elevation survey was performed to quantify differential settlement. The annual differential settlement values were evaluated to recent surveys and showed no significant increase in differential settlement across the ET cover. Additional analysis of the survey data will be included in the annual long-term monitoring report.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2

Site Name: Los Alamos County Airport Landfill Cover Replacement	**Date of Inspection:** December 8, 2022
City: Los Alamos	**Weather:** Clear, Sunny
State: New Mexico	**Temperature:** 40s
Agency: U.S. Department of Energy	**Inspector:** David Diehl, PE; Kevin Reid, PG
Site Element	Remarks
ET Cover	
Settlement (differential): ☐ Yes ☒ No **Low Spots (ponding):** ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The settlement survey grid was established to quantify differential settlement. The area with the highest differential settlement in past surveys is north of survey point 34, near the center of the northern half of the cover. Elevations of the 70 grid points were surveyed (Photo 1). During the current inspection, there was no new visible evidence of cover settlement. There was no evidence of ponding or low spots. There were no areas of concern with respect to settlement.
Surface Cracks: ☐ Yes ☒ No Length: See remarks Width: See remarks Depth: See remarks Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No surface cracks in the ET cover were observed. The crack repairs performed in August 2022 were inspected. There were no visible signs of new movement (separation) in the repaired cover material. The seed mix germinated and partially revegetated the disturbed areas (Photo 2). There was no compaction or subsidence of the fill material observed in the crack repairs.
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** There was no evidence of erosion from the landfill cover. There were no rills, pedestals, or incision points observed in the cover. There were no depositional packages of eroded material observed.
Biointrusion Holes: ☒ Yes ☐ No Areal Extent: discrete locations scattered across the landfill cover Depth: unknown Suspected Cause (Rodent/Other): rodent, possibly gopher Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** There was minor evidence of animal burrows on the landfill cover. There were also a few dormant anthills observed. The activity will continue to be monitored, but at this point it is insignificant and not in need of repair.
Vegetation Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:.	**Remarks:** The vegetation was mowed in the fall and is dormant. Overall the vegetation cover is dense ~50–70% following the summer rains. The vegetation is well established and is expected to return in spring (Photos 3 to 10).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2 (continued)

Site Element	Remarks
Rill/Gully: ☐ Yes ☒ No Areal Extent: N/A Depth: N/A Suspected Cause: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No evidence of rills or gullies were observed on the landfill cover.
Wet Areas: ☐ Yes ☒ No Ponding: ☐ Yes ☒ No Areal Extent: Seeps: ☐ Yes ☒ No Areal Extent: Estimated Flow Rate: Soft Subgrade: ☐ Yes ☒ No Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No wet areas were observed.
North and East Slopes Instability: ☐ Yes ☒ No Areal Extent: N/A Suspected Cause: Exposed Cover: ☐ Yes ☒ No Components: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The slopes were observed to be in stable condition with no evidence of erosion, slumping, or cracking (Photos 7 to 10).
Water Balance Instrumentation: Functioning Properly: ☐ Yes ☒ No Damage: ☒ Yes ☐ No Repairs necessary: ☒ Yes ☐ No If yes, explain: The cables for the southern matric potential station were damage by wildlife and may require repair.	**Remarks:** The north water balance instrument station was repaired in the fall, September 8, 2022. Two cables were reconnected after they were damaged by wildlife. Data were downloaded and all probes appeared to be functional. Upon data review, Probe #3 is not functioning correctly and requires maintenance. In the period since the prior inspection, the southern moisture monitoring station was damaged by wildlife (Photo 11). Upon data review, the matric potential station stopped recording data on October 26, 2022, due to cable damage. The moisture content station was fully functional and in good condition. Rigid protective devices were placed over both instrument stations in an attempt to protect them from future damage by wildlife.
Methane Monitoring Instrumentation: Functioning Properly: ☒ Yes ☐ No Damage: ☐ Yes ☒ No Repairs necessary: ☐ Yes ☒ No If yes, explain	**Remarks:** Methane monitoring was not performed during this inspection as it is only required annually. The vents were inspected and are in good condition.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2 (continued)

Site Element	Remarks
Rip Rap Lined Drainage Channels	
Settlement (Low Spots): ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rip-rap lined channels were in excellent condition and there was no observable sedimentation within the channels (Photos 12 to 16).
Material Degradation: ☐ Yes ☒ No Material Type: Areal Extent: Degree of Degradation Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No material degradation was noted.
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No erosion was noted.
Undercutting: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No undercutting was noted.
Obstructions: ☐ Yes ☒ No Type: Areal Extent: Size: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No obstructions were noted.
Slope Instability: ☐ Yes ☒ No Type: Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No slope instability was noted.
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was noted.
Drop Inlet Structures: Working Properly: ☒ Yes ☐ No Condition: Extent of Damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Structures are clear of debris and in good condition (Photo 17).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2 (continued)

Site Element	Remarks
Concrete Culvert	
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was observed.
Concrete Condition and Joints: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☐ Yes ☒ No If yes, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Concrete is in good condition (Photo 18).
Grating Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☒ Yes ☐ No If yes, explain:33' of grating are missing at the north end of the culvert. Grates were stolen. Repairs necessary: ☒ Yes ☐ No If yes, explain: grates will require replacement.	**Remarks:** Grating is in good condition (Photo 18).
Fencing	
Airport Fence Adjacent to Landfill: Bent posts: ☐ Yes ☒ No Loose posts: ☐ Yes ☒ No Broken links or wire: ☐ Yes ☒ No Damaged gates: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Airport fencing is in good condition and securing the site. This fencing is maintained by the County of Los Alamos.
Retaining Wall	
Retaining Wall Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain:	**Remarks:** Retaining walls are in good condition. No damage or issues were noted (Photos 19 and 20).
Retaining Wall Damage Description (if any): Issues Observed: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Repairs Necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** None

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2 (continued)

Site Element	Remarks
Permanent Erosion & Sedimentation Control Measures	
Rip Rap Berm near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rip-rap drainage on the side slope is in good condition (Photos 21 and 25).
Rock Check Dams near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, displaced rock, or other damage: ☐ Yes ☒ No Description of damage: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rock check dams are in good condition (Photos 23 and 24). Minor rills in the bare ground between rock check dams were noted on the upper slope (Photo 23) and some sediment was deposited on the lower slope. This condition does not appear to have changed since the previous inspection. No maintenance or repairs are necessary.
Landfill Terrace above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The landfill terrace above the retaining walls is in good condition (Photo 25).
Drainage Channels adjacent to Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The drainage channels adjacent to the retaining wall appear to be in good condition and working properly (Photo 26).
Gabion above Drainage Channels adjacent to Retaining Wall: Functioning: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The gabions above drainage channels adjacent to the retaining walls are in good condition.
Site Access	
Access Restrictions: ☒ Yes ☐ No Description: Secured fence with keyed lock Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The site has controlled access with a security fence and locked gates.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 2 (continued)

Site Element	Remarks
Debris Disposal Area (DDA)	
Debris Disposal Area Condition: ☒ Good Condition ☐ Poor Condition Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The surface of the DDA cover system is in good condition. The vegetation on the DDA is dormant but has good coverage (Photos 27 to 30). There is no observed degradation of the site.
General	
Vandalism: ☐ Yes ☒ No Description of damage: Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement	**Remarks:** Concrete culvert steel grates are missing and presumed stolen.
Land Use Change: ☐ Yes ☒ No Description: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No land use changes.
Summary of Recommended Maintenance and/or Repairs	
Maintenance/Repairs Necessary: ☒ Yes ☐ No If yes, explain: The southern moisture monitoring station needs to be repaired or abandoned if it is no longer needed.	**Remarks:** One moisture monitoring station was damaged by wildlife and has been offline since October 26, 2022.
Other	
None	

Figure 1 Locations and direction of photos on and around the ET cover

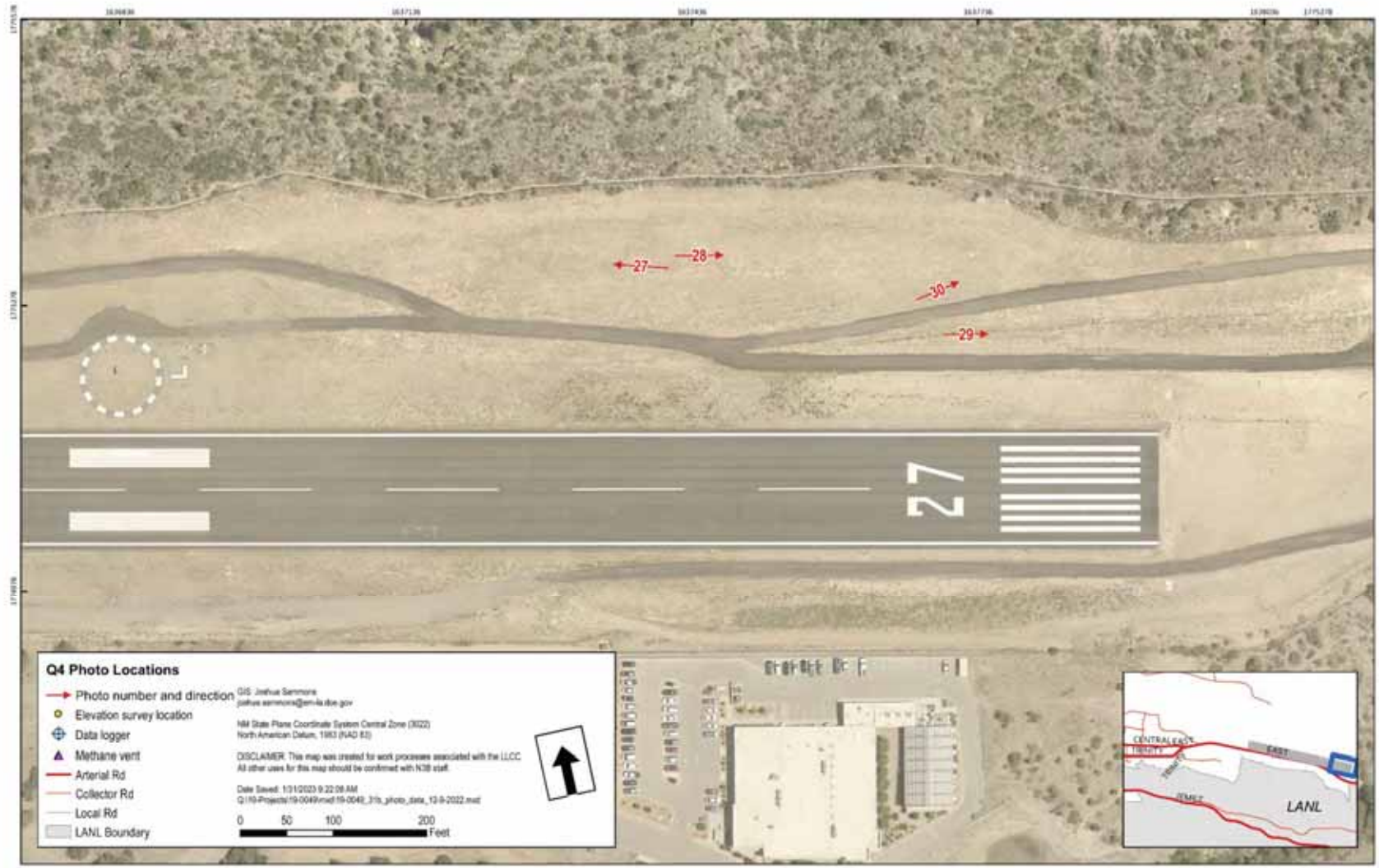


Figure 2 Locations and direction of photos at the Debris Disposal Area

Photo 1 Survey crew recording elevation of settlement survey grid point

Photo 2 Repaired tension crack on the landfill cover near Survey Point 24, looking east

Photo 3 Vegetation on the central section of the ET cover, looking east

Photo 4 Vegetation on the northern section of the ET cover, looking east

Photo 5 Vegetation on the northern and central sections of the ET cover, looking southwest

Photo 6 Vegetation on the southern and central sections of the ET cover, looking west

Photo 7 Vegetation on the upper section of the eastern side slope, looking north

Photo 8 Vegetation on the upper section of the eastern side slope, looking east

Photo 9 Vegetation on the lower section of the eastern side slope, looking north

Photo 10 Vegetation on the lower section of the eastern side slope, looking east

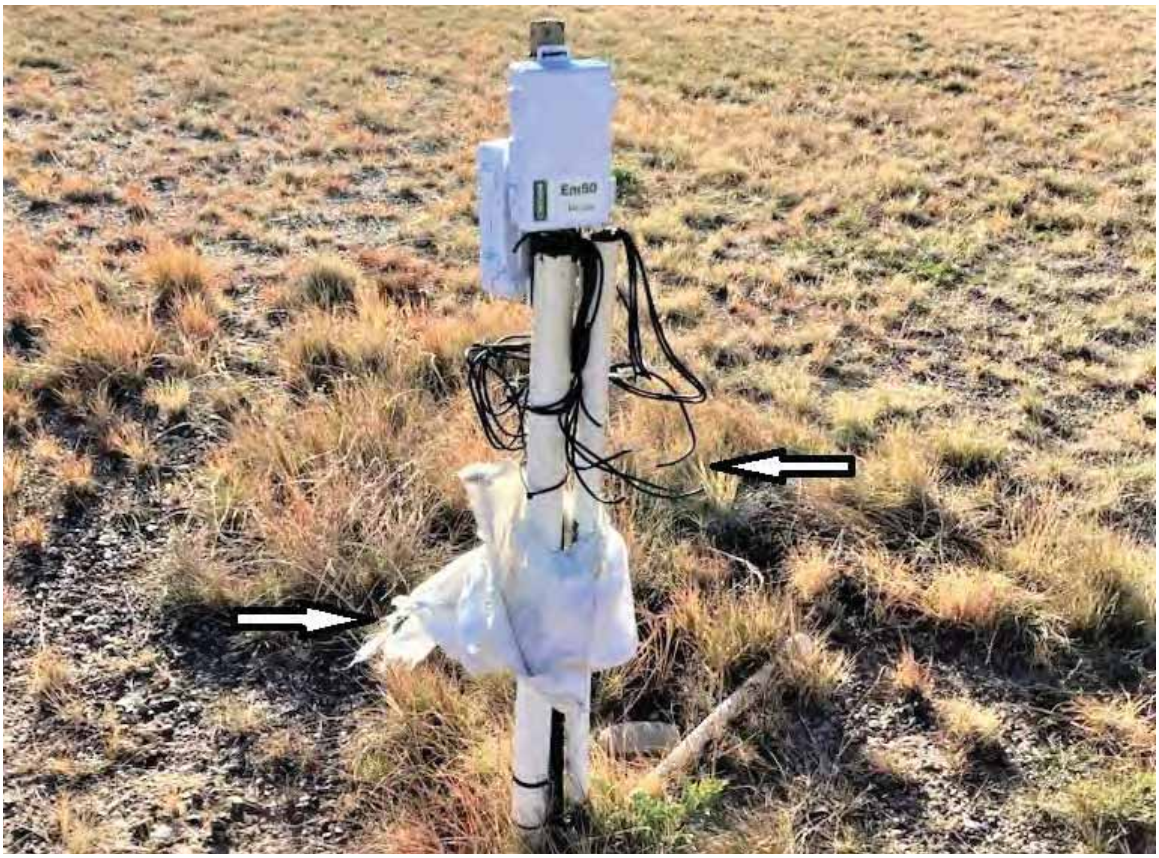


Photo 11 Damaged moisture monitoring station (note severed cables and damaged cover)

Photo 12 Northern drainage channel, looking east

Photo 13 Northern drainage channel, looking west

Photo 14 Eastern drainage channel, looking south

Photo 15 Eastern drainage channel, looking north

Photo 16 Southern drainage channel, looking west

Photo 17 Southern drainage channel inlet structure

Photo 18 Concrete culvert, looking south

Photo 19 Concrete retaining wall, looking northwest

Photo 20 Concrete retaining wall, looking southeast

Photo 21 Rip-rap berm (side-slope berm) above retaining wall, looking north

Photo 22 Rip-rap berm (side-slope berm) above retaining wall, looking east

Photo 23 Rock check dams, looking northwest

Photo 24 Rock check dams, looking northwest

Photo 25 Eastern terrace, rock check dams, and retaining wall, looking southeast

Photo 26 Drainage channel adjacent to concrete retaining wall, looking southeast

Photo 27 Northern side of the western end of the Debris Disposal Area, looking west

Photo 28 Northern side of the western end of the Debris Disposal Area, looking east

Photo 29 Southern side of the eastern end of the Debris Disposal Area, looking east.

Photo 30 Northern side of the eastern end of the Debris Disposal Area, looking northeast

Date: May 17, 2023 N3B-2023-0131

Cheryl Rodriguez
Soil and Water Remediation Federal Cleanup Director
U.S. Department of Energy
Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400
Los Alamos, New Mexico 87544

Subject: Contract Number 89303318CEM000007 – Submittal of the Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 3

Dear Ms. Rodriguez:

Enclosed please find the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) submittal of the quarterly inspection and maintenance report for the third quarter of monitoring year 7 for the Los Alamos County Airport Landfill cover and adjoining areas.

If you have any questions or need additional information, please contact David Diehl at (505) 551-2496 (david.diehl@em-la.doe.gov).

Sincerely,

Troy Thomson
Program Manager, Environmental Remediation

DD:ht

Enclosure(s): Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 3 (EM2023-0268)

cc: (letter and enclosure[s] emailed)
M. Lee Bishop, EM-LA
Sarah Eli Gilbertson, EM-LA
Brian Harcek, EM-LA
Kara Hetrick, EM-LA
Tyler Ingalls, EM-LA
John Loughead, EM-LA
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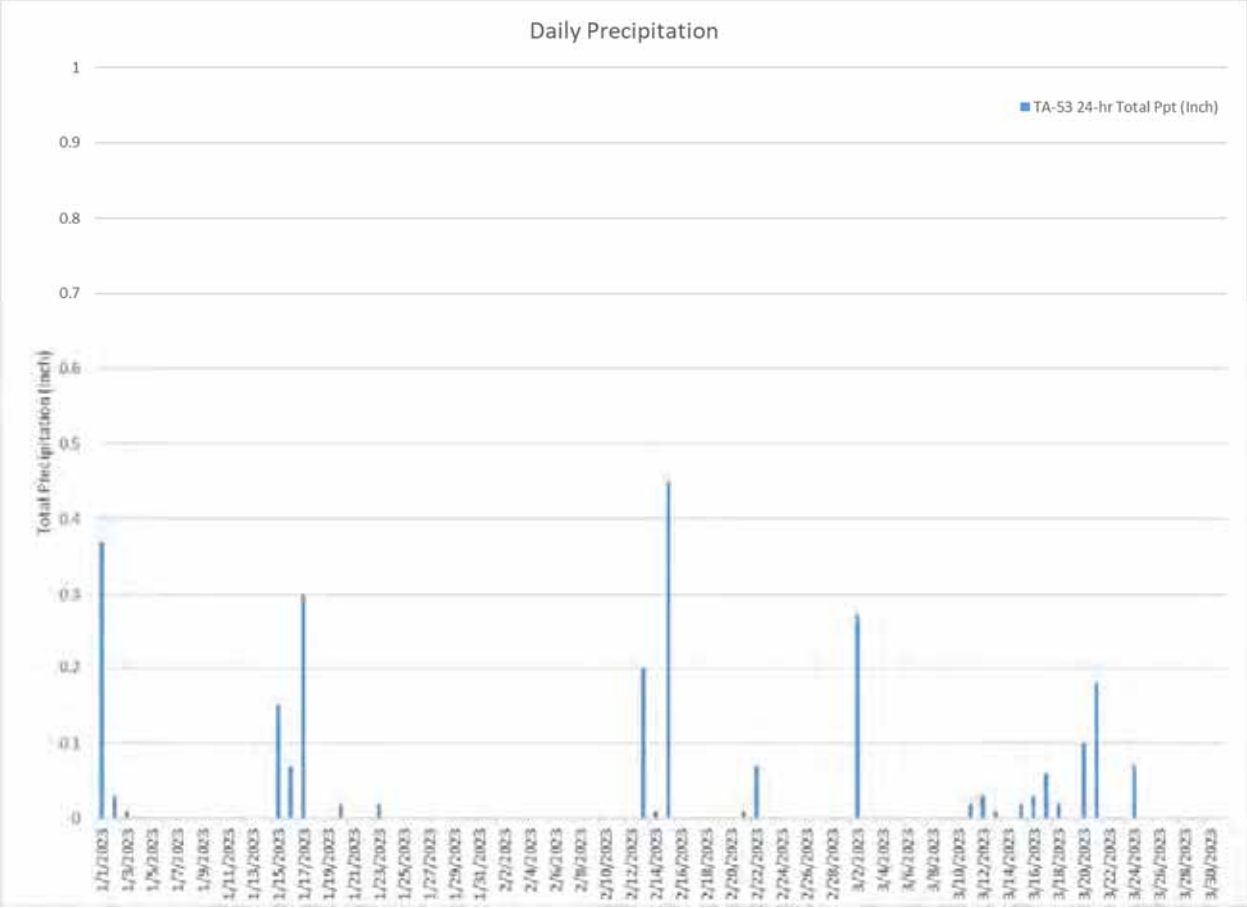
LOS ALAMOS COUNTY AIRPORT LANDFILL INSPECTION AND MAINTENANCE REPORT: MONITORING YEAR 7, QUARTER 3

SUMMARY

This is the twenty-seventh inspection (Monitoring Year 7, Quarter 3—inspection date: March 15, 2023) of the evapotranspiration (ET) cover and associated project elements for the Los Alamos County Airport Landfill. The inspections are performed in accordance with the "Long-Term Monitoring Plan, Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001 (a,d), Technical Area 73" (March 2017). The construction of the cover system was completed in July 2016.

For most of the year, rain gage RG038 is used to determine if a significant precipitation event has occurred at the airport. This gage is shut down during the winter months and the closest winter precipitation monitoring station is the Technical Area 53 (TA-53) meteorological station. During the monitoring period from January to March, there was a total of 2.52 in. of water-equivalent precipitation recorded at the TA-53 station, mostly in the form of snow. Because the precipitation was in the form of snow and the rain events did not exceed 1.0 in./hr, there were no significant precipitation event inspections triggered during the quarter.



All features of the landfill closure system are currently in good condition. The areas where tension cracks were repaired in August 2022 showed no returning signs of cracking. There were no other cracks on the landfill cover. The vegetation was mowed in the fall and was dormant. There are no erosion issues on the cover or side slopes. Minor biointrusion by small burrowing animals, not requiring attention at this time, was observed on the ET cover; and no biointrusion was observed at the debris disposal area. The cover surface has eroded to a “desert pavement” surface and has stabilized. All drainage systems are in good working condition.

Methane monitoring is performed annually and monitoring was performed during this inspection. No methane gas was detected in any of the four methane vents. Methane vents were intact and in good working condition. The four water balance monitoring (soil moisture and soil suction) stations were inspected. The southern station that measures soil matric potential was damaged by wildlife in late October and is currently offline. Repairs to this station are planned in the spring of 2023. The other three stations were in good working condition and soil moisture data were successfully downloaded from all of the data loggers.

The ET cover elevation survey was performed to quantify differential settlement. The annual differential settlement values were evaluated against recent surveys, which showed there was no significant increase in differential settlement across the ET cover. Additional analysis of the survey data will be included in the annual long-term monitoring report.

Photographs of the landfill and related closure features were collected during the inspection and are attached to this report along with photo location logs (Figures 1 and 2).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3

Site Name: Los Alamos County Airport Landfill Cover Replacement	**Date of Inspection:** March 15, 2023
City: Los Alamos	**Weather:** Partly cloudy
State: New Mexico	**Temperature:** Low 50s
Agency: U.S. Department of Energy	**Inspector:** David Diehl, PE; Kevin Reid, PG
Site Element	Remarks
ET Cover	
Settlement (differential): ☐ Yes ☒ No **Low Spots (ponding):** ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The settlement survey grid was established to quantify differential settlement. The area with the highest differential settlement in past surveys is north of survey point 34, near the center of the northern half of the cover. Elevations of the 70 grid points were surveyed. During the current inspection, there was no new visible evidence of cover settlement. There was no evidence of ponding or low spots. There were no areas of concern with respect to settlement.
Surface Cracks: ☐ Yes ☒ No Length: See remarks Width: See remarks Depth: See remarks Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No surface cracks in the ET cover were observed. There were, however, signs of winter freeze-thaw soil lofting and desiccation. These minor surface cracks are visible in some of the inspection photos but nothing of concern was noted in the field. The crack repairs performed in August 2022 were inspected. There were no visible signs of new movement (separation) in the repaired cover material. The seed mix germinated and partially revegetated the disturbed areas (Photo 1).
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** There was no evidence of erosion from the landfill cover. There were no rills, pedestals, or incision points observed in the cover. There were no depositional packages of eroded material observed.
Biointrusion Holes: ☒ Yes ☐ No Areal Extent: discrete locations scattered across the landfill cover Depth: unknown Suspected Cause (Rodent/Other): rodent, possibly gopher Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** There was minor evidence of animal burrows on the landfill cover. There were also a few dormant anthills observed. The burrowing activity will continue to be monitored, but at this point it is insignificant and not in need of repair.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3 (continued)

Site Element	Remarks
Vegetation Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:.	**Remarks:** The vegetation was mowed in the fall and is dormant. Overall the vegetation cover is dense ~50–70%. The vegetation is well established and is expected to return in spring (Photos 2 to 4).
Rill/Gully: ☐ Yes ☒ No Areal Extent: N/A Depth: N/A Suspected Cause: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No evidence of rills or gullies was observed on the landfill cover.
Wet Areas: ☐ Yes ☒ No Ponding: ☐ Yes ☒ No Areal Extent: Seeps: ☐ Yes ☒ No Areal Extent: Estimated Flow Rate: Soft Subgrade: ☐ Yes ☒ No Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No wet areas were observed.
North and East Slopes Instability: ☐ Yes ☒ No Areal Extent: N/A Suspected Cause: Exposed Cover: ☐ Yes ☒ No Components: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The slopes were observed to be in stable condition with no evidence of erosion, slumping, or cracking (Photos 5 to 9).
Water Balance Instrumentation: Functioning Properly: ☐ Yes ☒ No Damage: ☒ Yes ☐ No Repairs necessary: ☒ Yes ☐ No If yes, explain: The cables for the southern matric potential station were damage by wildlife and may require repair. Repair cables have been procured and repairs are pending.	**Remarks:** The north water balance instrument station was repaired in the fall, September 8, 2022. Two cables were reconnected after they were damaged by wildlife. Data were downloaded and all probes appeared to be functional (Photo 10). Upon data review, Probe #3 is not functioning correctly and requires maintenance. The southern moisture monitoring station was damaged by wildlife and stopped recording data on October 26, 2022, due to cable damage. The moisture content station was fully functional and in good condition. Replacement cables have been ordered and the system repairs are expected to be performed in early spring 2023. Rigid protective devices were placed over both instrument stations in an attempt to protect them from future damage by wildlife.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3 (continued)

Site Element	Remarks
Methane Monitoring Instrumentation: Functioning Properly: ☒ Yes ☐ No Damage: ☐ Yes ☒ No Repairs necessary: ☐ Yes ☒ No If yes, explain	**Remarks:** Methane monitoring was performed during this inspection and no methane was detected in any of the methane vents. The vents were inspected and are in good condition (Photo 11).
Rip Rap Lined Drainage Channels	
Settlement (Low Spots): ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The riprap-lined channels were in excellent condition and there was no observable sedimentation within the channels (Photos 12 to 14).
Material Degradation: ☐ Yes ☒ No Material Type: Areal Extent: Degree of Degradation Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No material degradation was noted.
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No erosion was noted.
Undercutting: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No undercutting was noted.
Obstructions: ☐ Yes ☒ No Type: Areal Extent: Size: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No obstructions were noted.
Slope Instability: ☐ Yes ☒ No Type: Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No slope instability was noted.
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was noted.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3 (continued)

Site Element	Remarks
Drop Inlet Structures: Working Properly: ☒ Yes ☐ No Condition: Extent of Damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Structures are clear of debris and in good condition (Photo 15).
Concrete Culvert	
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was observed.
Concrete Condition and Joints: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☐ Yes ☒ No If yes, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Concrete is in good condition (Photo 16).
Grating Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☒ Yes ☐ No If yes, explain: 33 ft of grating is missing at the north end of the culvert. Grates were stolen. Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement.	**Remarks:** With the exception of grating sections that were removed from the site, grating is in good condition (Photo 16).
Fencing	
Airport Fence Adjacent to Landfill: Bent posts: ☐ Yes ☒ No Loose posts: ☐ Yes ☒ No Broken links or wire: ☐ Yes ☒ No Damaged gates: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Airport fencing is in good condition and securing the site (Photo 17). This fencing is maintained by the County of Los Alamos.
Retaining Wall	
Retaining Wall Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain:	**Remarks:** Retaining walls are in good condition. No damage or issues were noted (Photos 18 to 20 and Photo 24).
Retaining Wall Damage Description (if any): Issues Observed: ☐ Yes ☒ No If yes, explain:	**Remarks:** None

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3 (continued)

Site Element	Remarks
Repairs Necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Permanent Erosion & Sedimentation Control Measures	
Rip Rap Berm above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The riprap drainage on the side slope is in good condition (Photos 21 and 22).
Rock Check Dams near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, displaced rock, or other damage: ☐ Yes ☒ No Description of damage: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rock check dams are in good condition (Photo 20 and Photos 23 to 25). Minor rills in the bare ground between rock check dams were noted on the upper slope, and some sediment was deposited on the lower slope. This condition does not appear to have changed since the previous inspection. No maintenance or repairs are necessary.
Landfill Terrace above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The landfill terrace above the retaining walls is in good condition (Photo 26).
Drainage Channels adjacent to Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The drainage channels adjacent to the retaining wall appear to be in good condition and working properly (Photos 23 and 24).
Gabion above Drainage Channels adjacent to Retaining Wall: Functioning: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The gabions above drainage channels adjacent to the retaining walls are in good condition (Photos 26 to 29).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 3 (continued)

Site Element	Remarks
Site Access	
Access Restrictions: ☒ Yes ☐ No Description: Secured fence with keyed lock Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The site has controlled access with a security fence and locked gates.
Debris Disposal Area (DDA)	
Debris Disposal Area Condition: ☒ Good Condition ☐ Poor Condition Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The surface of the DDA cover system is in good condition. The vegetation on the DDA is dormant but has good coverage (Photos 30 to 32). There is no observed degradation of the site.
General	
Vandalism: ☐ Yes ☒ No Description of damage: Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement	**Remarks:** Concrete culvert steel grates are missing and presumed stolen.
Land Use Change: ☐ Yes ☒ No Description: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No land use changes.
Summary of Recommended Maintenance and/or Repairs	
Maintenance/Repairs Necessary: ☒ Yes ☐ No If yes, explain: The southern moisture monitoring station is scheduled to be repaired, if possible.	**Remarks:** One moisture monitoring station was damaged by wildlife and has been offline since October 26, 2022.
Other	
None	

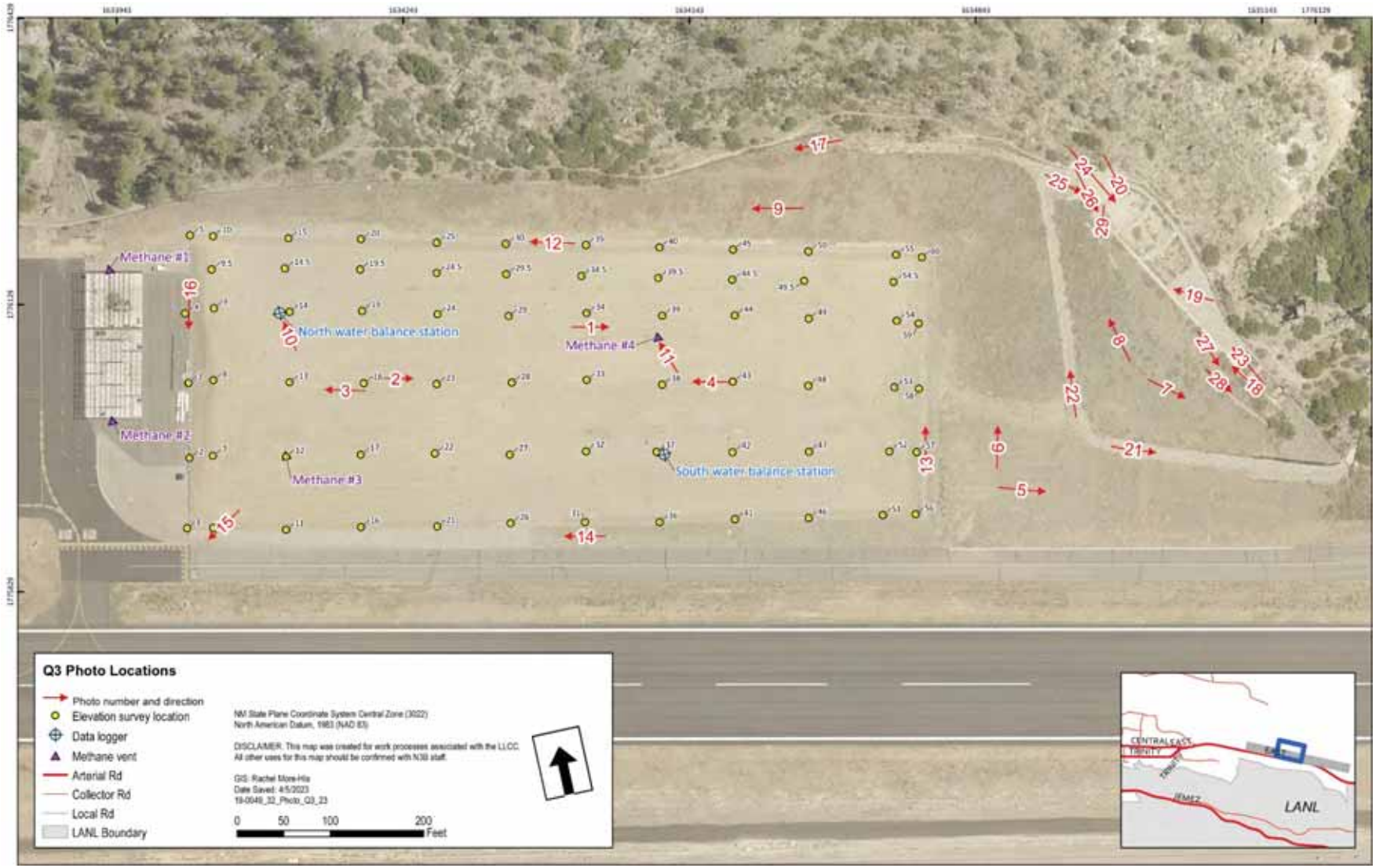


Figure 1 Locations and direction of photos on and around the ET cover

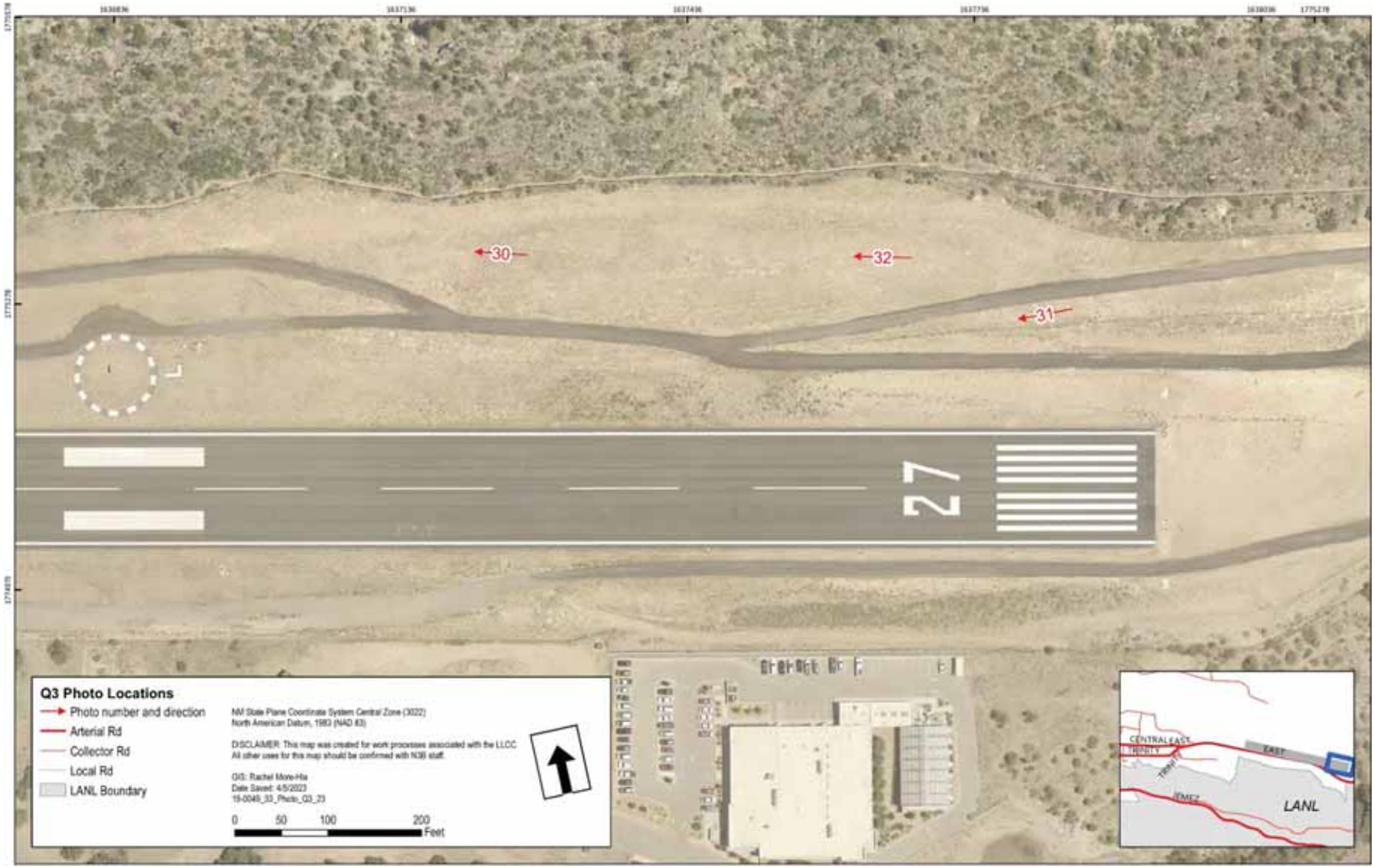


Figure 2 Locations and direction of photos at the debris disposal area

Photo 1 **Repaired tension crack on the landfill cover near Survey Point 34, looking east (Note: surface scoring is due to winter free e-thaw cycles or desiccation and does not appear to be new tension cracking.)**

Photo 2 **Vegetation on the west-central section of the ET cover, looking east**

Photo 3 Vegetation on the western end of the ET cover, looking west

Photo 4 Vegetation on the eastern end of the ET cover, looking west

Photo 5 Vegetation on the upper section of the eastern side slope, looking east

Photo 6 Vegetation on the upper section of the eastern side slope, looking north

Photo 7 Vegetation on the lower section of the eastern side slope, looking east

Photo 8 Vegetation on the lower section of the eastern side slope, looking north

Photo 9 Vegetation on the northern side slope, looking west

Photo 10 Inspection crew downloading moisture monitoring data from northern data logger

Photo 11 Eastern methane monitoring vent, looking north

Photo 12 Northern drainage channel, looking west

Photo 13 Eastern drainage channel, looking north

Photo 14 Southern drainage channel, looking west

Photo 15 Western drop inlet structure along the southern drainage channel

Photo 16 Concrete culvert, looking south

Photo 17 Security fencing along the north side of the landfill, looking west

Photo 18 Top of concrete retaining wall, looking north

Photo 19 Concrete retaining wall, looking northwest

Photo 20 Concrete retaining wall and check dams, looking south

Photo 21 Riprap berm (side-slope berm) above retaining wall, looking east

Photo 22 Riprap berm (side-slope berm) above retaining wall, looking north

Photo 23 Retaining wall drainage channel and rock check dams, looking northwest

Photo 24 Rock check dams, retaining wall, and drainage channels, looking south

Photo 25 Rock check dams, looking southeast

Photo 26 Eastern terrace, gabion walls, and concrete retaining wall, looking south

Photo 27 Southern gabion wall, looking south

Photo 28 Southern gabion wall, looking southeast

Photo 29 Northern gabion wall, looking south

Photo 30 Northwestern section of the debris disposal area, looking west

Photo 31 Southeastern end of the debris disposal area, looking west

Photo 32 North-central section of the debris disposal area, looking west

Date: July 14, 2023 N3B-2023-0260

Cheryl Rodriguez
Soil and Water Remediation Federal Cleanup Director
U.S. Department of Energy
Environmental Management
Los Alamos Field Office
1200 Trinity Drive, Suite 400
Los Alamos, New Mexico 87544

Subject: Contract Number 89303318CEM000007 – Submittal of the Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 4

Dear Ms. Rodriguez:

Enclosed please find the Newport News Nuclear BWXT-Los Alamos, LLC (N3B) submittal of the quarterly inspection and maintenance report for the fourth quarter of monitoring year 7 for the Los Alamos County Airport Landfill cover and adjoining areas.

If you have any questions or need additional information, please contact Kevin Reid at (505) 257-7710 (kevin.reid@em-la.doe.gov).

Sincerely,

Troy Thomson
Program Manager, Environmental Remediation

KR:ht

Enclosure(s): Los Alamos County Airport Landfill Inspection and Maintenance Report: Monitoring Year 7, Quarter 4 (EM2023-0468)

cc: (letter and enclosure[s] emailed)
Sarah Eli Gilbertson, EM-LA
Brian Harcek, EM-LA
Kara Hetrick, EM-LA
Tyler Ingalls, EM-LA
John Loughead, EM-LA
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LOS ALAMOS COUNTY AIRPORT LANDFILL INSPECTION AND MAINTENANCE REPORT: MONITORING YEAR 7, QUARTER 4

SUMMARY

This is the twenty-eighth inspection (Monitoring Year 7, Quarter 4—inspection date: June 12, 2023) of the evapotranspiration (ET) cover and associated project elements for the Los Alamos County Airport Landfill. The inspections are performed in accordance with the "Long-Term Monitoring Plan, Los Alamos County Airport Landfill Cover Replacement, Solid Waste Management Units 73-001 (a,d), Technical Area 73" (March 2017). The construction of the cover system was completed in July 2016.

During the non-winter months of April to October, rain gage (RG)038 is used to determine whether a significant precipitation event had occurred at the airport. During the monitoring period from April to June, a total of 3.03 in. of water-equivalent precipitation was recorded at the RG038 station, mostly as rain, and the maximum total precipitation was 0.57 in. on May 31, 2023. There were no exceedances of the 1.0 in./hr, significant precipitation event trigger during the quarter. Figure 1 shows the daily precipitation totals from April to June 2023.

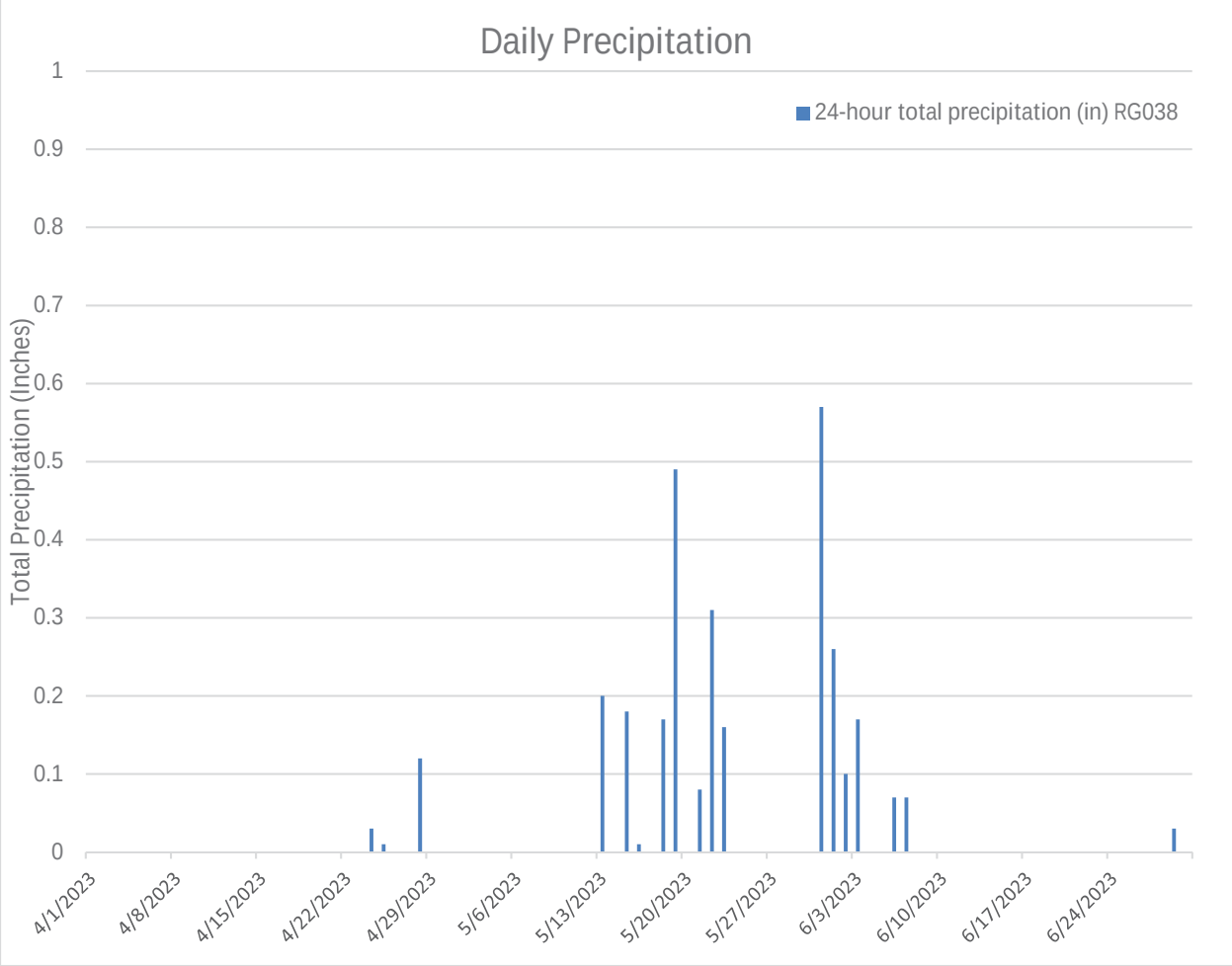


Figure 1: Daily precipitation totals from April 2023 to June 2023.

All features of the closure are currently in good condition. The areas where tension cracks were repaired in August 2022 showed no signs of cracks returning. No other cracks were observed on the landfill cover. Vegetation was prolific following a wet winter and rain in late May. The dominant cover type in June consisted of alfalfa and clover with abundant grasses and minor wildflowers. No erosion issues were observed on the cover or side slopes. Minor biointrusion by small burrowing animals, not requiring attention at this time, was observed on the ET cover; no biointrusion was observed at the debris disposal area. The cover surface has eroded to a desert pavement surface and has stabilized. All drainage systems are in good working condition.

Methane monitoring is performed annually and was not performed during this inspection. Methane vents were intact and in good working condition. The four water-balance monitoring (soil moisture and soil suction) stations were inspected. The southern station that measures soil matric potential was damaged by wildlife in late October and was repaired on April 13, 2023. The station is fully functioning since the cables were replaced. The other three stations were observed to be in good working condition and soil moisture data was successfully downloaded from all the data-loggers.

The ET cover elevation survey was performed to quantify differential settlement. The annual differential settlement values were evaluated against recent surveys and showed no significant increase in differential settlement across the ET cover. Additional analysis of the survey data will be included in the annual long-term monitoring report.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4

Site Name: Los Alamos County Airport Landfill Cover Replacement	**Date of Inspection:** June 12, 2023
City: Los Alamos	**Weather:** Clear, light winds
State: New Mexico	**Temperature:** H 70s
Agency: U.S. Department of Energy	**Inspector:** Kevin Reid, PG; David Diehl, PE
Site Element	Remarks
ET Cover	
Settlement (differential): ☐ Yes ☒ No **Low Spots (ponding):** ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The settlement survey grid was established to quantify differential settlement. The area with the highest differential settlement in past surveys is north of survey point 34, near the center of the northern half of the cover. Elevations of the 70 grid points were surveyed. During the current inspection, no new visible evidence was observed of cover settlement, ponding or low spots, or areas of concern with respect to settlement.
Surface Cracks: ☐ Yes ☒ No Length: See remarks Width: See remarks Depth: See remarks Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No surface cracks in the ET cover were observed. The crack repairs performed in August 2022 were inspected. No visible signs of new movement (separation) were observed in the repaired cover material. Vegetation is beginning to reestablish in the repaired areas (Photos 1 to 3).
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No evidence of erosion from the landfill cover was observed. No rills, pedestals, or incision points were observed in the cover. No depositional packages of eroded material observed.
Biointrusion Holes: ☒ Yes ☐ No Areal Extent: discrete locations scattered across the landfill cover Depth: unknown Suspected Cause (Rodent/Other): rodent, possibly gopher Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** There was minor evidence of animal burrows on the landfill cover. A couple of new mounds were noted in the west-central area of the cover. A few anthills were observed. The activity will continue to be monitored but, at this point, it is insignificant and not in need of repair.
Vegetation Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Repairs necessary: ☒ Yes ☐ No If yes, explain: Vegetation is approximately 1ft tall and recommended to be mowed.	**Remarks:** Overall the vegetation cover is dense approximately 50%–70%. The vegetation is well established and the dominant species were alfalfa and clover. Other minor cover types were grasses, shrubs, and wildflowers (Photos 4 to 6). Vegetation in some areas was approximately 1 ft tall and it is recommended to be mowed.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4 (continued)

Site Element	Remarks
Rill/Gully: ☐ Yes ☒ No Areal Extent: N/A Depth: N/A Suspected Cause: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No evidence of rills or gullies were observed on the landfill cover.
Wet Areas: ☐ Yes ☒ No Ponding: ☐ Yes ☒ No Areal Extent: Seeps: ☐ Yes ☒ No Areal Extent: Estimated Flow Rate: Soft Subgrade: ☐ Yes ☒ No Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No wet areas were observed.
North and East Slopes Instability: ☐ Yes ☒ No Areal Extent: N/A Suspected Cause: Exposed Cover: ☐ Yes ☒ No Components: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The slopes were observed to be in stable condition with no evidence of erosion, slumping, or cracking (Photos 7 to 10).
Water Balance Instrumentation: Functioning Properly: ☐ Yes ☒ No Damage: ☒ Yes ☐ No Repairs necessary: ☒ Yes ☐ No If yes, explain: The cables for the southern matric potential station were damage by wildlife and may require repair. Repair cables have been procured and repairs are pending.	**Remarks:** The north water-balance instrument station was inspected and data were downloaded. Upon data review, probe #3 for moisture content is recording only temperature, not water content. Troubleshooting the probe was unsuccessful, and the probe may need to be taken offline or replaced. The southern moisture-monitoring station was damaged by wildlife and stopped recording data on October 26, 2022, due to cable damage. The cables were replaced on April 13, 2023, and are fully functional and in good condition. Data were downloaded and both the matric potential and moisture monitoring stations are fully functional. Rigid protective devices were placed over both instrument stations and continue to protect the stations from damage by wildlife.
Methane Monitoring Instrumentation: Functioning Properly: ☒ Yes ☐ No Damage: ☐ Yes ☒ No Repairs necessary: ☐ Yes ☒ No If yes, explain	**Remarks:** Methane monitoring was not performed during this inspection. The vents were inspected and are in good condition (Photo 11).

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4 (continued)

Site Element	Remarks
Rip Rap Lined Drainage Channels	
Settlement (Low Spots): ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The riprap lined channels were in excellent condition and there was no observable sedimentation within the channels (Photos 12–15).
Material Degradation: ☐ Yes ☒ No Material Type: Areal Extent: Degree of Degradation Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No material degradation was noted.
Erosion: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No erosion was noted.
Undercutting: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No undercutting was noted.
Obstructions: ☐ Yes ☒ No Type: Areal Extent: Size: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No obstructions were noted.
Slope Instability: ☐ Yes ☒ No Type: Areal Extent: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No slope instability was noted.
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was noted.
Drop Inlet Structures: Working Properly: ☒ Yes ☐ No Condition: Extent of Damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Structures are clear of debris and in good condition.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4 (continued)

Site Element	Remarks
Concrete Culvert	
Siltation: ☐ Yes ☒ No Areal Extent: Depth: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No siltation was observed.
Concrete Condition and Joints: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☐ Yes ☒ No If yes, explain: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Concrete is in good condition (Photos 16 and 17).
Grating Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain: Issues Observed: ☒ Yes ☐ No If yes, explain: 33 ft of grating are missing at the north end of the culvert. Grates were stolen. Repairs necessary: ☒ Yes ☐ No If yes, explain: grates will require replacement.	**Remarks:** Grating is in good condition (Photos 16 and 17).
Fencing	
Airport Fence Adjacent to Landfill: Bent posts: ☐ Yes ☒ No Loose posts: ☐ Yes ☒ No Broken links or wire: ☐ Yes ☒ No Damaged gates: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** Airport fencing is in good condition and securing the site (Photo 7). This fencing is maintained by the County of Los Alamos.
Retaining Wall	
Retaining Wall Condition: General Condition progressing as expected: ☒ Yes ☐ No If no, explain:	**Remarks:** Retaining walls are in good condition. No damage or issues were noted (Photos 18 and 19).
Retaining Wall Damage Description (if any): Issues Observed: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Repairs Necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** None

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4 (continued)

Site Element	Remarks
Permanent Erosion & Sedimentation Control Measures	
Rip Rap Berm above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The riprap drainage on the side slope is in good condition (Photos 20 and 21).
Rock Check Dams near Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, displaced rock, or other damage: ☐ Yes ☒ No Description of damage: N/A Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The rock check dams are in good condition (Photo 22). No maintenance or repairs are necessary.
Landfill Terrace above Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The landfill terrace above the retaining walls is in good condition.
Drainage Channels adjacent to Retaining Wall: Functional: ☒ Yes ☐ No If no, describe locations: Damage, adjunct erosion, slope problem, or other damage/degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The drainage channels adjacent to the retaining wall appear to be in good condition and working properly (Photos 19, 22, and 23).
Gabion above Drainage Channels adjacent to Retaining Wall: Functioning: ☒ Yes ☐ No If no, describe locations: Damage or degradation: ☐ Yes ☒ No Description of damage: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The gabions above drainage channels adjacent to the retaining walls are in good condition (Photo 24).
Site Access	
Access Restrictions: ☒ Yes ☐ No Description: Secured fence with keyed lock Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The site has controlled access with a security fence and locked gates.

Long-Term Monitoring Checklist
for the Los Alamos County Airport Landfill Closure, Monitoring Year 7 Quarter 4 (continued)

Site Element	Remarks
Debris Disposal Area (DDA)	
Debris Disposal Area Condition: ☒ Good Condition ☐ Poor Condition Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** The surface of the DDA cover system is in good condition. The vegetation on the DDA had recently been mowed by the airport staff. (Photos 25 to 27). No degradation of the site was observed.
General	
Vandalism: ☐ Yes ☒ No Description of damage: Repairs necessary: ☒ Yes ☐ No If yes, explain: Grates will require replacement	**Remarks:** Concrete culvert steel grates are missing and presumed stolen.
Land Use Change: ☐ Yes ☒ No Description: Repairs necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** No land use changes.
Summary of Recommended Maintenance and/or Repairs	
Maintenance/Repairs Necessary: ☐ Yes ☒ No If yes, explain:	**Remarks:** None
Other	
None	

Figure 2 Locations and direction of photos (1–24) on and around the ET cover

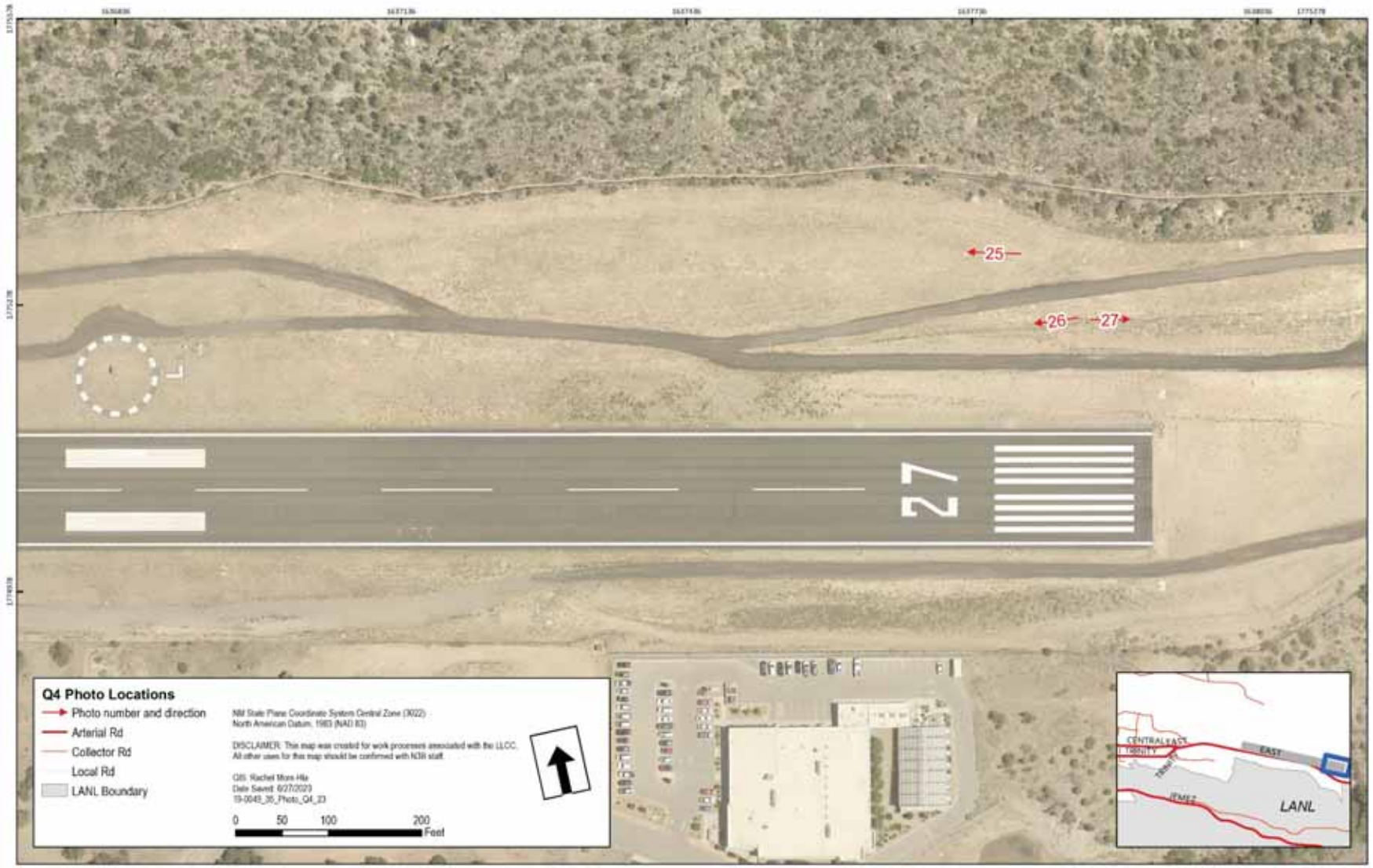


Figure 3 Locations and direction of photos (25–27)at the debris disposal area

Photo 1 Repaired tension crack on the landfill cover near survey point 29, looking east

Photo 2 Repaired tension crack on the landfill cover near Survey Point 14, looking east

Photo 3 **New vegetation growing along the repaired tension crack (Gaillardia pulchella - also known as firewheel, Indian blanket flower, or sundance)**

Photo 4 **Vegetation on the western end of the ET cover, looking east**

Photo 5 Vegetation on the center section of the ET cover, looking east

Photo 6 Vegetation on the eastern end of the ET cover, looking west

Photo 7 Vegetation and security fencing on the northern side slope, looking southwest

Photo 8 Vegetation on the northern side slope, looking west

Photo 9 Vegetation on the eastern side slope, looking north

Photo 10 Vegetation on the eastern side slope, looking east

Photo 11 Western methane monitoring vent, looking south

Photo 12 Northern drainage channel, looking east

Photo 13 Eastern drainage channel, looking south

Photo 14 Eastern drainage channel, looking north

Photo 15 Southern drainage channel, looking east

Photo 16 Concrete culvert, looking north

Photo 17 Concrete culvert, looking south

Photo 18 Concrete retaining wall and drainage channel, looking northwest

Photo 19 Concrete retaining wall, looking south

Photo 20 Riprap berm (side-slope berm) above retaining wall, looking north

Photo 21 Riprap berm (side-slope berm) above retaining wall, looking east

Photo 22 Retaining wall drainage channel and rock check dams, looking northwest

Photo 23 Retaining wall drainage channel, looking south

Photo 24 Northern gabion wall, looking south

Photo 25 Northwestern section of the debris disposal area, looking west

Photo 26 Southcentral section of the debris disposal area, looking west

Photo 27 Southeastern section of the debris disposal area, looking east

Attachment B

Water Balance Data

WATER BALANCE MONITORING SUMMARY

The moisture content probes data was collected and summarized in this report (Figures B-1 and B-2). The probes were installed on August 29, August 30, and September 4, 2016. Figure B-7 shows the monitoring point locations. Figure B-3 contains the available daily precipitation events for comparison of the response to infiltration reflected in the moisture probe data.

The moisture content probes reveal that infiltrated moisture due to precipitation quickly dries shortly after (Figures B-1 and B-2). There also appears to be some sensitivity of the moisture content measurements to soil temperature (especially noted in variation of winter and summer months). This data will take multiple seasons to analyze and better understand the water balance trends in the cover system.

Heat dissipation units (HDU) were replaced on May 18, 2017. These probes measure the matric potential or soil suction in the soil cover system at various depths. Collected data to date is shown in Figures B-4 and B-5. Figure B-6 contains the available daily precipitation events for comparison to response of the soil suction data. Figure B-7 shows the monitoring point locations.

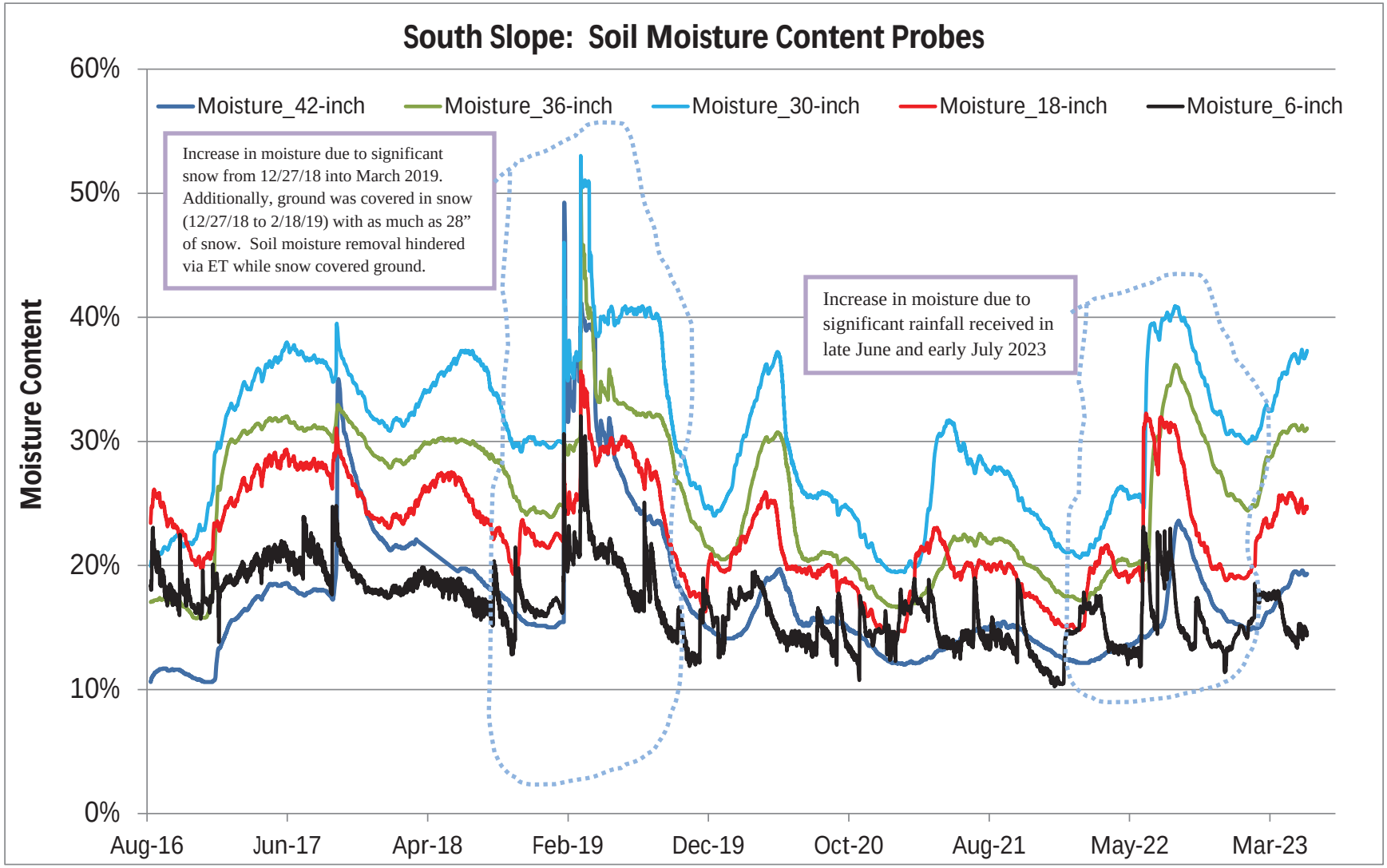


Figure B-1. Moisture Probe Data (September 2016 to June 2023) - ET Cover South Slope

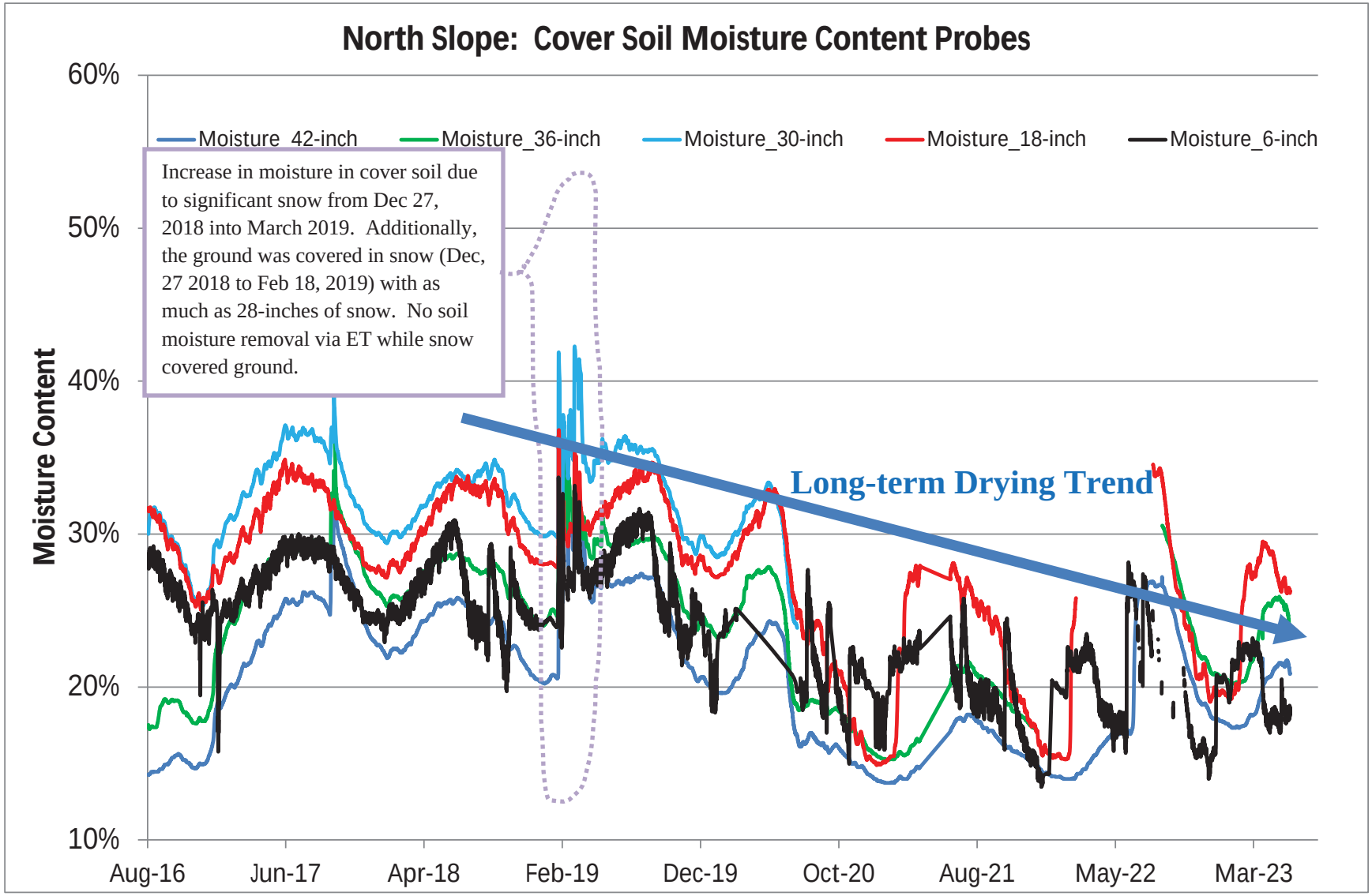


Figure B-2. Moisture Probe Data (September 2016 to June 2023) - ET Cover North Slope

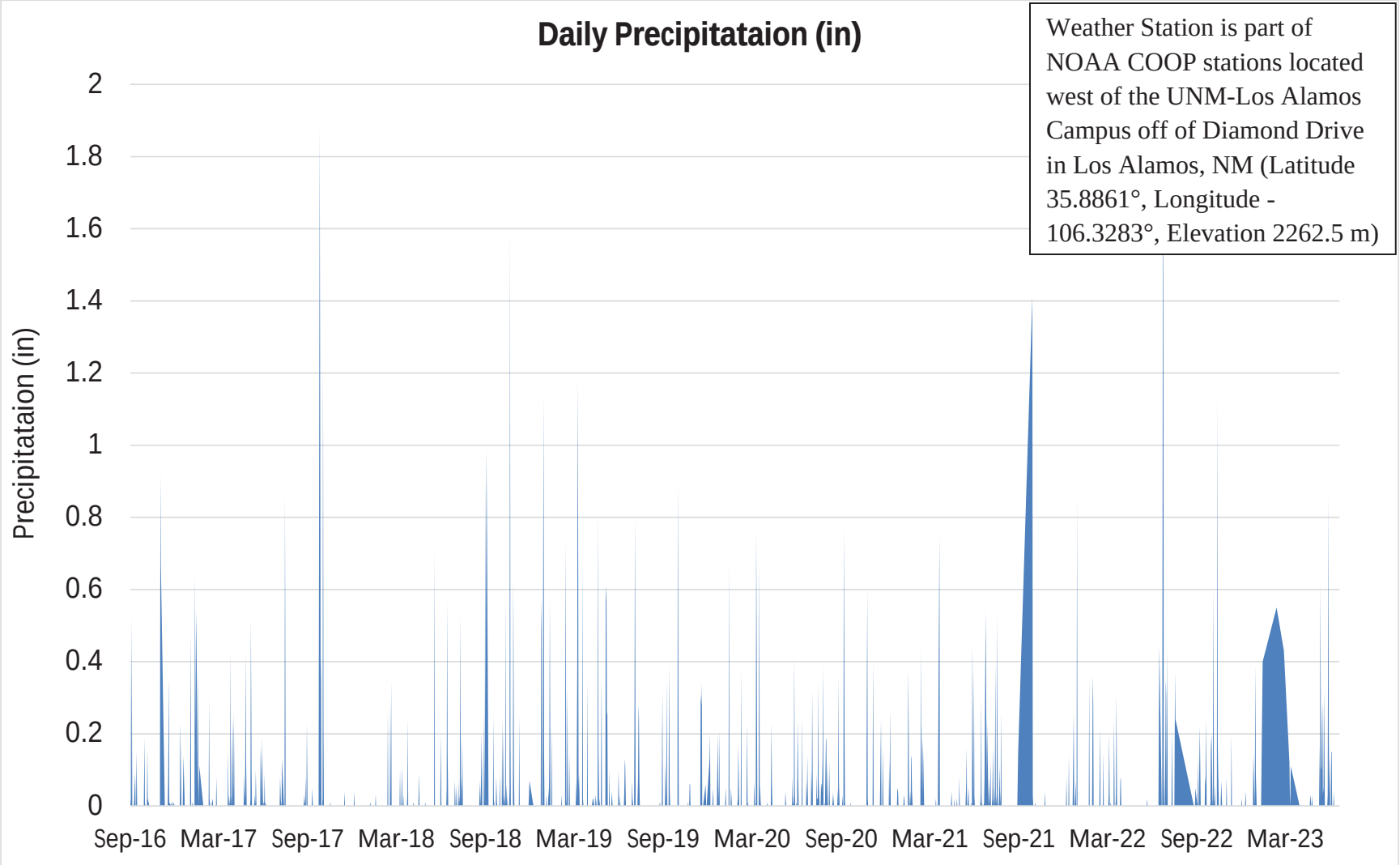


Figure B-3. Daily Precipitation (Sept 2016 to June 2023)

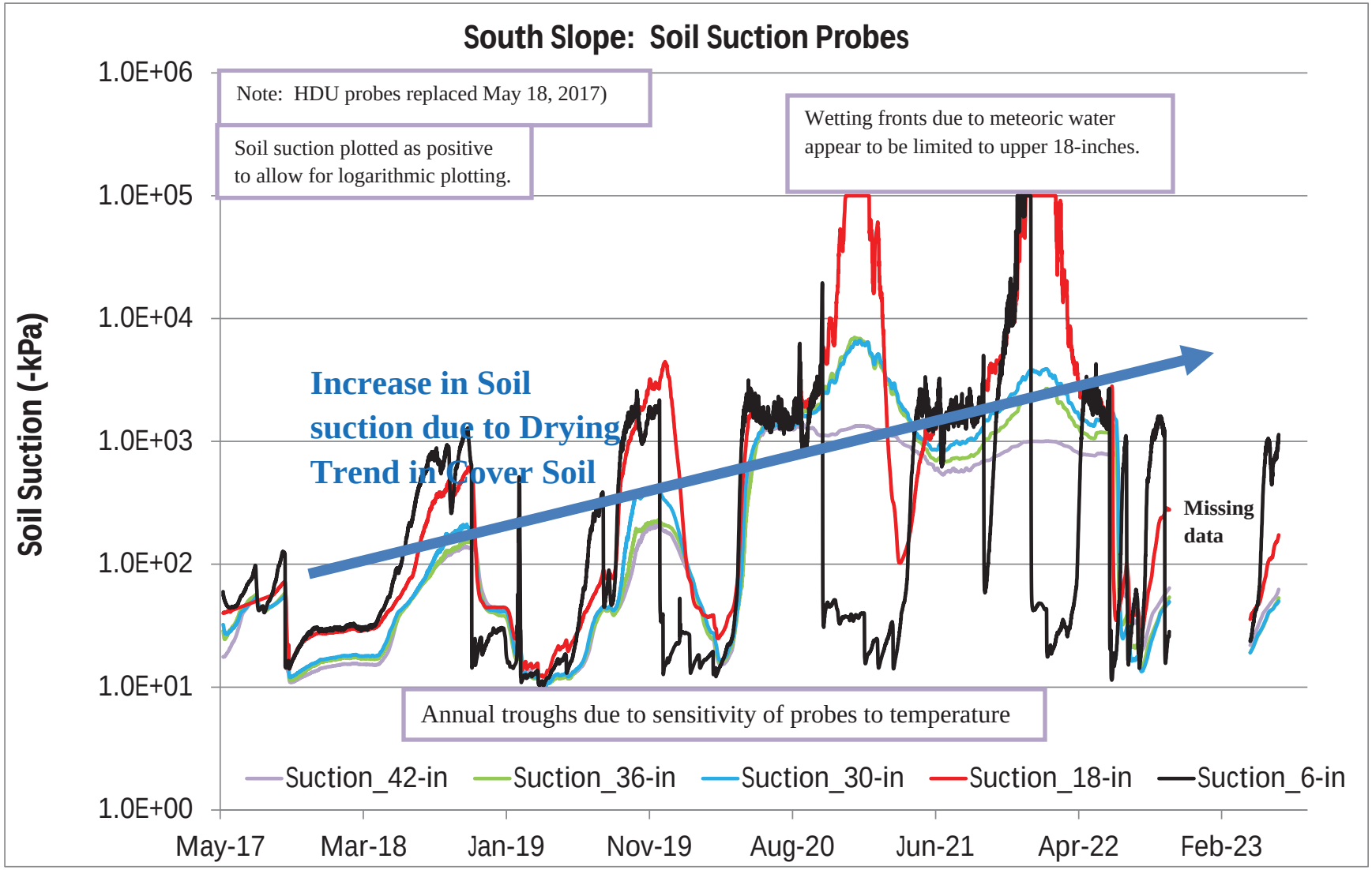


Figure B-4. HDU Data (May 2017 to June 2023) - ET Cover South Slope

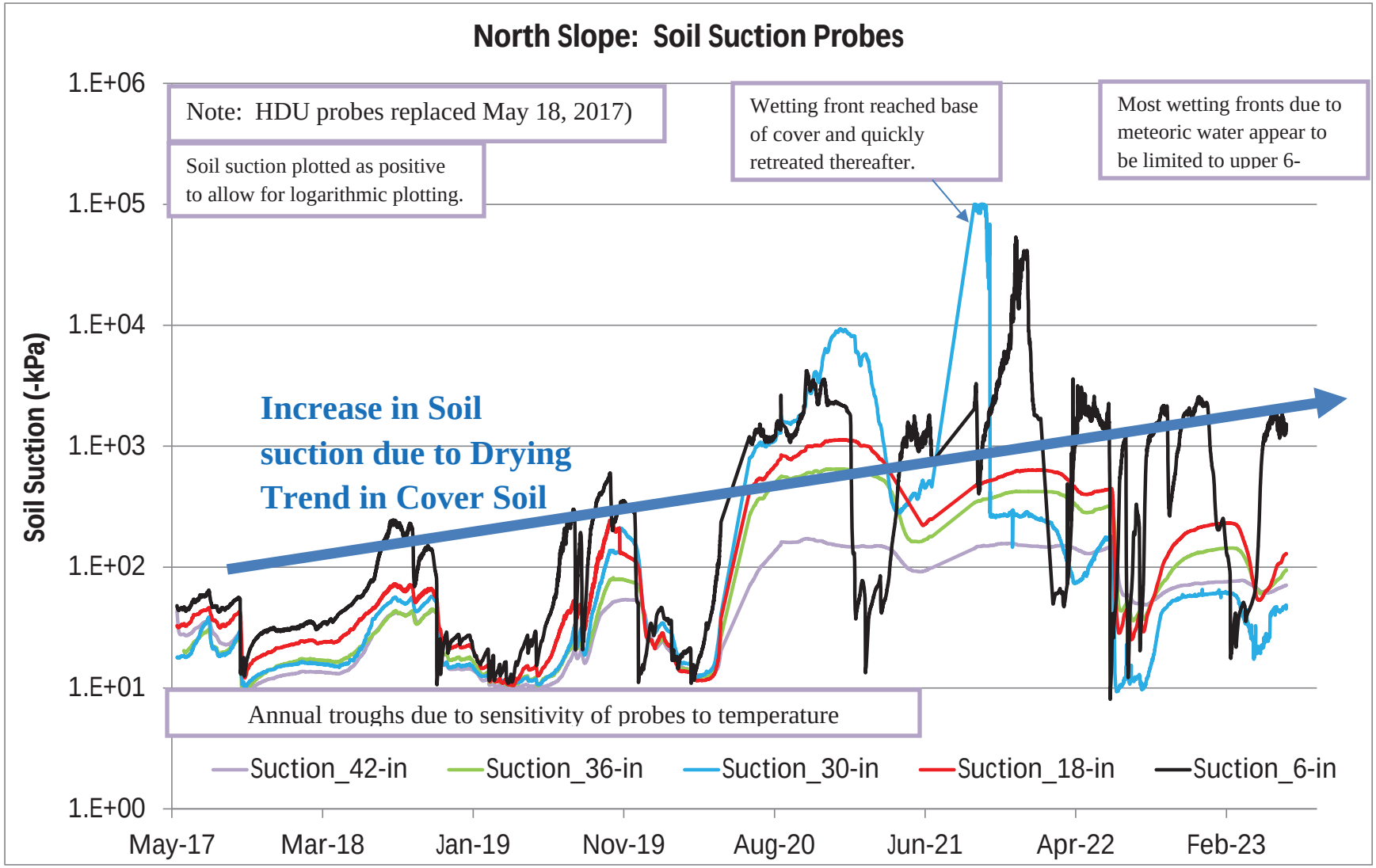


Figure B-5. HDU Data (May 2017 to June 2023) - ET Cover North Slope

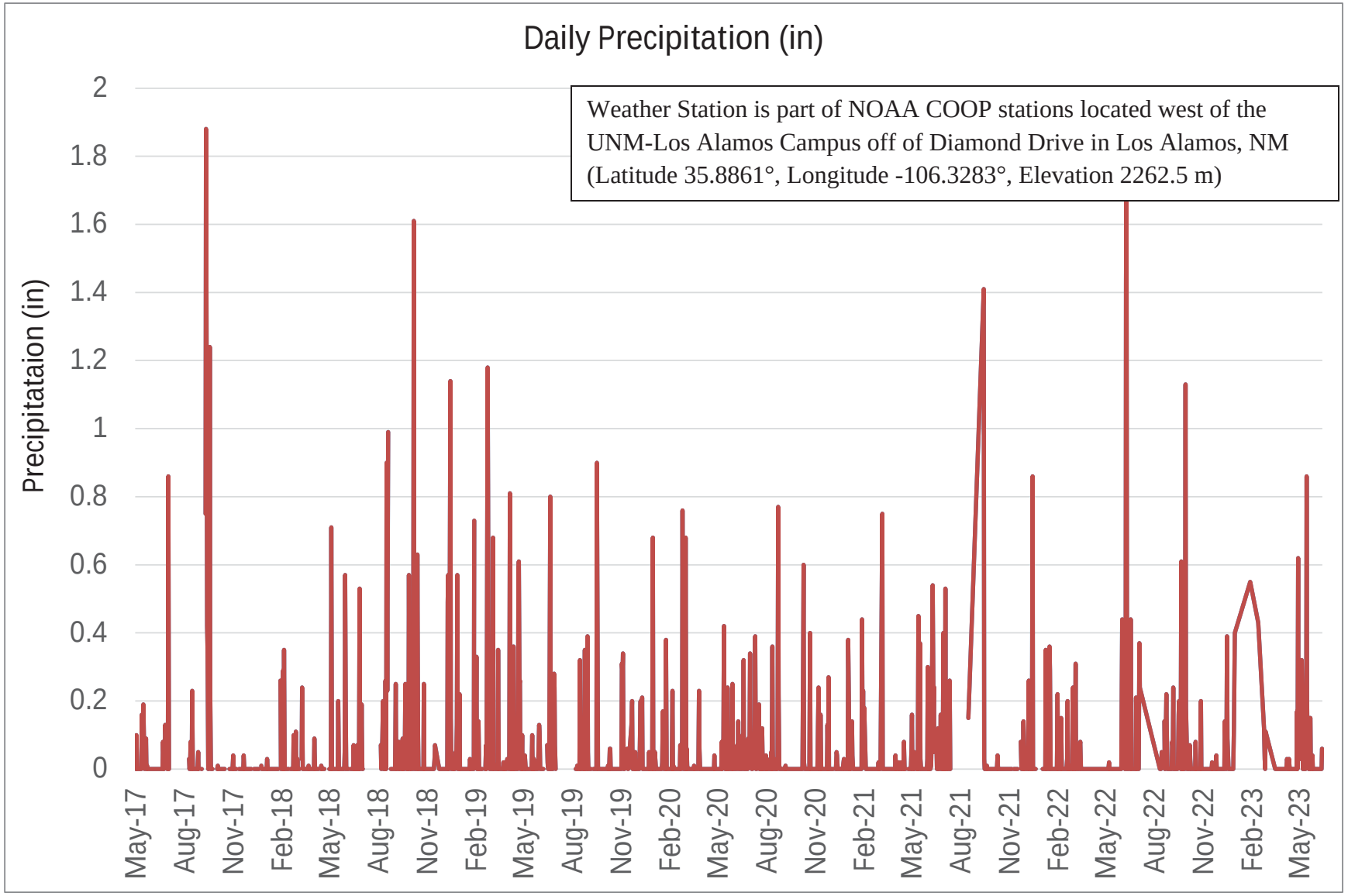


Figure B-6. Precipitation (May 2017 to June 2023)

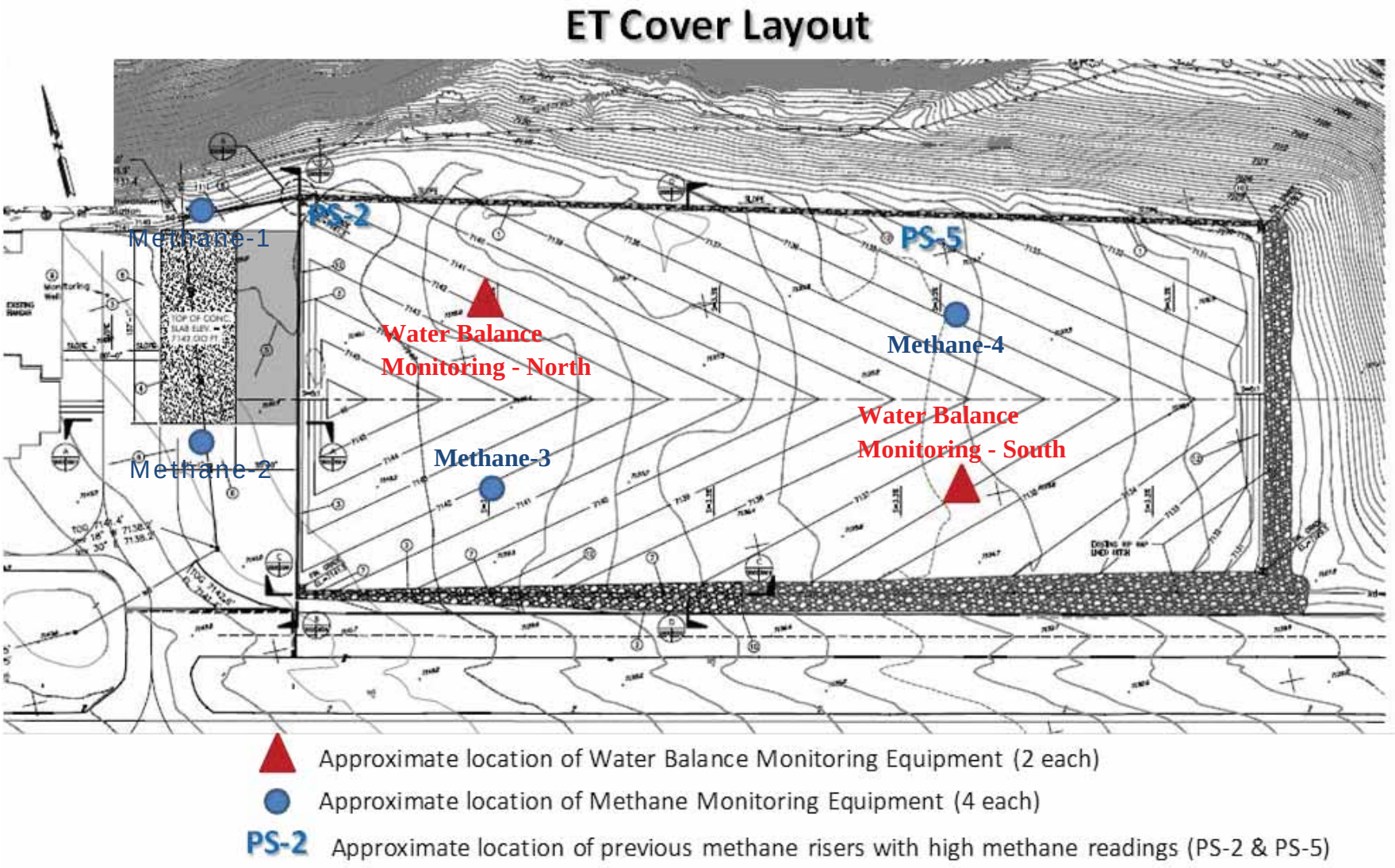


Figure B-7. Methane and Water Balance Probe Monitoring Locations

Attachment C

Methane Monitoring Data

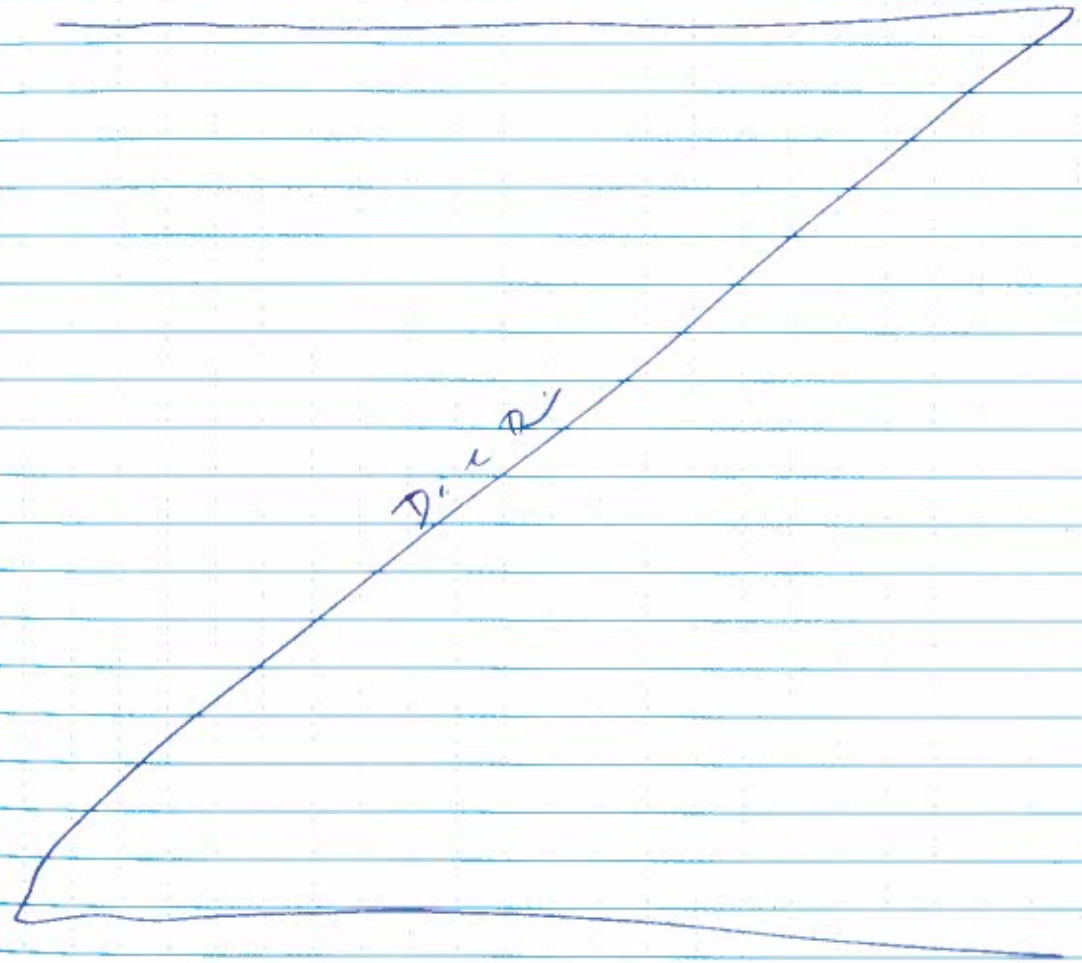
METHANE MONITORING

Table 1. Methane Monitoring Readings

Site Name: Los Alamos County Airport Landfill Cover Replacement				
City: Los Alamos		State: New Mexico		
Agency: Department of Energy		Inspector: David Diehl & Scott Rygh		
Date	Methane Monitoring Station (units are % of lower explosive limit)			
	Methane-1	Methane-2	Methane-3	Methane-4
March 15, 2023	0	0	0	0

Los Alamo County Airport Landfill
- Methane monitoring results
- Annual monitoring
- ~~Inspect~~ Inspection date: March 15, 2023
- Monitoring performed by Scott Rygh / David Diehl

Vent name	Monitoring result
Methane #1	Methane - 0%
Methane #2	Methane - 0%
Methane #3	Methane - 0%
Methane #4	Methane - 0%



Scale: 1 square = _____

Rite in the Rain

Attachment D

Inspection Reports After Significant Precipitation Events

There were no exceedances of the established 1 in./hr per hr precipitation intensity criterion during this monitoring period.

Attachment E

Differential Settlement/Tension Crack Monitoring

- Survey data with dates corresponding to quarterly inspections:
    - ❖ Year 7, Quarter 1, Inspection 25 survey performed September 8, 2022
    - ❖ Year 7, Quarter 2, Inspection 26 survey performed December 8, 2022
    - ❖ Year 7, Quarter 3, Inspection 27 survey performed March 15, 2023
    - ❖ Year 7, Quarter 4, Inspection 28 survey performed June 12, 2023
- Memo dated June 22, 2022. Subject: Crack in Los Alamos Airport Landfill Cover
- Memo dated September 7, 2022. Subject: Inspection of Crack Repair in Los Alamos Airport Landfill Cover

Survey Data Summary[1]							
Survey Point	Elevation – feet above sea level						Cumulative Settlement (ft)
	Original Survey 9/17/17	1st Qtr 9/8/22	2nd Qtr 12/8/22	3rd Qtr 3/15/23	4th Qtr 6/12/23		
1	7141.41	7141.29	7141.33	7141.47	7141.42		0
2	7141.50	7141.29	7141.35	7141.42	7141.4		0.1
3	7141.44	7141.26	7141.33	7141.41	7141.38		0.06
4	7141.50	7141.22	7141.3	7141.37	7141.34		0.16
5	7141.26	7140.92	7140.85	7140.97	7140.92		0.34
6	7140.79	7140.63	7140.69	7140.74	7140.74		0.05
7	7144.06	7143.91	7143.97	7144.04	7144.03		0.03
8	7146.42	7145.95	7146	7146.09	7146.05		0.37
9	7143.40	7143.1	7143.17	7143.25	7143.21		0.19
10	7140.54	7140.26	7140.34	7140.44	7140.38		0.16
11	7139.55	7139.26	7139.33	7139.41	7139.47		0.08
12	7142.73	7142.5	7142.64	7142.7	7142.67		0.06
13	7145.29	7145.12	7145.21	7145.39	7145.26		0.03
14	7142.02	7141.4	7141.45	7141.52	7141.46		0.56
15	7139.42	7139.12	7139.2	7139.27	7139.21		0.21
16	7138.25	7137.89	7138.02	7138.14	7138.1		0.15
17	7141.40	7141.12	7141.2	7141.29	7141.28		0.12
18	7143.99	7143.76	7143.85	7143.88	7143.87		0.12
19	7140.76	7140.28	7140.36	7140.43	7140.43		0.33
20	7137.75	7136.78	7136.81	7136.91	7136.83		0.92
21	7137.21	7137.66	7136.95	7137.03	7137.11		0.1
22	7139.96	7139.62	7139.67	7139.78	7139.72		0.24
23	7142.96	7142.69	7142.9	7142.94	7142.83		0.13
24	7139.90	7139.35	7139.41	7139.46	7139.44		0.46
25	7136.70	7135.82	7135.93	7136.01	7135.99		0.71
26	7136.46	7136.03	7136.09	7136.16	7136.13		0.33
27	7138.69	7138.11	7138.27	7138.33	7138.26		0.43
28	7141.52	7141.17	7141.26	7141.37	7141.3		0.22
29	7138.58	7138.32	7138.49	7138.58	7138.57		0.01
30	7135.30	7134.79	7134.96	7134.99	7134.92		0.38
31	7135.20	7134.57	7134.7	7134.81	7134.87		0.33
32	7137.51	7136.9	7137.01	7137.05	7137.06		0.45
33	7140.22	7139.75	7139.8	7139.84	7139.87		0.35
34	7138.06	7136.49	7136.54	7136.63	7136.62		1.44
35	7134.25	7133.85	7134.01	7134.08	7134.01		0.24
36	7134.30	7133.95	7133.98	7134.06	7134.09		0.21
37	7136.59	7136.11	7136.2	7136.26	7136.27		0.32
38	7138.62	7138.1	7138.18	7138.26	7138.24		0.38

Survey Data Summary[1]							
Survey Point	Elevation – feet above sea level						Cumulative Settlement (ft)
	Original Survey 9/17/17	1st Qtr 9/8/22	2nd Qtr 12/8/22	3rd Qtr 3/15/23	4th Qtr 6/12/23		
39	7135.85	7135.4	7135.54	7135.5	7135.58		0.27
40	7132.78	7132.39	7132.48	7132.56	7132.5		0.28
41	7133.04	7132.32	7132.35	7132.43	7132.45		0.59
42	7135.20	7134.67	7134.76	7134.92	7134.96		0.24
43	7137.28	7136.7	7136.8	7136.86	7136.88		0.4
44	7134.56	7134.15	7134.21	7134.28	7134.27		0.29
45	7131.89	7131.47	7131.59	7131.55	7131.67		0.22
46	7131.91	7131.35	7131.37	7131.48	7131.51		0.4
47	7134.12	7133.77	7133.88	7133.96	7133.99		0.13
48	7136.06	7135.72	7135.78	7135.9	7135.9		0.16
49	7133.29	7132.96	7133.09	7133.05	7133.19		0.1
50	7130.81	7130.31	7130.4	7130.48	7130.54		0.27
51	7130.48	7130.02	7130.12	7130.15	7130.2		0.28
52	7132.27	7131.83	7131.93	7131.99	7131.99		0.28
53	7134.60	7134.15	7134.23	7134.29	7134.32		0.28
54	7132.38	7132.05	7132.09	7132.15	7132.23		0.15
55	7129.37	7128.81	7128.89	7128.96	7129.03		0.34
56	7129.08	7128.48	7128.62	7128.68	7128.7		0.38
57	7130.40	7129.94	7130.03	7130.08	7130.17		0.23
58	7129.75	7129.31	7129.42	7129.48	7129.56		0.19
59	7129.59	7129.22	7129.3	7129.36	7129.46		0.13
60	7128.90	7128.53	7128.63	7128.74	7128.79		0.11

Notes: There is a small amount of variability in these measurements because of the manual surveys completed. Positive settlement value indicates drop in surface elevation.

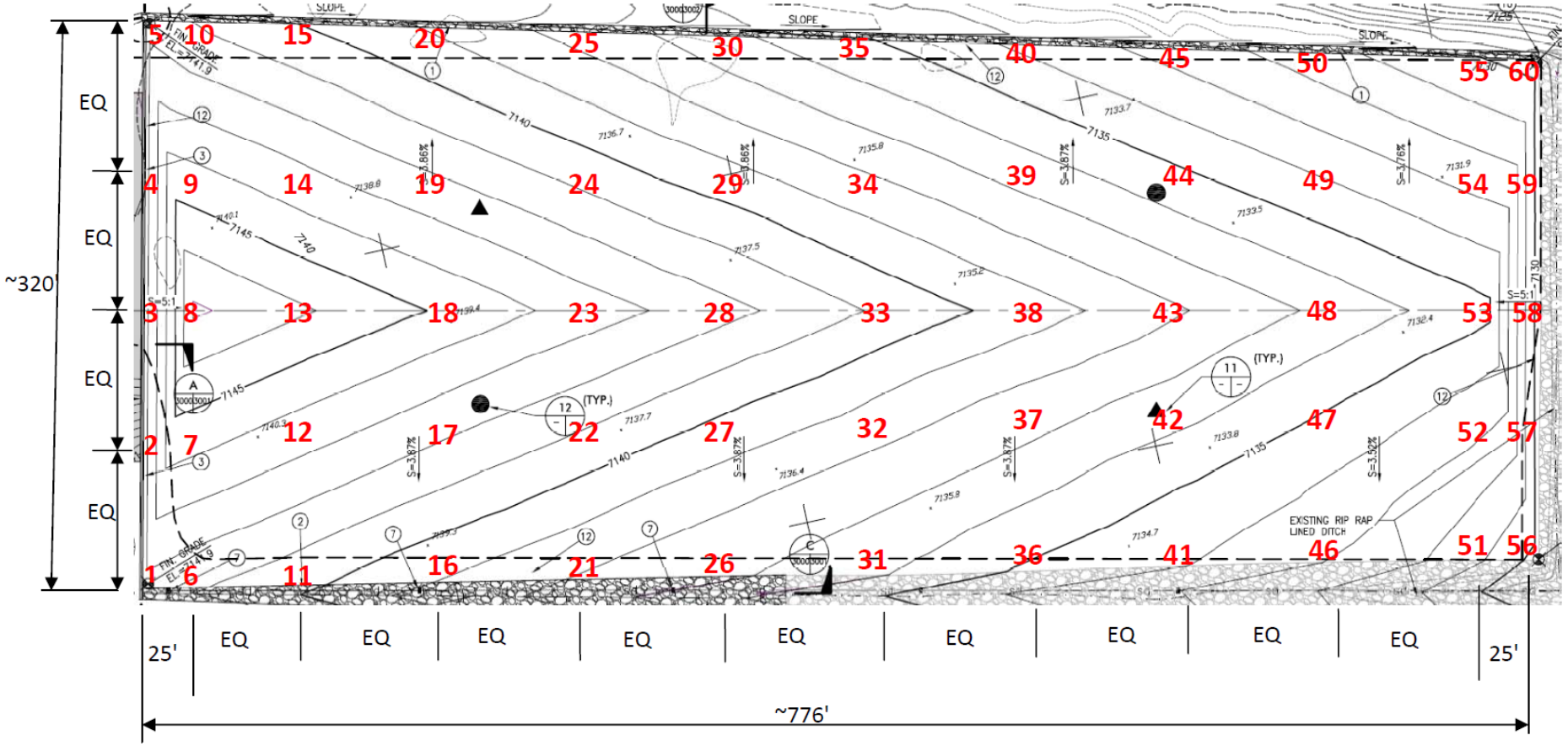


Figure E-1. Survey Locations on ET Cover

Dwyer Engineering LLC

Memo

To: Ken Vernon

From: Steve Dwyer

cc: David Diehl, Bill O'Neill

Date: June 22, 2022

Re: Crack in Los Alamos Airport Landfill Cover

Observation:

I traveled to Los Alamos, NM on March 4, 2022 to inspect a crack that has developed in the cover system at the Los Alamos Airport Landfill. This specific crack runs east/west in the northern half of the cover system (Figure 1). I viewed the crack with David Diehl and Bill O'Neill of N3B and Ken Vernon from Banda. The crack appears to be about 150-ft long, up to an 1.5-in wide, and a couple of feet deep (Figure 1).

There was also a smaller crack identified during this site visit along the southern perimeter of the cover system between the cover and perimeter riprap drainage ditch (Figure 2).

Figure 1. Picture of Surface Crack in Cover System

Figure 2. Crack Along Southern Perimeter of Landfill

Cause of Crack:

Based on observations of settlement prior to the cover placement and again after its placement, it is possible the waste was installed in trenches running east/west (Figure 3). The northern crack (Figure 1) appears to be running parallel with the estimated boundary of the northern waste trench (Figure 3). Thus, the continued settlement likely caused a tension crack along this boundary. There was significant infiltration of meteoric water into the waste prior to the installation of the initial asphalt/concrete cover and while it was in place. This moisture is still causing biodegradation in the waste although it is has slowed significantly. Thus, settlement continues – albeit much slower than when the asphalt/concrete cover was in place. The infiltration into the waste ceased after the Evapotranspiration (ET) Cover was installed based on ongoing monitoring documented in inspection reports.

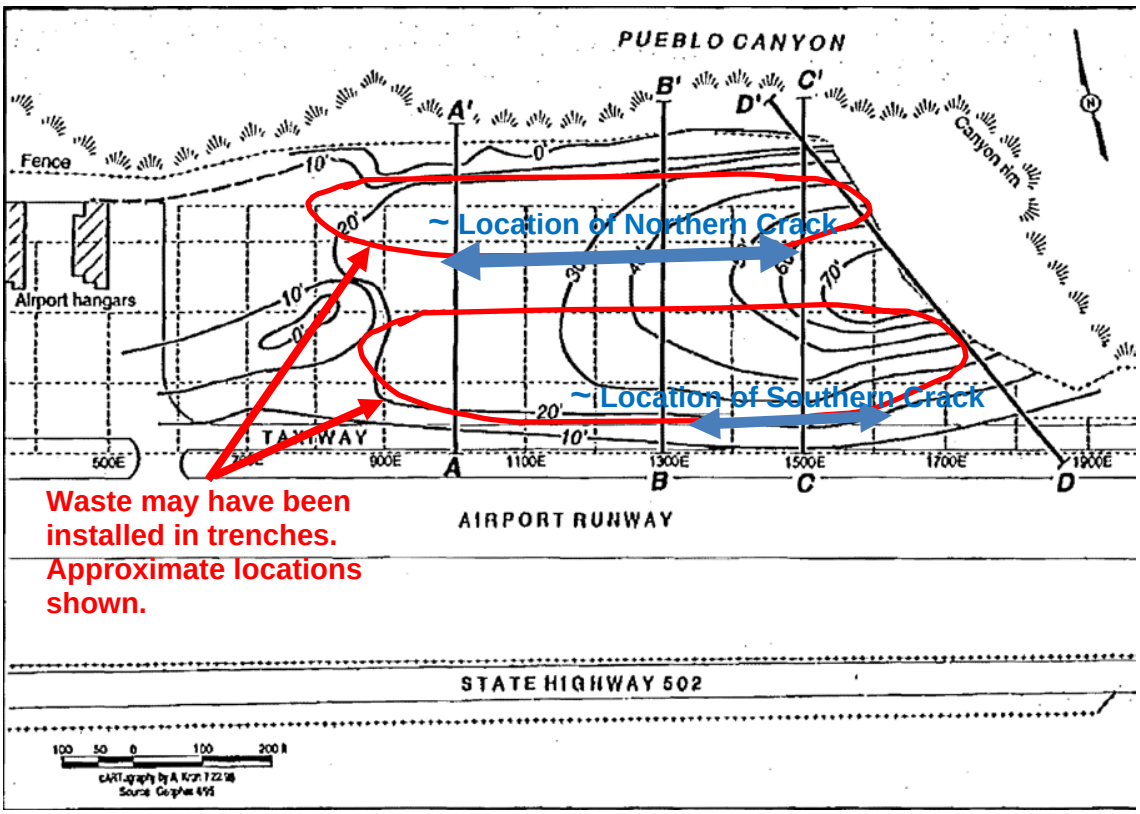


Figure 3. Estimated Waste Depths from LANL (1998)

The southern edge crack appears to be a tension crack along the southern edge of the waste perimeter and is much smaller than the crack in the northern portion of the landfill. Settlement of the underlying waste in the landfill has likely also caused this tension crack.

Maintenance Recommendations:

1. Repair / Fill Cracks by Hand:

   I recommend the cracks be repaired. Repairs performed by hand with minimal disturbance to existing vegetation is preferred at this time. The larger northern crack should be filled with soil meeting the intent of the original design specifications. That is, the soil shall be a sandy loam or loamy sand soil mixed with rock (D50 equal to 0.5-inch) at the rate of 25% rock to 75% soil by volume. Testing of soil or rock is not required – visual observation by the engineer in charge of the repair should be adequate to determine the adequacy of the soil and admixture.

   The cracks should be repaired by hand with a digging bar, spade, or similar equipment and filled. All filled soil shall be hand compacted with a hand tamping tool or similar equipment.

   Steps to repair larger northern crack (Figure 1):

a. Using a digging bar narrow enough to reach the bottom of the visible crack, collapse the soil along the edge of the crack into the crack and hand tamp to achieve a moderate compaction level that should be equal to approximately 90% of the maximum dry density per ASTM D698. This can simply be done be tamping/scraping the soil along the inside edge toward the bottom of the crack with the narrow digging end of the digging bar and then tamping the loose soil that has filled in the bottom of the crack with the other side to achieve a higher density. At the base of the crack where the crack is most narrow, the handle end of a spade may also be used to hand tamp the soil. Hand tamp the loose soil until it is noticeable that soil volume is no longer significantly reduced with each blow.

Figure 4. Digging Bar

b. After the soil toward the base of the crack has been compacted, fill and compact the remaining crack opening in approximate 6-inch lifts. That is, pour soil/rock admixture into the remaining opening filling about 6-inches deep in the crack and repeat tamping with the blunt side of the digging bar. A hand tamping tool may be used to perform compaction of the soil if the width of the crack permits. Repeat filling and compacting in 6-inch lifts until the crack is filled to the surface. A hand tamping tool shall be used to compact the surface of the crack. Make sure there are no depressions when compaction is complete at the surface of the crack.

Figure 5. Hand Tamping Tool

Steps to repair the thin southern crack (Figure 2):

a. Using a digging bar, tamp the crack with the digging side of the bar to the full depth allowed by hand tamping the crack. This should break up the crusted soil and collapse the soil into the crack. Since this crack is thin compared to the northern crack, little to no soil may be required to fll in the crack.

b. After tamping, breaking up the crusted soil, and filling soil/rock admixture where needed, hand tamp the filled crack with a hand tamping tool until no significant volume reduction in soil depth is achieved with each blow.
c. A hand tamping tool shall be used to compact the surface of the crack. Make sure there are no depressions when compaction is complete at the surface of the crack.

2. The disturbed areas of each repaired crack shall then be seeded with a native seed mix that has at least one grass and one forb from the plant seed originally specified for the cover system (Table 1) or similar as approved by the engineer in charge of the repair.

Table 1. Original Seed Mix

Common Name	*Scientific Name*	*% of Mix*
Grasses		
Blue grama*	*Bouteloua gracilis*	5 – 10%
Galleta grass*	*Hilaria jamesii*	5- 10%
Mutton grass	*Poa fendleriana*	10-15%
Sideoats grama*	*Bouteloua curtipendula*	10-15%
Arizona fescue†	*Festuca arizonica*	10 – 15%
Prairie junegrass†	*Koeleria macrantha*	5 – 10%
Bottlebrush squirreltail*	*Elymus elymoides*	15 – 20%
Little bluestem†	*Schizachyrium scoparium*	10 – 15%
Indian ricegrass*	*Oryzopsis hymenoides*	10 – 15%
Mountain brome†	*Bormus marginatus*	10 – 15%
Sand dropseed*	*Sporobolus cryptandrus*	1 - 8%
Thickspike wheatgrass	*Agropyron dasystachyum*	20 – 25%
Needle and Thread grass*	*Stipa comata*	5 – 10%
New Mexico needlegrass*	*Stipa neomexicana*	10 - 15%
Sheep fescue	*Festuca ovina*	10 – 15%
Smooth Brome	*Bromus inermis*	15 – 20%
Stream Bank Wheatgrass	*Elymus lanceolatus ssp. psammophilus*	20 – 25%
Forbs/ Wildflowers		
Firewheel	*Gaillardia pulchella*	2%
Evening primrose	*Oenothera caespitosa*	1%
Gooseberry leaf globemallow	*Sphaeralcea grossulariafolia*	1.5%

Common Name	*Scientific Name*	*% of Mix*
Scarlet gilia	*Ipomopsis aggregata*	1%
Plains aster	*Aster biglovii*	1%
Western yarrow	*Achillea millifolium*	½%
Fringed sage	*Artemisia frigida*	1%
Blue flax	*Linum perenne lewisii*	4%
Scarlet bulgler	*Penstemon barbatus*	2%
Palmer penstemon	*Penstemon palmerii*	2%
Prairie coneflower	*Ratibida columnifera*	1%
Showy golden-eye	*Heliomerus multiflora*	1%
Purple geranium	*Geranium caespitosum*	5%

*Species particularly suited for especially dry sites
†Species particularly suited for higher elevations (above 7000 ft.)

Additional Recommendations:

Place an additional row of survey stakes to provide more settlement detail in the area of the northern crack. Place the stakes approximately half way between the rows of existing stakes as seen in Figure 6. This added row of survey stakes will provide more detail to track differential settlement and the potential for ponding in the affected area.

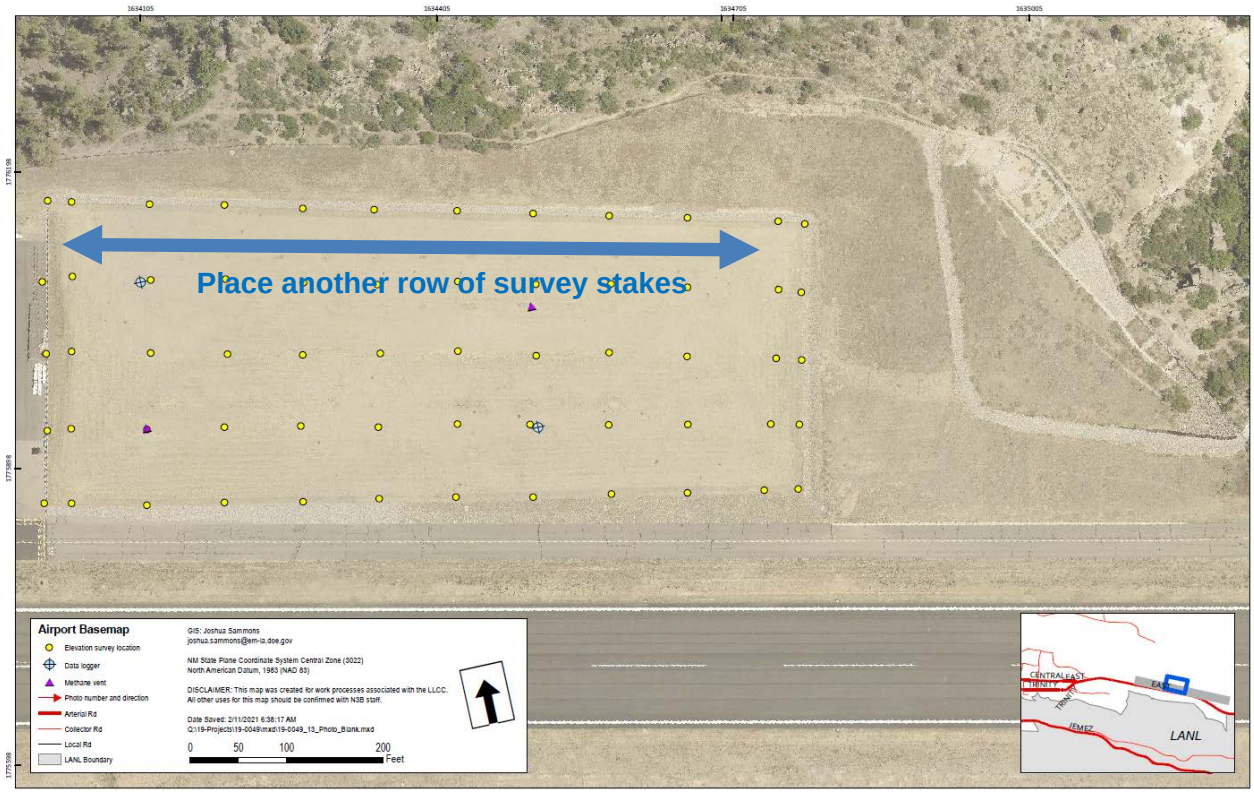


Figure 6. Survey Stakes on Landfill

Reference:

1. LANL. 1998. RFI Report for Potential Release Sites, 73-001 (a,b,c,d) 73-004(a) (Airport Landfill Areas) Volumes 1 to 3, Los Alamos National Laboratory report LA-UR-98-3824, November 1998.

Dwyer Engineering LLC

Memo

To: Ken Vernon (Banda Group, International, LLC)

From: Steve Dwyer (Dwyer Engineering LLC)

cc: David Diehl, Bill O'Neill (N3B)

Date: September 7, 2022

Re: Inspection of Crack Repair in Los Alamos Airport Landfill ET Cover

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Observation:

I traveled to Los Alamos, NM on September 1, 2022 to inspect crack repairs completed in the Los Alamos Airport Landfill Evapotranspiration (ET) Cover system. The crack repairs were completed in August 2022 (Figure 1). The cracks were repaired per the recommended procedure summarized in the Dwyer to Vernon memo dated June 22, 2022.

Northern Crack:

> The northern crack ran intermittently as shown in Figure 1. Repairs included filling the opening with similar soil mixed with gravel to match the original cover design and compacting. The filled areas were then seeded. The compacted fill soil matches the adjacent cover soil (Figure 3). Vegetation has begun to emerge in the seeded areas (Figure 4).

Southern Crack

> The southern crack was not repaired. There was no crack visible during this site inspection. Upon further inspection, it appears this prior crack was likely due to the termination of the geomembrane that was placed beneath the riprap in the adjacent lined channel. The geomembrane extends underneath the riprap adjacent to the landfill up the side slope and terminates at the edge of the ET Cover. The geomembrane is covered by a fraction of an inch of soil at this termination point (Figure 2). The movement in the geomembrane being so close to the surface from the warm days to the cool nights likely created a surface crack due to the brittle nature of the soil structure. This thin crack likely extended down from

the soil surface a fraction of inch to the geomembrane and thus did not continue into the cover itself. Refer to Figure 2.

Conclusion:

The crack repairs are *EXCELLENT*. The repairs meet all expectations. No further action is recommended.

References:

1. Dwyer, SF. 2022. Memo from SF Dwyer to K Vernon dated June 22, 2022, subject: Crack in Los Alamos Airport Landfill Cover.

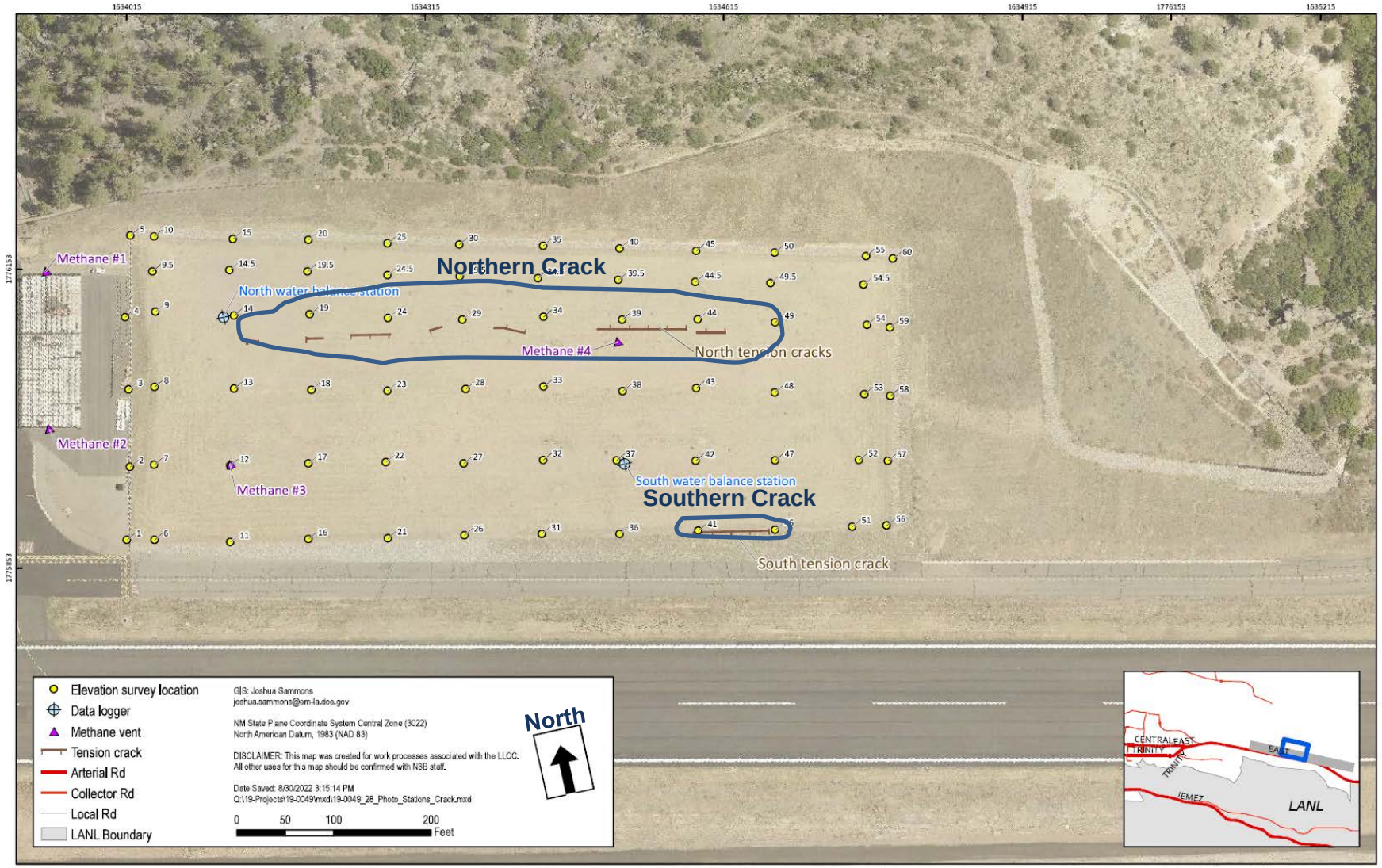

Figure 1. Crack Repair Locations

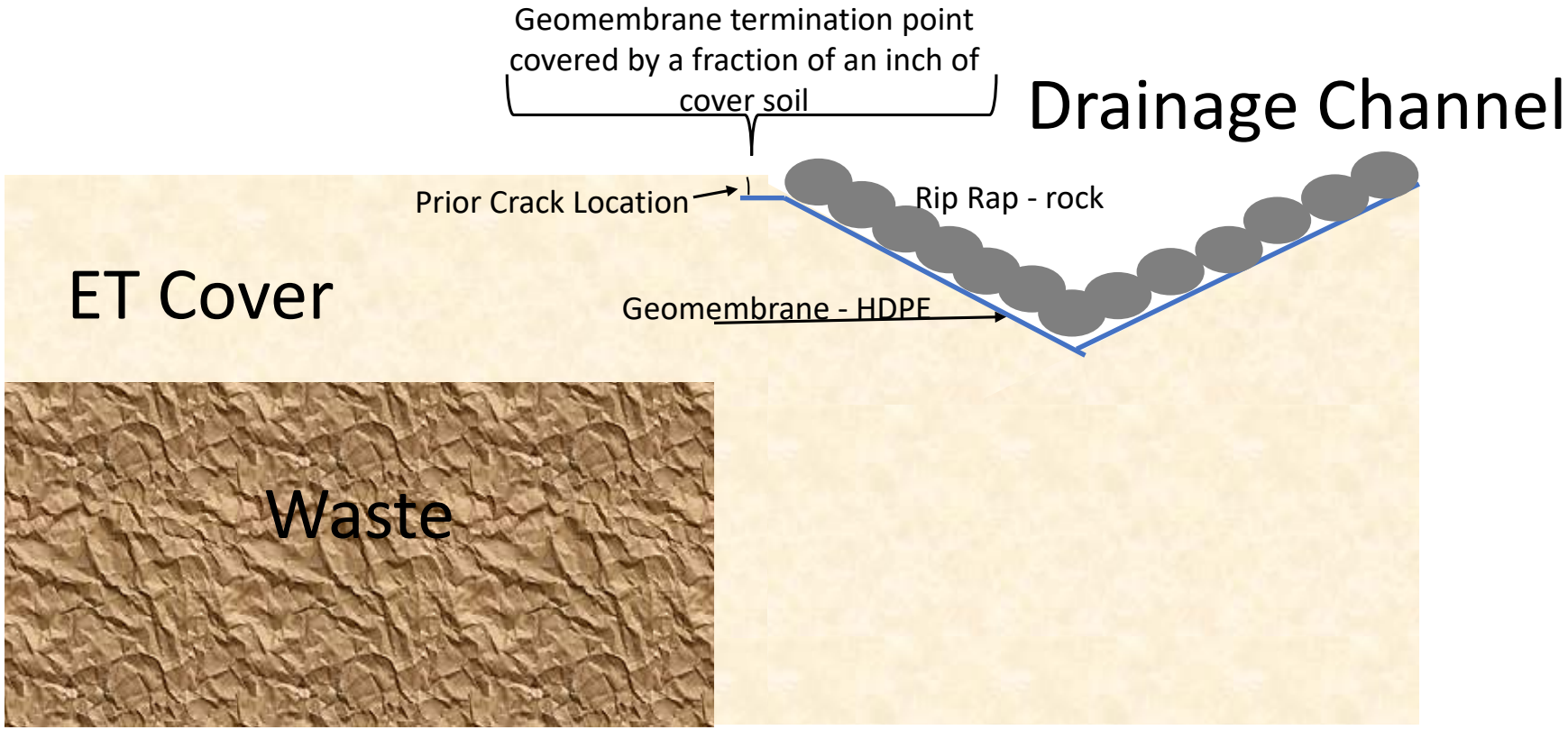

Figure 2. South Crack: Geomembrane Termination Point

Figure 3. Northern Crack Repair

Figure 4. Seeded Grass Emerging in Northern Crack Repaired Area